2003-2008 EPA Strategic Plan: Direction for the Future

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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THE ADMINISTRATOR

Message from the Acting Administrator
September 2003

I am pleased to present the U.S. Environmental Protection Agency's 2003 Strategic Plan, which will guide the Agency's work over the next five years. This Strategic Plan offers a new, more workable approach to our environmental protection efforts for the near future. We have established five new long-term, results-based goals to replace the ten goals of our previous plans. By focusing on fewer outcome-oriented goals, we can achieve better environmental results; provide greater flexibility in our internal operations to state, tribal, and federal partners; and use taxpayer dollars more wisely and effectively.

The events of the past two years have brought many changes in the way we as citizens have come to look upon our government and our communities. Our desire for improvements in the quality of life–cleaner and safer air, water, land, and the protection of natural ecosystems–remains sustained and strong. More Americans than ever before are traveling our country. They are enjoying the scenic and recreational opportunities of our rivers, parks, and forests, along with the attractions of our large cities and small towns, for which we are known and understandably proud.

Ensuring that our citizens live in a healthy, safe environment that supports these and many other beneficial uses is a responsibility that we at EPA welcome. Our 2003-2008 Strategic Plan maps out our approach to protecting and enhancing environmental quality and human health. We thank our partners and stakeholders for their continuing help toward achieving these goals. We are especially grateful to the American public for its unwavering support of our efforts to safeguard an environmental legacy that we and future generations can appreciate and enjoy.

Marianne Lamont Horinko
Acting Administrator

Contents

Introduction 1

Measuring Our Performance 7

Goal 1: Clean Air and Global Climate Change 9

Goal 2: Clean and Safe Water 32

Goal 3: Land Preservation and Restoration 61

Goal 4: Healthy Communities and Ecosystems 85

Goal 5: Compliance and Environmental Stewardship 123

Cross-Goal Strategies 147

- Partnerships 147
- Information 151
- Innovation 159
- Human Capital 166
- Science 175
- Homeland Security 184
- Economic and Policy Analysis 189

Appendix 1: Social Costs and Benefits 199
Appendix 2: Program Evaluations 253
Appendix 3: Consultation Efforts 267
Appendix 4: Coordination with Other Federal Agencies 275

INTRODUCTION

Since its establishment in 1970, the U.S. Environmental Protection Agency (EPA) and our federal, state, tribal, and local government partners have made great progress toward making our air and water cleaner and safer and protecting and restoring our land. Our mission statement is clear: to protect human health and the environment.

Today, however, we are dealing with some environmental issues far more complex than those of 20 or 30 years ago. The environmental problems we face in 2003 are more difficult to define and possible solutions are more difficult to identify. Population growth, and the way resources are consumed to sustain this growth, are altering the Earth in unprecedented ways. Scientific advances and technological developments pose new issues for human health and environmental protection. Today more than ever, we recognize the need to look toward the future to anticipate potential threats to human health and the environment, establish clear priorities, and prepare ourselves for addressing them.

Our success will depend on a variety of critical factors:

- First, we must set the right goals for protecting the environment and human health. We believe that close collaboration and good communications with our federal, state, and tribal partners are critical if we are to set meaningful goals and develop the strategies and approaches that will achieve the intended environmental results.

- We and our partners will need the best available scientific and economic information to establish priorities and make decisions. Sound science and technology will help us determine which problems pose important risks to our natural environment, human health, and quality of life. Reliable economic information will ensure our ability to make cost-efficient decisions.

- We must also collect the environmental information we need to assess where we are and where we need to go. Establishing a baseline of current conditions by identifying and monitoring a variety of environmental indicators can help us not only to set goals and develop strategies, but also to assess our progress and evaluate our performance.

- As we plan, the Agency must continue to explore new and creative ways to achieve our goals. We must look for innovative ways to address high-priority environmental problems and make full use of technology, market-based incentives, and environmental management systems.

- Finally, our future success depends on our ability to develop and sustain a highly skilled, adaptable, results-oriented workforce. We must ensure that EPA will have a workforce with the right mix of technical expertise, experience, and leadership capabilities to achieve our goals and carry out our mission.

In planning our work for the next 5 years and beyond, we have been mindful of these challenges, and we have been guided by several new initiatives and commitments. We are working hard across the Agency to focus our efforts on achieving measurable outcomes and the results that will be apparent in a safer, healthier environment; to create stronger, more effective partnerships with states and tribes; to implement reforms called for under the President's Management Agenda that will help us improve our management and performance; and to be more clearly accountable to the U.S. Congress and the American public for making progress toward our goals. These themes have shaped our strategic planning discussions over the past months, and they are reflected in this *Strategic Plan* for 2003 to 2008.

Focusing on Results: A New Set of Goals

EPA's 2003 *Strategic Plan* reflects a new perspective on the Agency's work—a sharpened focus on achieving measurable environmental results. Our 1997 and 2000 *Strategic Plans* were based on 10 strategic goals, including both outcome-oriented goals, such as Clean Air, and functional or support goals, such as Effective Management. In contrast, EPA has constructed its 2003 *Strategic Plan* around five new goals that describe the results we are striving to achieve: Clean Air and Global Climate Change, Clean and Safe Water, Land Preservation and Restoration, Healthy Communities and Ecosystems, and Compliance and Environmental Stewardship.

Under its new *Strategic Plan*, the Agency treats critical functions, such as sound science, quality environmental information, and innovation, not as goals in themselves, but as important means to an environmental end. These functions are part-and-parcel of the strategies and approaches the Agency intends to use to achieve each of its five goals, and they are discussed in general terms in the "Cross-Goal Strategies" chapter of this *Strategic Plan*.

EPA leaders believe that taking this broader approach of establishing five goals focused on environmental results and streamlining EPA's planning and budgeting structure will facilitate the Agency's ability to promote multimedia, cross-program approaches to solving environmental problems. Establishing goals that are less rigorously aligned with Agency programs or organizational units will provide greater flexibility, both within the Agency and for state and tribal environmental programs. EPA regional offices, for example, working with their state and tribal partners, will be better able to conduct regional strategic planning activities and address regional or geographic priorities under the Agency's five national goals.

Strengthening Partnerships: Improved Relationships with States and Tribes

Most of the advances in environmental protection that our Nation has realized over the past 30 years would not have been possible without the participation and support of state, tribal, and local governments. EPA's partnerships with states, tribes, and local governments are essential to achieving our human health and environmental protection goals. The Agency believes that it is only through our combined efforts that we can achieve the objectives and sub-objectives and meet the strategic targets set out in the pages that follow.

Over the coming years we will continue to work closely with our state partners to strengthen the National Environmental Performance Partnership System, a system established in 1995 to reflect commitments made by states and EPA to work together for environmental protection. Currently, we are collaborating with the Environmental Council of the States to improve opportunities for joint state-EPA regional office planning and priority-setting and to ensure that the results of these strategic discussions meaningfully influence EPA's planning and budgeting. Together, we are also reviewing our use of Performance Partnership Agreements—the negotiated agreements that define EPA and state responsibilities—to make them more useful and definitive and to reduce transaction costs. In keeping with our sharpened focus on achieving results, EPA believes that these agreements can be used more effectively to set out clear performance expectations for both states and EPA regional offices, to explain how we will work together, and to describe how we will hold one another mutually accountable for accomplishing our objectives and achieving measurable results.

Just as we work in partnership with states, EPA is committed to working with tribes in a government-to-government relationship to improve environmental and human health protection throughout the Nation. The Agency is particularly concerned about the poor state of the environment often found in Indian country. As a result, the work described in our *Strategic Plan* that focuses on communities must also provide for safeguarding tribes and tribal lands.

Implementing Reforms: The President's Management Agenda

Streamlining our goal structure to focus on the achievement of environmental results is an important, far-reaching reform. But it is not the only reform reflected in EPA's 2003 *Strategic Plan*. The President's Management Agenda, issued in August 2001, proposed three basic principles for reform: Government should be citizen-centered, results-oriented, and market-based.[1] EPA has kept these principles in mind as it developed its *Strategic Plan*. In particular, EPA's *Strategic Plan* reflects five government-wide initiatives presented in the President's Management Agenda: (1) strategic management of human capital, (2) competitive sourcing, (3) expanded electronic government, (4) improved financial performance, and (5) budget and performance integration.

In developing plans for each of its five environmental goals—establishing objectives and sub-objectives and developing the means and strategies for achieving them—EPA has considered opportunities to advance these initiatives. For example, the Agency has begun to carefully consider the unique skills, talents, and leadership that our future workforce will need to achieve each of our goals, and we are working to revise and implement a Human Capital Strategy (discussed in more detail in our "Cross-Goal Strategies") that is aligned with the Agency's planning and budgeting processes. In developing the strategies and approaches we will use to achieve our objectives, Agency staff have also been alert to opportunities for using competitive sourcing reviews to increase the efficiency and effectiveness of Agency operations. Through its cross-goal strategy for information, the Agency is expanding its use of electronic systems for information management and a number of outreach and information-sharing mechanisms to streamline and improve communications with its state and tribal partners and with the public. For example, the Agency was recently chosen to be managing partner of an online rule-making initiative and is working toward moving current federal rule-making systems into a uniform online approach.

In June 2003, EPA was recognized as the second Executive Branch agency (along with the Social Security Administration) to achieve a "green" status rating from OMB for improved financial performance. The Agency's record of superior accomplishments includes clean audit opinions on annual financial statements; effective internal controls to prevent erroneous payments; and resolving all outstanding material weaknesses for the first time since the Federal Manager's Financial Integrity Act[2] became law. Equally important to EPA's financial performance is the Agency's financial management system, which promotes integrated information to provide timely and reliable financial and performance data to program managers, who use it to support day-to-day decision making.

EPA has long been a model for integrating budget and performance, having linked its budget to its long-range *Strategic Plan* and *Annual Performance Plan* since fiscal year 1999. By integrating its planning and budgeting efforts and implementing other systems changes, the Agency has been better able to evaluate its programs, assess its performance, and use the results to make budget and program improvement decisions. The Agency will continue to strengthen links between budget and performance through its new goal structure. In addition, EPA is enhancing its financial reporting system, further integrating program performance and cost information and making it available to Agency managers and decision-makers on a real-time basis.

Strengthening Grants Management

Key to our efforts to improve EPA's financial performance are the steps we are taking to strengthen our management of grants. To benefit from our partners' innovations and expertise, EPA awards over one-half of its budget annually in grants to state, local, and tribal agencies;

educational institutions; and nonprofit organizations. Over the past several years, we have been working with them to develop an effective system for grants management that ensures we use federal funds responsibly to produce measurable environmental results.

EPA has developed its first long-term Grants Management Plan (available at http://www.epa.gov/ogd/grants/management.htm) to ensure that our grant programs meet the highest management and fiduciary standards, help us accomplish our strategic goals, and further our mission. By linking grants performance to achieving our performance goals, the activities proposed in the Grants Management Plan will further promote the Agency's effort to manage for results. Our Grants Management Plan establishes five goals: (1) Enhance the skills of EPA personnel involved in grants management; (2) Promote competition in the award of grants; (3) Leverage technology to improve program performance; (4) Strengthen EPA oversight of grants; and (5) Support efforts to identify and achieve environmental outcomes. We are committed to accomplishing these goals, and we will be working with our partners in the coming years to address the challenges involved in managing grants efficiently and effectively. We will report on our progress to the U.S. Congress through EPA's *Annual Report*.

Improving Accountability: Assessing the State of the Environment

The American public—taxpayers, communities, business and industry, environmental groups—have invested billions of dollars to control pollution and improve the environment. EPA believes that it is essential to assess our progress and review the results of those investments.

To help assess the current state of the environment and to provide a baseline against which we can measure future performance, the Agency has launched an "Environmental Indicators Initiative," under which we will collect data and information about the quality of our environment and develop an Agency-wide system for tracking and reporting on our progress. We are collaborating with our federal, state, and tribal partners to develop a set of measurements that can help us track environmental conditions over time. In 2003, we presented this information in our first *Draft Report on the Environment*, which will give Americans a better understanding of the condition of our Nation's environment and human health and allow the public to evaluate environmental programs and policies.[3] The information we collected for the *Draft Report on the Environment* and will collect for future updates will also be critical to the Agency's strategic planning, helping us to establish future goals and objectives, develop strategies, review our performance, and adjust our policies and approaches as necessary. The Agency's work on environmental indicators and *Draft Report on the Environment* are critical steps in our more comprehensive effort to identify priorities, focus resources on areas of greatest concern, manage our work effectively to achieve measurable results, and report regularly on our progress to the American public. In the coming months, we will be consulting with partners and

stakeholders on how best to align and integrate our environmental indicators work with our strategic planning.

EPA's 2003 *Strategic Plan*

This *Strategic Plan* sets out our goals for the next 5 years and describes how we intend to achieve a cleaner, healthier environment for all Americans. The chapters that follow discuss our five goals, each developed with input and advice from our partners and stakeholders; present the objectives, sub-objectives, and strategic targets that support them; and describe the means and strategies we and our partners will employ to achieve them. In addition, in a chapter on "cross-goal strategies," we present critical programs and approaches that guide our work across all the goals and through which we will accomplish our objectives.

In preparing our *Strategic Plan*, we have been guided by a commitment to the highest standards of management and to ensuring a strong, cost-effective system for protecting the environment and human health. In carrying out these efforts, we will continue to work closely with our governmental partners and to communicate our progress as clearly and effectively as possible to the American people whom we serve.

Notes

1.U.S. Office of Management and Budget. 2002. *The President's Management Agenda: FY 2002*. Washington, DC: U.S. Government Printing Office. Available online at: http://www.whitehouse.gov/omb/budget/fy2002/mgmt.pdf: Executive Office of the President, OMB Web Site. Date of Access: September 15, 2003.

2.Available online at: http://www.epa.gov/ocfo/integrity/integrity.htm .

3.U.S. Environmental Protection Agency, Office of Environmental Information. 2003. *Draft Report on the Environment*. Washington, DC: U.S. Government Printing Office. Available online at: http://www.epa.gov/indicators/roe/: EPA Environmental Indicators Initiative Web Site. Date of Access: September 15, 2003.

MEASURING OUR PERFORMANCE

RELATING GOALS TO ANNUAL PERFORMANCE

Are we making progress toward our strategic goals? Have we accomplished what we planned, and are we achieving the environmental results we intend?

To plan strategically, to adjust our approaches and activities to improve results, and to be able to report to the American people on our progress, EPA must routinely assess its performance and accomplishments. The Government Performance and Results Act (GPRA) requires agencies to report to Congress each year on their progress toward their strategic goals. Under GPRA, agencies set annual performance goals and establish measures to determine how well they are achieving those goals. Annual Performance Reports summarizing these findings are due to Congress after the end of every fiscal year.

EPA's strategic "architecture"—the Goals, Objectives, and Sub-Objectives that we use to plan our work, develop our budget, and account for our resources—is also designed to help us track our performance. Each of our five long-range strategic goals (Clean Air and Global Climate Change, Clean and Safe Water, Land Preservation and Restoration, Healthy Communities and Ecosystems, and Compliance and Environmental Stewardship) is broken down into a number of Objectives that describe what we intend to accomplish over 5 years in order to attain our larger goals. In turn, the Objectives are supported by a series of Sub-Objectives, which are focused on more specific results the Agency intends to achieve during those 5 years.

EPA's 2003 *Strategic Plan* introduces another element to many of the Sub-Objectives in the Agency's architecture: strategic targets. These 5-year targets will help us chart our course more quantitatively and track our progress from different perspectives. In most cases, we will develop our annual performance goals and measures to mirror each of our strategic targets, so that we can measure our progress each year toward these targets and the Sub-Objectives that they support. In this way our strategic targets help provide a clear first link in the Sub-Objective-to-Objective-to-Goal chain, demonstrating how the work the Agency conducts during a given year ultimately will help us reach our five Goals.

Taken in its entirety, EPA's strategic architecture presents a multi-year map for achieving our goals. It shows how accomplishments at each level—annual performance goals, strategic targets, sub-objectives, and objectives—"add up" to the next level and, ultimately, toward a strategic goal of "Clean Air" or "Clean and Safe Water." This structure also enables us to measure our performance on an annual basis and to track our progress over the long term. Most importantly, it allows EPA to present our partners, our stakeholders, and the public with a coherent, step-by-step plan for achieving our goals, accounting for our costs, measuring and

evaluating our performance, and managing our work to achieve environmental and human health protection results.

IMPROVING PERFORMANCE AND EFFICIENCY MEASURES

In addition to measuring our progress toward the objectives described in the *Strategic Plan*, we are developing improved long-term measures of our performance in key program areas. We are building on work being conducted in EPA and elsewhere to continue development of improved environmental and human health indicators. EPA's recent *Draft Report on the Environment*[1] and the ecosystem indicator report published by the H. John Heinz III Center for Science, Economics, and the Environment[2] demonstrate the challenges of developing scientifically sound indicators of the condition of the environment and human health. Nonetheless, the Agency continues to commit itself to making steady progress in better tracking the outcomes of its work. For instance, to better characterize the risks presented by air toxics, we are developing measures that go beyond tracking the tons of air toxics reduced as a result of EPA programs. A national air toxics monitoring network—a part of this effort—will track changes in ambient levels of a set of high-risk toxics over time. As another example, Agency cleanup programs are developing ways to measure the number of sites ready for reuse and the area of land now in use or ready for reuse. Once in place, such measures of effectiveness can supplement or replace objectives, sub-objectives, and targets in future EPA strategic plans.

Efficiency is another important aspect of performance measurement. Efficiency measures augment effectiveness measures; they relate program results to the resources invested or time spent to achieve those results. Efficiency measures are embedded in the architecture of this *Strategic Plan.* For example, one of the strategic targets under Goal 4 is an efficiency measure that will track the Agency's per-chemical costs of reviewing new chemicals prior to their entry into U.S. commerce. As a further commitment to making efficiency measures an integral tool in Agency management and accountability, we will include efficiency measures in our *Annual Performance Plans*. For instance, under our enforcement program in Goal 5, an efficiency measure will track the pounds of pollutants reduced against the time EPA staff spends in enforcement activities. We will continue to develop and refine efficiency measures, as well as effectiveness measures, as we work to improve measurement of our performance over the long term.

1.U.S. Environmental Protection Agency, Office of Environmental Information. 2003. *Draft Report on the Environment*. Washington, DC: U.S. Government Printing Office. Available online at: http://www.epa.gov/indicators/roe/: EPA Environmental Indicators Initiative Web Site. Date of Access: September 15, 2003.

2.The H. John HeinzIII Center for Science, Economics, and the Environment. September, 2002. *The State of the Nation's Ecosystems: Meauring the Lands, Waters, and Living Resources of the United States.* New York: Cambridge University Press.

GOAL 1
CLEAN AIR AND GLOBAL CLIMATE CHANGE

Protect and improve the air so it is healthy to breathe and risks to human health and the environment are reduced. Reduce greenhouse gas intensity by enhancing partnerships with businesses and other sectors.

Air quality in the United States has steadily improved, according to EPA's annual summary of air quality trends since the 1970s.[1] This trend toward cleaner air has occurred even as our economy has increased by 161 percent in gross domestic product, miles traveled by cars and trucks have increased by 149 percent, and energy consumption has increased by 42 percent. EPA continues to look for progressive solutions to remaining indoor and outdoor air pollution problems, which can cause breathing difficulties, long-term damage to respiratory and reproductive systems, cancer, and premature death.

Air pollution also can affect the environment by reducing visibility; damaging crops, forests, and buildings; acidifying lakes and streams; and stimulating the growth of algae in estuaries and the build-up, or bioaccumulation, of toxics in fish. Bioaccumulation poses particular risks to Native Americans and others who subsist on plants, fish, and game. Certain chemicals emitted into the air diminish the protective ozone layer in the upper atmosphere. Rapid development and urbanization in other countries is creating air pollution that threatens not only those countries but also the United States, since air pollution can travel great distances and across international boundaries.

EPA is addressing this broad range of problems strategically by applying a variety of approaches and appropriate tools. We have found that problems with broad national or global impact—emissions from powerplants and other large sources, pollution from motor vehicles and fuels, and stratospheric ozone depletion—are best handled primarily at the federal level. A national approach allows for the use of traditional regulatory tools where appropriate, and enables us to implement innovative, market-based techniques such as emissions trading, banking, averaging, and other national programs cost-effectively.

States, tribes, and local agencies can best address the regional and local problems that remain after federal measures have been fully applied. EPA works closely with public- and private-sector partners and stakeholders to develop the tools—such as monitoring, modeling, and emission inventories—that allow states, tribes, and localities to address these more localized problems. Many of these tools employ innovative techniques, such as voluntary programs for retrofitting diesel engines or community-based approaches to toxics, that are well-suited to the local nature of these problems.

Ongoing research continues to identify new air pollution issues, in areas from indoor air to radiation. We will work with our local, state, tribal, national, and international partners and stakeholders to achieve results through a suite of innovative approaches and programs that encourage cost-effective technologies and practices.

OBJECTIVES

Objective 1.1: Healthier Outdoor Air. Through 2010, working with partners, protect human health and the environment by attaining and maintaining health-based air-quality standards and reducing the risk from toxic air pollutants.

Sub-objective 1.1.1: More People Breathing Cleaner Air. By 2010, working with partners, improve air quality to healthy levels for 39 percent of the people who live in areas where the air does not meet new national standards for fine particles in 2001 and for 60 percent who live in areas not meeting new national standards for 8-hour ozone in 2001.[2,3] While some areas may not reach attainment of these new standards because of air pollutant concentrations that sometimes exceed the allowable levels, air quality will improve for an additional 27 percent of the people who live in areas not meeting new standards for 8-hour ozone in 2001. Maintain attainment status for the 123.7 million people who had healthy air for the criteria pollutants in 2001.

Strategic Targets:

- By 2010, reduce stationary source emissions of sulfur dioxide by 6.7 million tons from the 2000 level of 11.2 million tons, and by 2008, reduce stationary source emissions of nitrogen oxides by 3 million tons from the 2000 level of 5.1 million tons.[4]

- By 2010, reduce mobile source emissions of nitrogen oxides by 3.4 million tons from the 2000 level of 11.8 million tons; volatile organic compounds by 1.7 million tons from the 2000 level of 7.7 million tons; and fine particles by 122,400 tons from the 2000 level of 510,550 tons.[5]

Sub-objective 1.1.2: Reduced Risk from Toxic Air Pollutants. By 2010, working with partners, reduce air toxics emissions and implement area-specific approaches to reduce the risk to public health and the environment from toxic air pollutants.

Strategic Targets:

- By 2007, through maximum achievable control technology (MACT) standards, reduce air toxics emissions from major stationary sources by 1.7 million tons from the 1993 level of 2.7 million tons.[6]

- By 2010, through the President's Clear Skies legislation, reduce mercury emissions from electric-generating units by 22 tons from the 2000 level of 48 tons.

- By 2010, through federal standards, reduce air toxics emissions from mobile sources by 1.1 million tons from the 1996 level of 2.7 million tons.[7]

- By 2010, all of the 260,000 diesel school buses manufactured between model years 1991 and 2000 will be retrofitted either with better emission controls or equipment allowing use of cleaner fuels, and all 130,000 buses manufactured before 1991 but still in use in 2003 will be replaced.[8]

Means and Strategies for Achieving Objective 1.1

Our strategy for reducing outdoor air pollution combines national and local measures, reflecting different federal, state, tribal, and local government roles. EPA, states, and local agencies work together to meet clean air goals cost-effectively by employing various regulatory, market-based, and voluntary approaches and programs. States are primarily responsible for improving air quality and meeting national ambient air quality standards (NAAQS). States first develop emission inventories, operate and maintain air monitoring networks, and perform air quality modeling. They then develop state implementation plans (SIPs) that lay out the mobile and stationary source control strategies they will employ to improve air quality and meet NAAQS.

EPA assists states by providing technical guidance and financial assistance, issuing regulations, and implementing programs designed to reduce pollution from the most widespread and significant sources of air pollution: mobile sources, such as cars, trucks, buses, and construction equipment; and stationary sources, such as power plants, oil refineries, chemical plants, and dry cleaning operations. Interstate transport of pollutants—a problem no state can solve on its own—makes a major contribution to air pollution problems in the eastern United States. To address this issue, EPA requires control of upwind sources that contribute to downwind problems in other states.

EPA has a trust responsibility to protect air quality in Indian country, but authorized tribes may choose to develop and implement their own air quality programs. EPA and tribes are working to increase the currently limited information on air quality on tribal lands, build tribal capacity to administer air programs in Indian country, and establish EPA and state mechanisms to work effectively with tribal governments on regulatory development and regional and national policy issues.

Over the next several years, we will focus on implementing the fine particulate and 8-hour ozone standards, reducing emissions from electric-generating units through the President's Clear Skies cap-and-trade legislation, and implementing EPA's air toxics program using progressive, market-oriented methods to gain improvements in air quality most cost-effectively. We will continue to work with multi-state planning groups to develop strategies for reducing regional haze and with individual states to develop implementation approaches to reduce emissions of particulate matter (PM) and ozone precursors. In addition, we will work with states to identify opportunities for better integrating ozone and PM efforts, such as improving emission inventories and comprehensive air quality modeling approaches, controlling sources of precursors common to both pollutants, and coordinating control strategy planning cycles.

Improving Air Quality

To help states meet the clean outdoor air objective, we will continue to develop federal programs for mobile and stationary sources aimed at achieving large, nationwide, cost-effective reductions in emission of PM and its contributors: sulfur dioxide (SO_2), nitrogen oxides (NO_x) and elemental and organic carbon; ozone-forming NO_x; and volatile organic compounds (VOCs).

The President's Clear Skies legislation is a cornerstone of our strategy. Clear Skies sets strict, mandatory emission caps on three air pollutants from power generators—SO_2, NO_x, and mercury. Clear Skies, combined with other control programs, will bring many counties into attainment with EPA's new health-based standards for ozone and fine particles. By 2020, Clear Skies, EPA's proposed rule to decrease emissions from heavy-duty nonroad diesel engines, and other existing state and federal control programs, such as pollution controls for cars, trucks, and industrial boilers, will together bring all but 18 counties nationwide (including only 8 counties in the East) into attainment with the fine particle standards and all but 27 counties nationwide (including only 20 counties in the East) into attainment with the ozone standards. (In comparison, current [1991-2001] data show that today 129 counties nationwide [114 in the East] exceed the fine particle standard and 290 counties nationwide [268 in the East] exceed the new ozone standard.) In terms of benefits, by 2010, improvements in air quality under Clear Skies will result in 7,900 fewer premature deaths and $54 billion in health benefits nationwide each year. By 2020, improvements in air quality will result in 14,100 fewer premature deaths and $110 billion in health benefits nationwide each year.[9]

Supporting our strategic goal of achieving progressive, cost-effective improvements in air quality, Clear Skies will not significantly change national electricity prices. Power generators will continue to rely on diverse sources of fuel, including our abundant domestic coal resources. As the President's Clear Skies legislation moves forward in Congress, we will continue to implement the Acid Rain Program to reduce SO_2 and NO_x emissions and will address the interstate transport of ozone and NO_x through the NO_x Budget Trading Program under the NO_x SIP Call.

EPA is now implementing national programs that will dramatically reduce future emissions from a wide range of mobile sources, including cars, minivans, sport utility vehicles, trucks, buses, motorcycles, recreational vehicles, forklifts, generators, marine engines, locomotives, and lawn and garden equipment. To enhance compliance with recently promulgated heavy-duty vehicle standards, for example, we are developing rules for in-use emissions and on-board diagnostics. EPA estimates that, when fully implemented, the heavy-duty vehicle standards will prevent 8,300 premature deaths, more than 9,500 hospitalizations, and 1.5 million lost work days every year.[10] We are also developing a program to establish new standards for non-road diesel engines, including sulfur requirements for non-road diesel fuel, and we are planning to address emissions from locomotives and marine engines.

EPA is addressing diesel exhaust from on-road and non-road sectors not only by establishing new standards, but also through voluntary programs to reduce emissions from existing diesel engines in trucks, buses, and construction equipment. These programs will greatly reduce emission of air toxics, as well as criteria pollutants and their precursors, and meet our strategic goal of achieving air quality cost-effectively. For instance, EPA will expand its efforts to create voluntary diesel-retrofit projects to reduce PM from older, high-polluting trucks and buses. We will concentrate on areas with sensitive populations, and on raising public awareness of the problem of children riding in older, high-emitting diesel school buses. EPA will provide schools with grants for retrofitting and replacing diesel school buses and reducing idling. We will also work with the trucking and railroad industries to adopt pollution control and energy-saving technologies. To address emissions from trucks idling at truck stops and rest areas, EPA will continue to develop agreements with truck fleets, the truck-stop industry, manufacturers of idle-control technologies, and state and local governments to create incentives for implementing idle-control technologies.

We will continue to implement the reformulated gasoline program, while working to address issues associated with the use of oxygenates (e.g., methyl tertiary-butyl ether [MTBE] and ethanol). With our partners, we will create a compliance program to ensure that vehicles and engines are clean, and we will help states incorporate on-board diagnostic inspections into their vehicle inspection and maintenance programs. We will also continue to help states and local agencies implement the transportation conformity regulation, which ensures that federally funded or approved highway and transit activities are consistent with SIPs, and will propose and finalize

changes to the regulation to address the revised ozone and PM standards. In addition, we will work to ensure the technical integrity of mobile source controls in SIPs. Finally, recognizing that efforts to reduce emissions need to be accompanied by efforts to reduce the effects of unmanaged growth and development, EPA will work with state and local governments, assisting them in crafting comprehensive strategies that accommodate necessary growth and economic development while minimizing adverse effects on air quality and other quality-of-life factors.

Reducing Risks From Toxic Pollutants

The Clean Air Act requires EPA to regulate emission of 188 toxic air pollutants, including dioxin, asbestos, toluene, and such metals as cadmium, mercury, chromium, and lead compounds.[11] To further reduce exposure to air toxics, EPA will develop and issue federal standards for major stationary sources which, when implemented through state programs, will reduce toxic emissions by 1.7 million tons. In addition, we will conduct national, regional, and community-based efforts to reduce multimedia and cumulative risks. Characterizing emissions and the risks they pose on national and local scales, such as in Indian country, will require significant effort. We will need to update the science and to keep the public informed about these issues.

We will develop and refine tools, training, handbooks, and information to assist our partners in characterizing risks from air toxics, and we will work with them on strategies for making local decisions to reduce those risks. We are working with state and local agencies to design a national toxics monitoring network, and we will compile and analyze information from local assessments to better characterize risk and assess priorities.

Working with Tribes and Other Partners

EPA is committed to working with tribes on a government-to-government basis to develop the infrastructure and skills tribes need to assess, understand, and control air quality on their lands. We will increase air monitoring in Indian country, and, in consultation with tribes, we will establish needed federal regulatory authorities and help tribes develop and manage their own air programs in a manner consistent with EPA Indian Policy and tribal traditions and culture. We plan to complete a policy determining when Federal Implementation Plans are appropriate for bringing Clean Air Act programs to Indian country. We will support tribal air programs by providing technical support, assistance with data development, and training and outreach, and we will help tribes participate in discussions of national policy and operations and in regional planning and coordination activities. Where tribes choose not to develop their own programs, we will implement air quality programs directly.

As we develop and implement clean air strategies, we will work with other federal agencies to ensure a coordinated approach. Our federal partners include the Department of Agriculture (in the areas of animal feeding operations, agricultural burning, and controlled

burning), the Department of Transportation (for transportation-related air quality issues), the Department of Energy (for electric utilities, electricity generation, and energy efficiency issues), and the Department of Interior (concerning visibility in national parks and wilderness areas).

EPA will also work to address sources of air pollutants that lie outside our borders, but pose risks to public health and air quality within the United States. We will work with the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, and other agencies to improve our capability to detect, track, and forecast the effects of air pollutants from international sources. We will continue our efforts to address and reduce the risk from airborne persistent and bioaccumulative toxins (PBTs) transported across international boundaries. By engaging with the international scientific community, we hope to improve our understanding of international flows and our tools for analyzing and evaluating response policies. Working through bilateral agreements and multilateral international organizations (such as the United Nations Environment Programme and the Organisation for Economic Cooperation and Development), we will promote capacity building, technology transfer, and other strategies to reduce foreign sources of pollution. EPA will also help represent the United States in existing multilateral international agreements (such as the Convention on Long-Range Transboundary Air Pollution and the United Nations Stockholm Convention on Persistent Organic Pollutants) to control sources of internationally transported pollutants and protect U.S. interests. In North America, we will work with Canada and Mexico within such existing agreements as the U.S.-Mexico La Paz Agreement (http://air.utep.edu/bca/jac/agreement.html), the U.S.-Canada Air Quality Agreement (http://www.epa.gov/airmarkt/usca/agreement.html), and the North American Agreement on Environmental Cooperation (http://www.naaec.gc.ca/eng/agreement/agreement_e.htm), to control the cross-border flow of pollutants. We will also work with Canada, Mexico, and key stakeholders to identify and explore new approaches to managing air quality along our common borders.

Objective 1.2: Healthier Indoor Air. By 2008, 22.6 million more Americans than in 1994 will be experiencing healthier indoor air in homes, schools, and office buildings.[12]

Strategic Targets:

- By 2008, approximately 12.8 million additional people will be living in homes with healthier indoor air. These include people living in homes with radon-resistant features, children not being exposed to environmental tobacco smoke, and asthmatics with reduced exposure to indoor asthma triggers.

- By 2008, approximately 7.8 million additional students and staff will experience improved air quality in their schools.

- By 2008, approximately 2 million additional office workers will experience improved air quality in their workplaces.

Means and Strategies for Achieving Objective 1.2

Air within homes, schools, and workplaces can be more polluted than outdoor air in the largest and most industrialized cities.[13] And because people typically spend close to 90 percent of their time indoors,[14] many may have a greater exposure to indoor pollution than to outdoor air pollution. Relative risk reports issued by EPA,[15] the Science Advisory Board,[16] and several states[17] rank indoor air pollution among the top four environmental risks. Moreover, people who may spend the most time indoors, thus exposed to indoor air pollutants for long periods of time, are often those who may be most susceptible to their effects: the young, the elderly, and the chronically ill, especially those suffering from respiratory or cardiovascular disease.

To address indoor air quality issues, EPA develops and implements voluntary outreach and partnership programs that inform and educate the public about indoor air quality and actions that can reduce potential risks in homes, schools, and workplaces. Through these voluntary programs, EPA disseminates information and works with state, tribal, and local governments; industry and professional groups; and the public to promote actions to reduce exposures to possibly harmful levels of indoor air pollutants, including radon.

Educational literature, multimedia materials, media campaigns, hotlines, clearinghouse operations, and other outreach efforts provide the public, our partners, and the professional and research communities with information about indoor air health risks and actions that can reduce those risks. We also transfer technology by providing detailed guidance on indoor-air-related building design, operation, and maintenance practices to building owners, building managers, and school facility managers and easy-to-use tools to educators and school facility managers. Our partners—including health care providers who treat children with asthma; school personnel who manage school environments; county and local environmental health officials; and populations that might be disproportionately affected by indoor air pollution—have the expertise and/or credibility that allow EPA to reach a larger audience than we could on our own. To support these voluntary approaches, we will base our recommendations for reducing potential exposure to indoor contaminants on the most current science available.

EPA will also provide tribes with appropriate tools and assistance to address indoor air toxics, such as radon, environmental tobacco smoke, PM, and biological issues, such as mold contamination. We will work with other federal agencies to provide guidance and assistance on how to reduce the exposure levels of these contaminants in all Indian communities.

EPA will broaden awareness and increase action by working with national as well as local community-based organizations to design and implement programs that address critical indoor air quality problems, including radon, secondhand smoke, asthma, and mold contamination in homes, child care and school facilities, and other residential environments. Through our State Indoor Radon Grant Program, we will continue to help states that have not yet established the basic elements of an effective radon assessment and mitigation program, and will support innovation and expansion in states that already have programs. Other indoor environment programs will focus on expanding national awareness of asthma triggers through outreach to schools, child care centers, health care providers, and the general public.

Objective 1.3: Protect the Ozone Layer. By 2010, through worldwide action, ozone concentrations in the stratosphere will have stopped declining and slowly begun the process of recovery, and the risk to human health from overexposure to ultraviolet radiation, particularly among susceptible subpopulations, such as children, will be reduced.

Strategic Targets:

- By 2010, atmospheric concentrations of the ozone-depleting substances CFC-11 and CFC-12 will have peaked at no more than 300 and 570 parts per trillion respectively, while production of these chemicals will be allowed only for very limited essential uses.

- By 2010, all methyl bromide production and import, except for exemptions permitted by the Montreal Protocol, and 45 percent of all HCFC production and import, will be phased out, further accelerating the recovery of the stratospheric ozone layer.

Means and Strategies for Achieving Objective 1.3

Scientific evidence amassed over the past 25 years has shown that chlorofluorocarbons and hydrochlorofluorocarbons (refrigerants), halons, (fire-extinguishing agents), methyl bromide (a pesticide), and other halogenated chemicals used around the world are depleting the stratospheric ozone layer. As a result, more harmful ultraviolet (UV) radiation is reaching the earth,[18] increasing the risk of overexposure to radiation and consequent health effects, including skin cancer, cataracts, and other illnesses. More than a million new cases of skin cancer are diagnosed each year,[19] and more than half of all Americans develop cataracts by the time they are 80 years old.[20]

As a signatory to the *Montreal Protocol on Substances That Deplete the Ozone Layer* (Montreal Protocol),[21] the United States is obligated to regulate and enforce its terms domestically. In accordance with this international treaty and related Clean Air Act requirements,[22] EPA will continue to implement the domestic rule-making agenda for the reduction and control of ozone-depleting substances (ODS) and enforce rules controlling their production, import, and emission. This implementation includes combining market-based regulatory approaches with sector-specific technology guidelines and facilitating the development and commercialization of alternatives to methyl bromide and HCFCs. We will strengthen outreach efforts to ensure efficient and effective compliance, and continue to identify and promote safer alternatives to curtail ozone depletion. To help reduce international emissions, we will assist with the transfer of technology to developing countries and work with them to accelerate the phase-out of ozone-depleting compounds. EPA estimates that in the United States alone between 1990 and 2165, the worldwide phase-out of ODS will save 6.3 million lives from fatal cases of skin cancer, avoid 299 million cases of nonfatal skin cancers, and avoid 27.5 million cases of cataracts.[23]

Because the ozone layer is not expected to recover until the middle of this century at the earliest,[24] the public will continue to be exposed to higher levels of UV radiation than existed prior to the use and emission of ODS.[25] Recognizing this fact and the public's current sun-exposure practices, EPA will continue education and outreach efforts to encourage behavioral changes as the primary means of reducing UV-related health risks.

Objective 1.4: Radiation. Through 2008, working with partners, minimize unnecessary releases of radiation and be prepared to minimize impacts to human health and the environment should unwanted releases occur.

> **Sub-objective 1.4.1: Enhance Radiation Protection.** Through 2008, protect public health and the environment from unwanted releases of EPA-regulated radioactive waste and minimize impacts to public health from radiation exposure. By 2008, increase the total number of drums of radioactive waste certified by EPA as properly disposed to 140,171 (420.5 million milli curies) from 47,171 (141.5 million milli curies) in 2003. (The estimated total drums to be deposited at the Waste Isolation Pilot Plant [WIPP] is 860,000 [2.6 billion milli curies] over the next 35 years.[26])
>
> **Sub-objective 1.4.2: Maintain Emergency Response Readiness.** By 2008, ensure Agency readiness to inform the public about and protect them from airborne releases of radiation. By 2008, 80 percent of EPA's 300-person Radiation Emergency Response

Team will meet scenario-based response criteria, up from 50 percent in 2005. By 2008, EPA's National Radiation Monitoring System will cover 70 percent of the U.S. population. (2005 baseline: 37 percent of the U.S. population)

Means and Strategies for Achieving Objective 1.4

EPA continues to meet the statutory mandates for managing radiation waste and controlling radioactive emissions and to fulfill its responsibilities under Presidential decision directives for radiological emergency preparedness and response. These responsibilities form the core of our strategy to protect the public and the environment from unnecessary exposure to radiation. EPA works with states, tribes, and industry to develop innovative training, public information, and voluntary programs to minimize these exposures.

One of EPA's major responsibilities related to radiation is certifying that all radioactive waste shipped by the Department of Energy (DOE) to the WIPP is disposed of safely and according to EPA's standards. We inspect waste generator facilities and biennially evaluate DOE's compliance with applicable environmental laws and regulations. Every 5 years, EPA must recertify that the WIPP will comply with EPA's radioactive waste disposal regulations.

Mining and processing naturally occurring radioactive materials for use in medicine, power generation, consumer products, and industry inevitably generate emissions and waste. EPA provides guidance and training to other federal and state agencies in preparing for emergencies at U.S. nuclear plants, transportation accidents involving shipments of radioactive materials, and acts of nuclear terrorism. The Agency sets protective limits on radioactive emissions for all media—air, water, and soil—and develops guidance for cleaning up radioactively-contaminated Superfund sites. We will ensure that the Agency employs appropriate methods to manage radioactive releases and exposures. These include health-risk site assessments; risk modeling, cleanup, and waste management activities; voluntary programs to minimize exposure to radiation in commercial products and industrial applications; national radiation monitoring; radiological emergency response; and provision of federal guidance to our international, federal, state, and local partners.

EPA will continue to assist states in retrieving and disposing of radioactive sources that find their way into non-nuclear facilities, particularly scrap yards, steel mills, and municipal waste disposal facilities. We will also continue to work with the International Atomic Energy Agency and other federal agencies to prevent metals and finished products suspected of having radioactive contamination from entering the country. We will create partnerships with states, local agencies, and tribes to locate and secure lost, stolen, or abandoned radioactive sources within the United States and to develop voluntary programs with state and local agencies and industry to investigate

and promote pollution prevention and operational practices and technologies that reduce industrial radioactive releases.

EPA also operates the Environmental Radiation Ambient Monitoring System (ERAMS), the only national environmental radiation program that provides information about the wide-scale spread of radioactive material from nuclear or radiological incidents. Over the next several years, EPA will improve ERAMS by adding deployable monitoring instruments that can quickly be shipped to affected areas, by conducting real-time monitoring for contamination in air, and by replacing old equipment with state-of-the art air samplers.

Objective 1.5: Reduce Greenhouse Gas Intensity. Through EPA's voluntary climate protection programs, contribute 45 million metric tons of carbon equivalent (MMTCE) annually to the President's 18 percent greenhouse gas intensity improvement goal by 2012. (An additional 75 MMTCE to result from the sustained growth in the climate programs are reflected in the Administration's business-as-usual projection for greenhouse gas intensity improvement.[27])

Strategic Targets:

- Through EPA's ENERGY STAR® program, prevent 27 MMTCE in the buildings sector in 2012, in addition to the 20 MMTCE prevented annually in 2002.[28]
- Through EPA's industrial sector programs, prevent 80 MMTCE in 2012, in addition to the 43 MMTCE prevented annually in 2002.[29]
- Through EPA's transportation programs, prevent 13 MMTCE in 2012, in addition to the 2 MMTCE being prevented annually as of 2002.

Means and Strategies for Achieving Objective 1.5

This objective will accomplish the portion of the goal that addresses reducing greenhouse gas (GHG) intensity by enhancing partnerships with businesses and other sectors. In 2002, President Bush announced a U.S. climate policy to reduce the GHG intensity of the U.S. economy by 18 percent over the next decade. EPA's strategy for helping to improve GHG intensity is to enhance its partnerships with businesses and other sectors through programs that deliver multiple benefits in addition to reducing GHG intensity—from cleaner air to lower energy bills. At the core of these efforts are voluntary government-industry partnership programs designed to capitalize on the opportunities that consumers, businesses, and organizations have for making sound investments in efficient equipment, policies and practices, and transportation choices.

EPA manages a number of voluntary climate efforts to improve information in the marketplace and more quickly deploy technology in the residential, commercial, and transportation sectors of the economy. The ENERGY STAR® partnership (http://www.energystar.gov/) has been successful in profitably avoiding GHG emissions. EPA will continue SmartWay Transport Partnership (http://www.epa.gov/smartway/) efforts with the trucking and railroad industries to reduce GHGs voluntarily through efficiency or energy-saving technologies and to promote cleaner vehicles and the adoption of pollution control and energy-saving technologies that reduce NO_x and PM emissions. EPA's Best Workplaces for Commuters℠ program (http://www.commuterchoice.gov/) will also continue developing innovative solutions to commuting challenges faced by U.S. employers and employees by promoting commuter benefits that reduce vehicle trips and miles traveled. Other activities at EPA will further advance fuel-efficient and clean automotive technology, thus saving energy and reducing GHG emissions.

EPA will continue to build on the success of the voluntary programs in the industrial sector, focusing on reducing carbon dioxide emissions and continuing successful initiatives to reduce methane emissions and emissions of the high-global-warming-potential gases. EPA's goals for these efforts are to cost-effectively return emissions of methane to 1990 levels or below by 2012; to cost-effectively limit emissions of the more potent GHGs (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride); and to facilitate the use of clean energy technologies and promote renewable energy.

EPA will continue its efforts to provide state and local governments with technical, outreach, and education services about climate change impacts, mitigation and adaptation options, and related issues so that they may more effectively and comprehensively address their goals. Internationally, EPA will promote the voluntary use of low- and zero-GHG technologies.

Objective 1.6: Enhance Science and Research. Through 2010, provide and apply sound science to support EPA's goal of clean air by conducting leading-edge research and developing a better understanding and characterization of environmental outcomes under Goal 1.

> **Sub-objective 1.6.1: Provide Science to Support Air Programs.** Through 2010, use the best available scientific information, models, methods, and analyses to support air-program-related guidance and policy decisions.
>
> **Sub-objective 1.6.2: Conduct Air Pollution Research.** Through 2010, provide methods, models, data, and assessment research associated with air pollutants. Focus criteria pollutant research on emissions, fate and transport, exposures, mechanisms of injury, and health effects to support the periodic revision and implementation of National Ambient Air Quality Standards and to develop information and tools for understanding

and characterizing environmental outcomes associated with criteria pollutants. Focus air toxics research on developing and improving air quality models and source receptor tools; cost-effective pollution prevention and other control options; and scientific information and tools for understanding and characterizing environmental outcomes associated with national, urban, and residual air toxic risks.

Means and Strategies for Achieving Objective 1.6

EPA's science and research efforts are designed to provide the best information available to support our policies and regulations. First, we identify the research necessary to develop the quality information and tools we need for decision-making, standard-setting, and implementation work. Once these scientific tools are in use, we can identify data gaps and determine our needs for further research.

Science to Support Air Programs

EPA will continue to use sound science to determine the relative risks that air pollution poses to human health and the environment; identify the best means to detect, abate, and avoid environmental problems associated with air pollutants; and evaluate the effectiveness of control programs in reducing exposure to harmful levels of air pollution. The Agency will base its efforts to reduce environmental risks on the best available scientific information and will continue to integrate critical scientific assessment with policy, regulatory, and nonregulatory activities.

Science activities related to air quality fall into three broad categories: (1) exposure and risk assessment, (2) program development and assessment, and (3) development and assessment of technology.

Risk Assessment

EPA conducts risk assessments on both criteria and hazardous air pollutants to support our air toxics program and to assist in estimating the risks associated with exposure to criteria pollutants, such as fine particulates. We also conduct radiation-risk assessments to evaluate health risks from radiation exposure; to determine appropriate levels for cleaning up contaminated sites; and to develop radiation protection and risk management policy, guidance, and rules.

Program Development and Assessment

Using mathematical models, EPA works with states and tribes to evaluate control options, control plans, the impacts of alternative emission scenarios, and the effect of federal

rules. EPA's Acid Rain Program uses deposition models to evaluate our allowance trading program and to support the National Acid Precipitation Assessment Program, which coordinates federal acid deposition research. In addition, we use mathematical models, ambient monitoring information, and other data to determine the effectiveness of control strategies.

Technology Development and Assessment

Developing and assessing innovations in environmental protection is another important aspect of EPA's clean air program. Through its clean automotive technology program, EPA will continue to develop advanced clean and fuel-efficient automotive technology. We will collaborate with industry to transfer the unique EPA-patented, highly efficient hybrid engine and powertrain components, originally developed for passenger cars, to meet the more demanding size, performance, durability, and towing requirements of sport utility and urban delivery vehicles, without compromising performance, safety, or reductions in emissions.

EPA is committed to common-sense, cost-effective solutions that result in cleaner air. To control air toxics reasonably and effectively, EPA will continue to evaluate control technologies to ensure that they are protective, cost-effective, and commercially viable.

Effectively using partnerships is a key aspect of our approach to sound science. Under a joint effort on air quality forecasting, for example, EPA and the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) are combining their expertise in air quality, atmospheric measurements, and modeling to develop a consistent, national numerical air quality model for short-term air quality forecasts for ozone and PM. We are contributing our national collection, analysis, and distribution of ambient air quality (our AIRNow program) and emissions data; air quality modeling; and detailed research analysis of air quality impacts on human health. NOAA brings expertise in operational meteorological modeling, air quality research, and product development and distribution.

Air Pollution Research

To meet our objectives for clean outdoor and indoor air, EPA's Office of Research and Development (ORD) has developed multi-year plans for research on PM, tropospheric ozone (and other criteria pollutants), and air toxics that lay out long-term goals for the next 5 to 10 years and describe targets the Agency intends to meet to reduce scientific uncertainties.[30]

In addition to the research we are conducting to support our clean air objectives, EPA has also developed a multi-year plan for global change, which is discussed under Goal 4: Healthy Communities and Ecosystems.

Particulate Matter

EPA's research on PM represents the largest portion of its clean air research program. Guided by expert advice from the National Research Council of the National Academy of Sciences and several other organizations outside the Agency, EPA is addressing its PM research goals by using in-house laboratory resources and partnering with numerous academic institutions, including five PM research centers around the Nation.

To achieve our objectives for healthier outdoor air, the PM research program provides health and exposure information needed to establish standards and develop tools, such as emissions measurement methods, air quality models, and ambient measurement methods, that allow states, local agencies, and tribes to achieve NAAQS cost-effectively. From FY 2003 to FY 2007, research will focus on developing data and tools needed for implementation of the current PM standard and for the next required review of the standard. Because there is a 5-year cycle for reviewing NAAQS, future research will focus on the information needed to determine whether standards should be retained or revised and to implement new or revised standards.

Tropospheric Ozone

The tropospheric ozone research program addresses not only ozone, but other criteria pollutants such as sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Under this research program, EPA will develop scientific criteria documents that can be used to establish air quality standards that protect human health and the environment. The research also focuses on developing tools, such as improved emissions estimates and modeling capability, to help states, local agencies, and tribes meet the air quality standards.

Air Toxics

Air toxics research is designed to answer critical scientific questions that will result in more certain risk assessments and more effective risk management practices for stationary point, area, mobile, or indoor sources of air toxics. This research will help to reduce risks from toxic air pollutants by improving information on evaluating risks from air toxics and methods for reducing those risks. Currently, in-house laboratories and research centers conduct most of this research. In the future, EPA will consider the using extramural research grants to complement its intramural program.

EXTERNAL FACTORS

State implementation of delegated air programs, state and local implementation of federal regulations, and state and local agencies' implementation of their own air pollution control regulations and programs are necessary for achieving our objectives and sub-objectives for clean

air. However, many states are currently facing reduced budgets and resource constraints that might impede their ability to carry out environmental protection programs.

Lawsuits and court action might require the Agency to adjust schedules and delay its accomplishment of certain goals and objectives. Achievement of the clean air objectives can also be affected by economic conditions and development patterns in the United States and the world and by choices made for energy and transportation policies.

Weather conditions and meteorological patterns have very important effects on air quality. For example, high temperatures and bright sunlight can increase the formation of ozone. Wind can carry air pollution from one area to another, while conditions of little or no wind can cause air pollutants to remain in an area and build up to unhealthy levels. These effects must be considered when developing and implementing plans and strategies to achieve and maintain clean air.

Finally, Objective 1.1 and Sub-objectives 1.1.1 and 1.1.2 assume enactment and implementation of the Clear Skies legislation proposed by the President in 2002. As this proposed legislation is still in the early stages of the legislative process, it is not possible to predict at this time what action the U.S. Congress will take.

Human Capital Focus For Achieving Goal 1

EPA's workforce planning, hiring, and training activities will emphasize:

- Risk assessment, environmental/risk modeling and monitoring, economic analysis, and standard-setting
- Communication and coalition-building
- Energy efficiency and clean-energy technology
- Waste management and cleanup, radiation monitoring, and radiological emergency response
- Toxicity mechanisms; chronic health effects; emissions measurement and estimation methods; exposure, dose, and response modeling; atmospheric modeling; monitoring methods; and control and prevention technologies.

Efficiency Measures For Goal 1

Efficiency measures relate results to the resources or time invested to achieve those results and augment effectiveness measures in evaluating performance. They help us integrate EPA's budget and performance—part of the President's Management Agenda—and demonstrate the cost-effectiveness and timeliness of program activities.

Under Goal 1, EPA is developing efficiency measures to track our progress in reducing the costs of developing acid rain and related market-based programs:

EPA is in the process of developing efficiency measures to evaluate progress in reducing transaction costs for Acid Rain and related market-based programs. These transaction cost efficiencies deal with e-Gov practices and minimizing emissions data reporting transaction costs. For example, the Agency plans by 2005 to reduce annual emissions and monitor certification data reporting costs by 50 percent from approximately $4,000 per unit in the baseline year of 2000.

Notes

1.U.S. Environmental Protection Agency. September 2002. *Latest Findings on National Air Quality: 2001 Status and Trends*. EPA 454/K-02-001. Washington, DC: GPO. Available online at http://www.epa.gov/air/aqtrnd01/: EPA Office of Air and Radiation Web Site. Date of Access: September 8, 2003.

2.Areas not meeting the new standards are EPA projections based on 1999-2001 air quality monitoring data, which is maintained in the *Air Quality Subsystem* (AQS). AQS contains ambient air pollution data collected by EPA and state, local, and tribal air pollution control agencies from thousands of monitoring stations. Information can be obtained from: U.S. Environmental Protection Agency, Technology Transfer Network, Air Quality System Web Site, http://www.epa.gov/ttn/airs/airsaqs/sysoverview.htm. Date of Access: September 8, 2003.

3.In 2001, the number of people living in areas not meeting new standards was 110,839,831 for 8-hour ozone and 65,119,817 for particulate matter $(PM)_{2.5}$. In 2010, the number of people living in areas meeting new standards is expected to be 66,339,377 for 8-hour ozone and 25,173,130 for $PM_{2.5}$.

4.U.S. Environmental Protection Agency, Office of Air and Radiation. July 2003. *Clear Skies Act Fact Sheet 2003*. Washington, DC: GPO. Available online at http://www.epa.gov/air/clearskies/fact2003.html. Date of Access: September 8, 2003.

5.Baseline is from: U.S. Environmental Protection Agency, Office of Air and Radiation. September 2002. *Final Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines.* EPA 420-R-02-022. Washington, DC: GPO. Available online at http://www.epa.gov/otaq/regs/nonroad/2002/r02022.pdf. Date of Access: September 8, 2003.

6.Baseline is from: U.S. Environmental Protection Agency, Office of Air and Radiation. May 2001. *1993 National Toxics Inventory: Baseline 1993 NTI Raw Data*. Washington, DC: GPO.

7.Baseline is from: U.S. Environmental Protection Agency, Office of Air and Radiation. *1996 National Toxics Inventory. 1996 Inventory Documentation and Data*. Washington, DC: GPO. Available online at http://www.epa.gov/ttn/chief/net/1996inventory.html. Date of Access: September 8, 2003.

8.Data on number of school buses manufactured taken from: Monahan, Patricia. February 2002. *Pollution Report Card: Grading America's School Bus Fleets*. Cambridge, MA: Union of Concerned Scientists.

9. U.S. Environmental Protection Agency, Office of Air and Radiation. July 2003. *2003 Technical Support Package for Clear Skies, Section B: 2003 Human Health and Environmental Benefits*. Washington, DC: GPO. Available online at http://www.epa.gov/air/clearskies/technical.html. Date of Access: September 8, 2003.

   An alternative methodology projects that by 2010, Clear Skies will prevent 4,700 premature deaths and deliver $10 billion in health benefits annually and, by 2020, prevent 8,400 premature deaths and deliver $21 billion in public health benefits annually.

10.U.S. Environmental Protection Agency, Office of Air and Radiation. December 2000. *Regulatory Announcement: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements*. EPA 420-F-00-057. Washington, DC: GPO. Available online at http://www.epa.gov/otaq/regs/hd2007/frm/f00057.pdf. Date of Access: September 8, 2003.

11.Clean Air Act, Title I, Section 112. Available online at http://www.epa.gov/air/caa/caa112.txt: EPA Clean Air Act Web Site. Date of Access: September 8, 2003.

12.The 1994 baseline is assumed to be zero for purposes of tracking the results of EPA indoor air programs because the number of Americans experiencing healthier indoor air prior to 1994 is unknown.

13.U.S. Environmental Protection Agency. 1987. *The Total Exposure Assessment Methodology (TEAM) Study: Summary and Analysis: Volume I*. EPA 600-6-87-002a. Washington, DC: GPO.

14.U.S. Environmental Protection Agency. 1989. *Report to Congress on Indoor Air Quality, Volume II: Assessment and Control of Indoor Air Pollution*. EPA 400-1-89-001C. Washington, DC: GPO.

15.U.S. Environmental Protection Agency. 1987. *Unfinished Business: A Comparative Assessment of Environmental Problems*. EPA 230287025a. Washington, DC: GPO.

16.U.S. Environmental Protection Agency, Science Advisory Board. 1990. *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. EPA-SAB-EC-90-021. Washington, DC: GPO.

17. Florida Center for Public Management. September 1995. *Comparing Florida's Environmental Risks: Risks to Florida and Floridians*. Tallahassee. Available online at http://www.pepps.fsu.edu/FCER/final.pdf: Program for Environmental Policy and Planning Systems Web Site, Institute of Science and Public Affairs, Florida State University. Date of Access: September 8, 2003.

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18.United Nations Environment Programme. 2002. *Scientific Assessment of Ozone Depletion*. Available online at http://www.unep.org/ozone/sap2002.shtml: UNEP, The Ozone Secretariat Web Site. Date of Access: September 8, 2003.

19.American Cancer Society Inc. 2003. *Cancer Facts and Figures: 2003*. No. 5008.03. Available online at http://www.cancer.org/downloads/STT/CAFF2003PWSecured.pdf. Date of Access: September 8, 2003.

20.Prevent Blindness America. 2003. *Cataract Fact Sheet*, FS32. Available online at http://www.preventblindness.org/resources/factsheets/CataractsFS32.PDF. Date of Access: September 8, 2003.

21.United Nations Environment Programme. *The Montreal Protocol on Substances that Deplete the Ozone Layer, as adjusted Beijing 1999.* Nairobi, Kenya. Available online at http://www.unep.org/ozone/montreal.shtml: UNEP, The Ozone Secretariat Web Site. Date of Access: September 8, 2003.

22.Clean Air Act, Title VI. Available online at http://www.epa.gov/air/caa/title6.html: EPA Clean Air Act Web Site. Date of Access: September 8, 2003.

23.U.S. Environmental Protection Agency, Office of Air and Radiation. 1999. *The Benefits and Costs of the Clean Air Act 1990-2010, EPA Report to Congress*. EPA-410-R-99-001. Washington, DC: GPO. Available online at http://www.epa.gov/air/sect812/1990-2010/chap1130.pdf. Date of Access: September 8, 2003.

24.United Nations Environment Programme. 2002. *Scientific Assessment of Ozone Depletion*. Available online at http://www.unep.org/ozone/sap2002.shtml: UNEP, The Ozone Secretariat Web Site. Date of Access: September 8, 2003.

25.UV irradiance has increased since the early 1980s by 6 to 14 percent at more than 10 sites distributed over mid- and high latitudes of both hemispheres. Information from: United Nations Environment Programme. 2002. *Scientific Assessment of Ozone Depletion*. Available online at http://www.unep.org/ozone/sap2002.shtml: UNEP, The Ozone Secretariat Web Site. Date of Access: September 8, 2003.

26.U.S. Department of Energy. August 2002. *Transuranic Waste Performance Management Plan.* Carlsbad. Available online at http://www.wipp.carlsbad.nm.us/: DOE, Carlsbad Field Office, Waste Isolation Pilot Plant Web Site. Date of Access: September 8, 2003.

27.Overall, EPA's climate protection programs will prevent 185 MMTCE annually by 2012, up from 65 MMTCE in 2002. Of the additional 120 MMTCE that will be prevented annually by 2012, 75 MMTCE will result directly from the sustained growth in many of the climate programs and are reflected in the Administration's business-as-usual projection for GHG intensity improvement; 45 MMTCE will contribute to the attainment of the President's 18 percent GHG intensity improvement goal. The strategic targets outline the path for preventing the 120 MMTCE by 2012.

28.MMTCE being prevented annually in 2002 is an estimate based on an analysis of actions that EPA's program partners have taken through the end of 2002.

29.Target includes the Agency's work with state and local governments, and state and local governments' work with industry to prevent GHG emissions.

30.For more detailed information on ORD's multi-year plans, see: U.S. Environmental Protection Agency, Office of Research and Development. *Research Directions: Multi-Year Plans.* Washington, DC: EPA. Available online at http://www.epa.gov/osp/myp.htm. Date of Access: September 8, 2003.

GOAL 2
CLEAN AND SAFE WATER

Ensure drinking water is safe. Restore and maintain oceans, watersheds, and their aquatic ecosystems to protect human health, support economic and recreational activities, and provide healthy habitat for fish, plants, and wildlife.

Over the 30 years since the enactment of the Clean Water and Safe Drinking Water Acts, government, citizens, and the private sector have worked together to make dramatic progress in improving the quality of surface waters and drinking water.

Thirty years ago, many of the Nation's drinking-water systems provided water to the tap with either very limited treatment (usually disinfection) or no treatment at all. Drinking water was too often the cause of acute illnesses linked to microbiological contaminants or of longer-term health problems resulting from exposure to low levels of toxic and other contaminants. Today, drinking-water systems monitor the quality of the water they provide and treat water to ensure compliance with standards covering a wide range of contaminants. In addition, new efforts to prevent contaminants from entering drinking-water sources are helping to keep drinking water safe. We now regulate disposal of wastes to ground waters that are potential sources of drinking water.

Thirty years ago, about two-thirds of the surface waters assessed by states were not attaining basic water quality goals and were considered polluted.[1] Some of the Nation's waters were open sewers posing health risks, and many water bodies were so polluted that traditional uses, such as swimming, fishing, and recreation, were impossible. Today, the number of polluted waters has been dramatically reduced, and many clean waters are even healthier. A massive investment of federal, state, and local funds has resulted in a new generation of sewage treatment facilities able to provide "secondary" treatment or better. More than 50 categories of industry now comply with nationally consistent discharge regulations. In addition, sustained efforts to implement "best management practices" have helped reduce runoff of pollutants from diffuse, or "nonpoint," sources.

Cleaner, safer water has renewed recreational, ecological, and economic interests in communities across the Nation. The recreation, tourism, and travel industry is one of the largest employers in the Nation, and a significant portion of recreational spending comes from swimming, boating, sport fishing, and hunting.[2] Each year, more than 180 million people visit the shore for recreation.[3] In 2001, people spent a total of $70 billion—$35.6 billion on fishing, $20.6 billion on hunting, and $13.8 million on items used for both hunting and fishing. Wildlife watchers spent an additional $38.4 billion on activities around the home and on trips.[4] The commercial fishing industry, which also depends on clean water and healthy wetlands, contributed $28.6 billion to the economy in 2001.[5]

The dramatic restoration of some of the Nation's most polluted waters has paid large dividends in enhanced recreation, healthier fisheries, and stronger local economies. The Cuyahoga River, which once caught fire, is now busy with boats and harbor businesses that generate substantial revenue for the city of Cleveland. Oregon's Willamette River has been restored to provide swimming, fishing, and water sports. Even Lake Erie, once infamous for its dead fish, now supports a $600 million per year fishing industry.[6]

Despite improvements in the quality of water, serious water pollution and drinking-water problems remain. Population growth continues to generate higher levels of water pollution and places greater demand on drinking-water systems. To further our progress toward clean waters and safer drinking water, we must both maintain our commitment to the core measures we have already established and look for new ways to improve water quality and protect human health.

OBJECTIVES

Objective 2.1: Protect Human Health. Protect human health by reducing exposure to contaminants in drinking water (including protecting source waters), in fish and shellfish, and in recreational waters.

> **Sub-objective 2.1.1: Water Safe To Drink.** By 2008, 95 percent of the population served by community water systems will receive drinking water that meets all applicable health-based drinking-water standards through effective treatment and source water protection. (2002 Baseline: 93.6 percent of population; note that year-to-year performance is expected to change over time as new standards take effect.)
>
> (*Note*: Routine data analyses of the Safe Drinking Water Information System (SDWIS) have revealed a degree of nonreporting of violations of health-based drinking water standards and of violations of regulatory monitoring and reporting requirements. As a result of these data quality problems, the baseline statistic of national compliance with health-based drinking water standards likely is lower than reported. In consultations with states, the Agency is currently engaged in statistical analysis to more accurately quantify the impact of these data quality problems, and this has resulted in significant improvements in data accuracy and completeness. Even as these improvements are made, SDWIS serves as the best source of national information on compliance with SDWA requirements and is a critical database for program management, the development of drinking water regulations, trends analyses, and public information.)

Strategic Targets:

- By 2008, the percentage of the population served by community water systems that receives drinking water that meets health-based standards will be:

  – 95 percent for those requirements with which systems need to comply as of December 2001. (2002 Baseline: 93.6 percent of the population)[7]

  – 80 percent for those requirements with a compliance date of January 2002 or later. (2002 Baseline: percent of population to be determined starting in January 2004 and revised as new standards take effect. Covered standards include: Stage 1 disinfectants and disinfection by-products/interim enhanced surface-water treatment rule/long-term enhanced surface water treatment rule/arsenic; year-to-year performance is expected to change as new standards take effect.)

- By 2008, the percentage of community water systems that provide drinking water that meets health-based standards will be:

  – 95 percent for those requirements with which systems need to comply as of December 2001. (2002 Baseline: 91.6 percent of community water systems)[8]

  – 80 percent for those requirements with a compliance date of January 2002 or later. (2002 Baseline: percent of community water systems to be determined starting in January 2004 and revised as new standards take effect. Covered standards include: Stage 1 disinfection by- products/interim enhanced surface-water treatment rule/long-term enhanced surface-water treatment rule/arsenic; year-to-year performance is expected to change as new standards take effect.)

- By 2008, 95 percent of the population served by community water systems in Indian country will receive drinking water that meets all applicable health-based drinking-water standards. (2002 Baseline: 91.1 percent of the population served by systems. Year-to-year performance is expected to change as new standards take effect.)[9]

- By 2008, 50 percent of source water areas (both surface and ground water) for community water systems will achieve minimized risk to public health.

(2002 Baseline: estimated to be 5 percent; "minimized risk" achieved by substantial implementation, as determined by the state, of source water protection actions in a source water protection strategy.)[10]

- By 2015, in coordination with other federal agencies, reduce by 50 percent the number of households on tribal lands lacking access to safe drinking water. (2000 Baseline: Indian Health Service data indicating 31,000 homes on tribal lands lack access to safe drinking water.)[11]

Sub-objective 2.1.2: Fish and Shellfish Safe to Eat. By 2008, improve the quality of water and sediments to allow increased consumption of fish and shellfish as measured by the strategic targets described below.

Strategic Targets:

- By 2008, improve the quality of water and sediments to allow increased consumption of safe fish in not less than 3 percent of the water miles/acres identified by states or tribes as having a fish consumption advisory in 2002. (2002 Baseline: 485,205 river miles and 11,277,276 lake acres were identified by states or tribes in 2002 as having fish with chemical contamination levels resulting in an advisory of potential human health risk from consumption.)[12]

- By 2008, 85 percent of the shellfish-growing acres monitored by states will be approved for use. (1995 Baseline: 77 percent approved for use of 21.6 million acres monitored: 69 percent approved and 8 percent conditionally approved.)[13]

Sub-objective 2.1.3: Water Safe for Swimming. By 2008, restore water quality to allow swimming in not less than 5 percent of the stream miles and lake acres identified by states in 2000 as having water quality unsafe for swimming. (2000 Baseline: approximately 90,000 stream miles and 2.6 million lake acres reported by states as not meeting a primary contact recreational use in the 2000 reports under section 305(b) of the Clean Water Act.)[14]

Strategic Targets:

- By 2008, protect the quality of recreational waters nationwide so that the number of waterborne disease outbreaks attributable to swimming in, or other recreational contact with, the ocean, rivers, lakes, or streams will be reduced to not more than 8, measured as a 5-year average. (2002 Baseline: an average of 9 recreational contact waterborne disease outbreaks reported per year by the Centers for Disease Control over the years 1994 to 1998;

adjusted by the Heinz Center to remove outbreaks associated with waters other than natural surface waters [such as pools or water parks].)[15]

- By 2008, coastal and Great Lakes beaches monitored by state beach safety programs will be open and safe for swimming in more than 96 percent of the days of the beach season. (2002 Baseline: monitored beaches open 94 percent of the days of the beach season.)[16]

Means and Strategies for Achieving Objective 2.1

Protecting and Improving Drinking Water

Safe drinking water and clean surface waters are critical to protecting human health. More than 260 million Americans rely on the safety of tap water provided by water systems that comply with national drinking-water standards.[17] EPA's strategy for ensuring safe drinking water over the next several years includes four key elements:

- Developing or revising drinking-water standards
- Supporting states, tribes, and water systems in implementing standards
- Promoting sustainable management of drinking-water infrastructure
- Protecting sources of drinking water from contamination.

Develop Drinking-Water Standards

The Safe Drinking Water Act directs EPA to establish national standards for contaminants in drinking water provided to consumers by water systems. Over the past 30 years, EPA has established standards for some 91 contaminants. Over the next several years, EPA expects to establish additional standards for microbial contaminants, disinfectants, disinfection by-products, and microbial pathogens or other contaminants found in distribution systems.

Through 2008, EPA will continue to assess the need for new or revised drinking-water standards. Based on recommendations from the National Research Council, the National Drinking Water Advisory Council, and other stakeholders, the Agency will continue to evaluate health effects data and risks of exposure to contaminants; information on technologies that prevent, detect, and remove contaminants; and compliance costs. If there is adequate information, EPA will determine whether a new risk-based drinking-water standard is necessary, or whether revision to an existing standard is warranted. Where the source of the contamination is surface water, the Agency will also consider applying the pollution control authorities of the Clean Water Act, including development of water quality criteria for human health under Section 304 of the Act. These criteria, once adopted by states and authorized tribes, will form the basis for limits on discharges of the contaminants to surface waters and guide programs to reduce runoff.

Implement Drinking-Water Regulations

EPA works closely with states, tribes, and owners and operators of municipal water systems to ensure the full and effective implementation of drinking-water standards and to support the highest possible rate of compliance with those standards. Over the next 5 years, EPA will provide guidance, training, and technical assistance to states, tribes, and systems; ensure proper certification of water system operators; and promote consumer awareness of the safety of drinking-water supplies.

Small community water systems are more likely to have difficulty complying with drinking-water standards. Consistent with the Agency's Small Systems Strategy, EPA will provide training and assistance addressing the use of cost-effective treatment technologies, proper waste disposal, and compliance with standards for high-priority contaminants, including arsenic in drinking water and microbes, disinfectants, and disinfection by-products.

High-quality information is needed to support the effective implementation of drinking-water standards. The Safe Drinking Water Information System serves as the primary source of national information on compliance with all Safe Drinking Water Act requirements, and is a critical database for program management. EPA will work to ensure that all applicable drinking-water regulatory requirements are incorporated into this new data system to help states and authorized tribes manage their drinking-water programs. EPA will also continue to work with states and others to improve data completeness, accuracy, timeliness, and consistency.

Support Sustainable Drinking-Water Infrastructure

Providing drinking water that meets safe standards often requires an investment in the construction or maintenance of infrastructure. The Drinking Water State Revolving Fund (DWSRF) provides water systems with low-interest loans to make infrastructure improvements.

Even with financial assistance from the DWSRF, the Agency's September 2002 report on the infrastructure gap identifies a multi-billion-dollar gap in capital infrastructure financing over the next 20 years.[18] Thus, EPA will continue to provide infrastructure grants to capitalize DWSRFs. EPA will also work with states to ensure that funds are effectively managed, and with water system owners and operators to encourage them to adopt sustainable management systems.

In a related effort, EPA will work with other federal agencies to develop a coordinated approach to improving access to safe drinking water. The 2002 World Summit in Johannesburg adopted the goal of reducing the number of people lacking access to safe drinking water by 50 percent by 2015.[19] EPA will contribute to this work through its support for development of drinking-water facilities in Indian country and Alaskan Native villages, using set-aside funds from the DWSRF and targeted grants. Other federal agencies, such as the Department of the Interior (DOI) and the U.S. Department of Agriculture (USDA), also play key roles in addressing this problem. EPA will work with these agencies to develop a coordinated strategy by 2005 and

to begin implementing the strategy in 2006. In addition, Mexico Border infrastructure projects, described under Goal 4: Healthy Communities and Ecosystems, will also increase access to safe drinking water.

Prevent Contamination of Sources of Drinking Water

There is growing recognition that protecting the quality of sources of drinking water, including surface waters and ground water, can reduce violations of drinking-water standards. EPA will support protection of drinking-water sources through training and technical assistance to states, tribes, and communities that are taking voluntary measures to prevent or reduce contamination of source water. The Agency will foster coordination of contamination prevention strategies across jurisdictions, and will also work with states and tribes to use Clean Water Act authorities to prevent contamination of waters that serve as public water supplies and are at high risk.

In a related effort, EPA will protect ground water that is a source of drinking water by ensuring safe underground injection of waste materials. EPA will continue working with states and tribes to educate and assist underground injection control well operators; working with industry and stakeholders to collect and evaluate data on potential ground-water contamination from more than two dozen types of Class V (shallow) wells, including agricultural and storm-water drainage wells and large-capacity septic systems; and exploring best management practices for protecting underground sources of drinking water.

Safeguarding Water Infrastructure

EPA is also the federal organization responsible for ensuring the safety of critical water infrastructure in the event of terrorist or other intentional acts. Over the next several years, EPA will continue to provide technical support and financial assistance to help drinking-water and wastewater utilities assess their vulnerability to terrorist or other intentional acts and develop or revise their emergency response plans. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Bioterrorism Act) requires community water systems supplying drinking water to more than 3,300 people (of which there are about 9,000 nationwide) to conduct vulnerability assessments and prepare emergency response plans by certain dates. Wastewater systems have also been conducting vulnerability assessments and developing emergency response plans through technical assistance provided by EPA. While the deadlines in the Bioterrorism Act and the statutory mandates are time specific for vulnerability assessments and emergency response plans, EPA and the water infrastructure community agree that these protective activities are not “one time only” endeavors, but represent an iterative process based on new and emerging information, science, and technology.

The Agency will spearhead and support efforts to develop effective and affordable methods, technologies, equipment, and other tools needed to protect drinking-water and wastewater systems from attack. Another aspect of maintaining a secure infrastructure is

ensuring that critical information reaches the right people by the fastest means necessary. The Agency will continue to support the operation of a secure, internet-based, password-protected Information Sharing and Analysis Center that provides data on threats of attacks or actual alerts and notices to drinking-water and wastewater utilities.

Making Fish and Shellfish Safe to Eat

Some toxic contaminants that enter water bodies can move up the food chain and build up to levels that make fish unsafe to eat. States and tribes report they have issued fish consumption advisories for some 14 percent of river miles and 28 percent of lake acres.[20] Shellfish also can accumulate disease-causing microorganisms and toxic algae. In 1995, shellfishing was prohibited in 11 percent of the approximately 25 million acres that support shellfishing.[21] EPA is working with states, tribes, and other federal agencies to improve water and sediment quality so all fish and shellfish are safe to eat and to protect the public from consuming fish and shellfish that pose unacceptable health risks.

Make More Fish Safe to Eat

Most fish consumption advisories today are issued because of unhealthy levels of mercury in fish. Although small amounts of mercury are discharged to waters, most mercury in fish originates from combustion sources, such as coal-fired power plants and incinerators, which release it into the air. The mercury is then deposited by rainfall onto land and water, where it is concentrated in water bodies and moves up the food chain through fish to people. EPA is working to reduce releases of mercury to the air through controls on combustion sources. For example, EPA expects that by 2010, federal market-based and other air regulatory programs will reduce electric-generating unit emissions of mercury by 22 tons from their 2000 level of 48 tons (see Goal 1 of this *Strategic Plan*).

Improving water and sediment quality is another key element of the strategy for making more fish safe to eat. Implementation of Clean Water Act programs will improve water quality by reducing discharges from storm-water systems, combined sewer overflows, and concentrated animal feeding operations, and by reducing runoff from nonpoint sources.

These water quality programs rely on sound scientific information concerning individual contaminants in fish. EPA recently issued a criteria document under the Clean Water Act identifying the safe levels of mercury in fish tissue and will help states and tribes adopt the criterion into water quality standards. EPA expects that states and authorized tribes will adopt the new mercury fish tissue criterion by 2008. In 2000, EPA revised the methodology calculating "human health criteria" for contaminants found in surface waters. This new methodology reflects recent research on the health effects of contaminants and their potential in water to be concentrated in the food chain and to pose a greater risk to people who consume fish. EPA partly recalculated the criteria for 83 pollutants and will be revising these criteria and additional criteria more completely over the next several years.

EPA is also working to restore the quality of aquatic sediment in critical water bodies, with special emphasis on the Great Lakes. In addition, EPA will use Superfund program authorities to restore the quality of sediment. To reduce the potential for future sediment contamination, EPA is working to reduce the use of polychlorinated biphenyls (PCBs), a major sediment contaminant, in electrical equipment. (See Goal 4 of this *Strategic Plan*.)

Another key element of EPA's strategy for making more fish safe to eat is expanding the amount and type of information about fish safety and making this information available to the public. EPA provides guidance to states and tribes on monitoring and fish sampling. EPA also provides funding and technical training to help states and tribes assess fish safety in more of their waters every year. The Agency expects that by 2008, the percentage of rivers and lakes monitored to determine the need for fish advisories will continue to increase. EPA is also conducting a nationwide survey of contamination in fish.

A key public information tool is the Internet-based National Listing of Fish and Wildlife Consumption Advisories.[22] This website allows states and tribes to enter their advisories and provides the public with information about the location of advisories, the fish that are affected, and the number of meals or amount of fish that a person can safely eat.

Make More Shellfish Safe to Eat

The safety of shellfish is managed through a partnership of the U.S. Food and Drug Administration (FDA), the Interstate Shellfish Sanitation Commission (ISSC), and coastal states. States monitor shellfishing waters and can restrict harvesting if shellfish taken from the waters are unsafe.

Although a sound system for monitoring the condition of shellfishing waters and limiting public exposure to unsafe shellfish is in place, shellfish harvesting is restricted in many acres of otherwise productive shellfishing waters. EPA is working with states, the FDA, the ISSC, and the National Oceanic and Atmospheric Administration (NOAA) to increase the percentage of shellfishing acres where harvesting is permitted from the estimated 1995 level of 77 percent to 85 percent in 2008.

Over the past several years, the ISSC, working with states and federal agencies, has developed a new information system that uses state monitoring data to pinpoint areas where shellfishing has been restricted. This information system will enable EPA and the states to more readily identify possible sources of pollutants restricting the use of shellfishing waters. This information can also be used to strengthen water pollution control activities, including development of watershed plans, implementation of National Estuary Program plans, issuance or reissuance of permits to point sources, enforcement of existing permits, and implementation of controls over diffuse sources of polluted runoff.

Making Waters Safe for Swimming

Recreational waters, especially beaches in coastal areas and the Great Lakes, provide outstanding recreational opportunities for many Americans. Swimming in some recreational waters, however, can pose a serious risk of illness as a result of exposure to microbial pathogens. Beach closures to protect the public from harmful levels of pathogens can have significant economic impacts. In some cases, these pathogens can be traced to sewage treatment plants, malfunctioning septic systems, and discharges from storm-water systems and animal feeding operations. EPA is implementing a three-part strategy to protect the quality of the Nation's recreational waters. The Agency will work to protect recreational water generally, control combined sewer overflows (CSOs), and protect the quality of public beaches along the coasts and Great Lakes.

Protect Recreational Waters

The first element of the strategy is broadly focused on all recreational waters. To protect and restore these waters, EPA works with state, tribal, and local governments to implement the core programs of the Clean Water Act. For example, development and implementation of total maximum daily loads (TMDLs) will generally benefit recreational waters that are impaired. The continuing implementation of the discharge permit program, urban storm-water controls, and nonpoint pollution control programs will also reduce pollution to recreational waters.

Control Combined Sewer Overflows

Full implementation of controls for overflows from combined storm and sanitary sewers is another key step in protecting recreational waters. These overflows release untreated sewage containing high levels of pathogens. CSOs, which occur in about 770 communities around the country, can have a significant impact on the quality of recreational waters. EPA, states, and local governments are making steady progress toward reducing overflows under the "CSO Policy."[23] Most communities with CSOs have now implemented basic control measures. Some 34 percent of these communities have submitted long-term plans for controlling overflows and 16 percent have begun implementation.[24]

Protect Coastal and Great Lakes Beaches

The third element of the strategy to protect and restore recreational waters is focused on public beaches along coastal areas and the Great Lakes. Under the recently enacted Beaches Environmental Assessment and Coastal Health (BEACH) Act, EPA provides grants to state, tribal, and local governments for programs to monitor beach water quality and notify the public when bacterial contamination poses a risk to swimmers. EPA expects that 100 percent of significant public beaches will be managed under BEACH Act programs by 2008.

The BEACH Act requires that coastal and Great Lakes states adopt scientifically sound water quality criteria for bacteria. EPA expects that all 35 coastal and Great Lakes states will have adopted such criteria for beaches by 2008. As a result of a related effort, Agency-approved analytic methods will be available for pathogens of concern at beaches.

Finally, EPA will continue to expand public access to Internet-based beach information on its website. Governments receiving BEACH Act grants and communities responding to EPA's annual National Beach Health Protection Survey will provide information on water quality, beach monitoring and advisory programs, and beach closures.

Objective 2.2: Protect Water Quality. Protect the quality of rivers, lakes, and streams on a watershed basis and protect coastal and ocean waters.

Sub-objective 2.2.1: Improve Water Quality on a Watershed Basis. By 2008, use both pollution prevention and restoration approaches, so that:

– In 600 of the Nation's watersheds, water quality standards are met in at least 80 percent of the assessed water segments (2002 Baseline: 453 watersheds of the total 2,262 U.S. Geological Survey (USGS) cataloguing unit scale watersheds across the Nation)[25]

– In 200 watersheds, all assessed water segments maintain their quality and at least 20 percent of assessed water segments show improvement above conditions as of 2002. (2002 Baseline: 0 USGS cataloging unit scale watersheds)

Strategic Targets:

- By 2012, fully attain water quality standards in over 25 percent of those water bodies identified in 2000 as not attaining standards, with an interim milestone of restoring 5 percent of these waters by 2006. (2002 Baseline: 0 percent of the 255,408 miles and 6,803,419 acres of waters on 1998/2000 lists of impaired waters developed by states and approved by EPA under section 303(d) of the Clean Water Act.)[26]

- By 2008, reduce levels of phosphorus contamination in rivers and streams so that phosphorus levels are below levels of concern established by USGS or levels adopted by a state or authorized tribe in a water quality standard in:

  – 55 percent of test sites for major rivers (1992-1998 Baseline: 50 percent)[27]

  – 38 percent of test sites for urban streams (1992-1998 Baseline: 33 percent)[28]

  – 30 percent of test sites for farmland streams (1992-1998 Baseline: 25 percent)[29]

- By 2008, improve water quality in Indian country at not fewer than 90 monitoring stations in tribal waters for which baseline data are available (i.e., show at least a 10 percent improvement for each of four key parameters: total nitrogen, total phosphorus, dissolved oxygen, and fecal coliforms). (2002 Baseline: four key parameters available at 900 sampling stations in Indian country.)

- By 2015, in coordination with other federal partners, reduce by 50 percent the number of households on tribal lands lacking access to basic sanitation. (2000 Baseline: Indian Health Service data indicating that 71,000 households on tribal lands lack access to basic sanitation.)[30]

Sub-objective 2.2.2: Improve Coastal and Ocean Waters. By 2008, prevent water pollution and protect coastal and ocean systems to improve national and regional coastal aquatic ecosystem health by at least 0.2 points on the "good/fair/poor" scale of the National Coastal Condition Report. (2002 Baseline: National rating of "fair/poor" or 2.4, where the rating is based on a 5-point system in which 1 is poor and 5 is good, and is expressed as an areally- weighted mean of regional scores using the National Coastal Condition Report indicators addressing water clarity, dissolved oxygen, coastal wetlands loss, eutrophic conditions, sediment contamination, benthic health, and fish tissue contamination.)[31]

Strategic Targets:

- By 2008, maintain water clarity and dissolved oxygen in coastal waters at the national levels reported in the 2002 National Coastal Condition Report. (2002 Baseline: 4.3 for water clarity; 4.5 for dissolved oxygen.)
- By 2008, improve ratings reported on the national "good/fair/poor" scale of the National Coastal Condition Report for:
  - Coastal wetlands loss by at least 0.2 points (2002 Baseline: 1.4)
  - Contamination of sediments in coastal waters by at least 0.2 points (2002 Baseline: 1.3)
  - Benthic quality by at least 0.2 points (2002 Baseline: 1.4)
  - Eutrophic conditions by at least 0.2 points (2002 Baseline: 1.7)
- By 2010, in cooperation with other nations, federal agencies, states, tribes, and local governments, reduce the rate of increase in the number of invasions by non-native invertebrate and algae species of marine and estuarine waters. (2000 Baseline: rate of increase approximately 1 percent per year.)[32]

Means and Strategies for Achieving Objective 2.2

Improving Water Quality on a Watershed Basis

To protect and improve water quality on a watershed basis, EPA will focus its work with states, interstate agencies, tribes, and others on six key areas: (1) strengthen the water quality standards program; (2) improve water quality monitoring; (3) develop effective watershed plans

and TMDLs; (4) implement effective nonpoint pollution control programs; (5) strengthen the National Pollutant Discharge Elimination System (NPDES) permit program; and (6) effectively manage infrastructure assistance programs.

While EPA expects to work with states, interstate agencies, and tribes in each of these areas, progress toward water quality improvements will largely depend on success in integrating programs on a watershed basis; engaging diverse stakeholders in solving problems; and applying innovative ideas, such as water quality trading, to deliver cost-effective water pollution control.

Strengthen the Water Quality Standards Program

State and tribal water quality standards provide the environmental baselines for water quality programs. EPA provides scientific information concerning contaminants in the form of "water quality criteria" guidance and identifies innovative approaches to support state and tribal adoption of water quality standards that protect water for such uses as swimming, public water supply, and fish and wildlife.

In July 2003, EPA published the Water Quality Standards and Criteria Strategy.[33] Developed in cooperation with states, tribes, and the public, the strategy provides a foundation for EPA's work to strengthen state and tribal water quality standards programs. Over the next 5 years, the strategy calls for EPA to develop guidance for implementing new and existing water quality criteria; develop a criteria methodology for waterbody sedimentation; develop a revised aquatic life criteria methodology; publish additional nutrient criteria (for example, for coastal waters and wetlands) and provide implementation guidance; and promote increased use of biological criteria and ecological evaluation to support assessment of water conditions on a watershed scale.

In addition, the strategy identifies some key efforts to strengthen the program in the coming years, including developing nutrient standards, adopting biological criteria, and assisting tribal governments in adopting water quality standards. In a complementary effort, EPA will review risk assessment methodologies applied to chemical pollutants and pathogens in biosolids generated by wastewater treatment plants and will assess the need for new or revised standards to protect public health and the environment.

Finally, EPA will work with states and tribes to ensure the effective operation and administration of the standards program. For example, all states and authorized tribes are expected to review and revise their standards every 3 years, as required by the Clean Water Act. In addition, EPA will promptly review and approve or disapprove changes to standards, as required by the Act.

Improve Water Quality Monitoring

Scientifically defensible data and information are essential tools in the Information Age. Water quality monitoring and assessment programs—the essential underpinning of all aspects of the watershed approach— must be strengthened and upgraded across the country.

Over the next 5 years, EPA will assist states and tribes in significantly improving information concerning the condition of the Nation's rivers, lakes, streams, wetlands, and ground water (to the extent possible). Specifically, EPA will work with other federal agencies, states, and tribes to adopt comprehensive monitoring strategies, addressing all the elements essential to an effective monitoring program, and statistically valid monitoring networks. EPA will also encourage them to develop biological monitoring programs and will provide states with technical assistance to increase their submission of monitoring data to the STORET national water quality data repository. This monitoring work will be coordinated with assessments of fish tissue contamination, the condition of water at beaches, the condition of coastal waters, and the condition of ground water.

Develop Effective Watershed Plans and TMDLs

EPA is working with states, interstate agencies, and tribes to foster a "watershed approach" as the guiding principle of clean water programs. EPA is encouraging states to develop watershed plans with a comprehensive approach to assessing water quality, defining problems, integrating management of diverse pollution control, and financing projects. States have successfully adopted watershed approaches that use a "rotating basin" approach as well as other methods. Where necessary, states will upgrade their continuing planning processes to ensure development of a watershed approach. EPA is also working with tribes to support development of watershed approaches to protecting tribal waters.

EPA is supporting the development of watershed plans in specific geographic areas. In addition to continuing watershed protection programs as part of the National Estuary Program, the Chesapeake Bay Program, the Great Lakes Program, and the Gulf of Mexico Program, EPA has provided grants for watershed-based plans in recent years and is beginning a new watershed grant program in 2003. EPA expects to continue supporting development of plans in key watersheds over the next 5 years.

In watersheds where water quality standards are not attained, states will be developing TMDLs. Some impaired waters are isolated segments that can be addressed individually. The vast majority of impaired waters, however, are clustered on a watershed basis. EPA is encouraging states to develop TMDLs for these waters on a watershed basis, because watershed-based TMDLs are less expensive to develop and create the opportunity for innovations such as

water quality trading and watershed-based permitting. Trading is a valuable tool that allows sources of pollution to share responsibility for controlling pollution within a watershed and to achieve pollution reductions at the lowest possible cost.

While supporting state watershed plans, EPA will continue working with states to develop TMDLs consistent with state TMDL development schedules and court-ordered deadlines. States and EPA have made significant progress in the development and approval of TMDLs and expect to maintain the current pace of approximately 3,000 TMDLs per year.

Control Nonpoint Source Pollution

Watershed plans and TMDLs will focus pollution control efforts for impaired waters on a range of pollution sources, including runoff from diffuse, or "nonpoint," sources. EPA will also support state, interstate agency, tribal, and other federal agency efforts to implement management practices that will reduce levels of nonpoint source pollution in both impaired waters and in other waters, including surface water and groundwater, nationwide.

A critical step in this effort is for EPA to forge strategic partnerships with a broad range of agricultural interests at all levels. EPA will work with USDA to ensure that federal resources, including grants under section 319 of the Clean Water Act and Farm Bill funds, are managed in a coordinated way. As part of this effort, EPA will work with states on developing and implementing watershed-based plans, focused on watersheds with impaired water quality caused by nonpoint sources. These plans are a mechanism to coordinate monitoring and planning on a watershed basis and will build a foundation for effective implementation actions using federal and other funding. EPA will also work cooperatively with USDA to develop voluntary nutrient management plans for small animal feeding operations (not covered by regulations) and to implement riparian and stream bank protection measures over the next 5 years.

In related efforts, EPA will collaborate with state managers of Clean Water Revolving Loan Funds to increase investments in projects to reduce nonpoint source pollution. Properly managed on-site/decentralized systems are an important part of the Nation's wastewater infrastructure. EPA will encourage state, tribal, and local governments to adopt voluntary guidelines for the effective management of these systems and to use Clean Water Revolving Loan Funds to finance systems where appropriate.

Strengthen NPDES Permit Program and Implement National Industrial Regulation Strategy

The NPDES requires point sources discharging to water bodies to be permitted and pretreatment programs to control discharges from industrial facilities to the Nation's sewage treatment plants. This program provides a management framework for protecting the Nation's waters through the control of billions of pounds of pollutants. EPA has five key strategic

objectives for the program over the next 5 years: (1) ensure effective management of the permit program, including focusing on permits that have the greatest benefit for water quality; (2) implement wet-weather point source controls, including the storm-water program; (3) implement the newly developed program for permits at large, concentrated animal feeding operations (CAFOs); (4) advance program innovations, such as watershed permitting and trading; and (5) develop national industrial regulations for industries where the risk to water bodies supports a national regulation.

In 2003, EPA is developing the "Permitting for Environmental Results Strategy" to address concerns about the backlog in issuing permits and the health of state NPDES programs. The strategy focuses limited resources on the most critical environmental problems by targeting three key areas: (1) developing and strengthening systems to ensure program integrity; (2) focusing EPA and states on achieving environmental results; and (3) fostering efficient permitting operations. The need to increase data quality and quantity, including modernizing the Permits Compliance System and integrating it with other environmental databases, is common to all three areas. Beginning in FY 2004, EPA will assess NPDES program integrity and track the implementation of followup actions that result from the assessments.

EPA is working with states, tribes, and other interested parties to strengthen the permit program in several other areas that will benefit water quality. The Agency recently finalized new rules for discharges from CAFOs and will work with states to ensure that most CAFOs are covered by permits by 2008. In addition, over the next 5 years, EPA expects that 100 percent of NPDES programs will have issued general permits requiring storm-water management programs for Phase II (mid-sized) municipalities and requiring storm-water pollution prevention plans for construction sites covered by Phase II of the storm-water program. Finally, EPA and states will monitor the percentage of significant industrial facilities that have control mechanisms in place to implement applicable pretreatment requirements prior to discharging to publicly owned treatment works.

Most industrial facilities discharging directly to water bodies or to sewage treatment plants have permit limits or pretreatment controls based on national regulations developed for the class of industrial activity. Regulations are now in place for most major industrial classes. Over the next 5 years, EPA will complete national regulations now under development (including, for example, meat and poultry processing, construction and development sites, aquaculture farms, and cooling-water intake structures). In consultation with the public, EPA will also establish program priorities based on sound science and demonstrated benefits, including the potential for cost-effective risk reduction. In addition to evaluation of regulatory options, EPA will consider other approaches (including clarifying guidance, environmental management systems, and permit writer support).

Support Sustainable Wastewater Infrastructure

Much of the dramatic progress in improving water quality is directly attributable to investment in wastewater infrastructure—the pipes and facilities that treat the Nation's sewage. But the job is far from over. Communities are challenged to find the fiscal resources to replace aging infrastructure, meet growing infrastructure demands fueled by population growth, and secure their infrastructure against threats.

Clean Water State Revolving Funds (CWSRFs) provide low-interest loans to help finance wastewater treatment facilities and other water quality projects. These projects are critical to the continuation of the public health and water quality gains of the past 30 years. As of early 2003, the federal government had invested almost $20 billion in CWSRFs.[34] The revolving nature of the funds and substantial additions from states have magnified that investment, so that $42.4 billion has been available for loans.[35] Recognizing the substantial remaining need for wastewater infrastructure, EPA expects to continue to provide significant annual capitalization to CWSRFs for the foreseeable future. This continued federal investment in state revolving funds, along with other traditional sources of financing (including increased local revenues), will result in significant progress toward addressing the Nation's wastewater treatment needs.

Over the next 5 years, EPA will work with CWSRFs to meet several key objectives:

- Fund projects designed as part of an integrated watershed approach
- Link projects to environmental results through the use of scientifically sound water quality and public health data
- Support development of integrated priority lists addressing nonpoint pollution and estuaries protection projects, as well as wastewater projects
- Maintain the CWSRF's excellent fiduciary condition.

Another important approach to closing the gap between the need for clean water projects and available funding is to use sustainable management systems to ensure that infrastructure investments are tailored to the needs of the watershed and are well capitalized and well maintained. Sustainable management systems prolong the lives of existing systems and provide Americans with clean water at lower cost. EPA will work to institutionalize these systems and will also encourage rate structures that lead to full cost pricing and support water metering and other conservation measures. As part of this effort, EPA will continue to promote environmental management systems, especially for public agencies, that focus on improved compliance, environmental performance beyond compliance, pollution prevention, and sustainable water infrastructure. Response to date is very positive, and support for adoption of environmental management systems in the public sector is growing rapidly.

In a related effort, EPA will work with other federal agencies to improve access to basic sanitation. The 2002 World Summit in Johannesburg adopted the goal of reducing the number of

people lacking access to safe drinking water and basic sanitation by 50 percent by 2015.[36] EPA will contribute to this work through its support for development of sanitation facilities in Indian country and Alaskan Native villages, using funds set aside from the CWSRF and targeted grants. Other federal agencies, such as DOI and USDA, also play key roles in addressing this problem. In addition, Mexico Border infrastructure projects, described under Goal 4: Healthy Communities and Ecosystems, will improve access to basic sanitation.

Improving Coastal and Ocean Water Quality

Coastal and ocean waters are environmentally and economically valuable to the Nation. Key programs focused on and critical to improving coastal waters are:

- Assessing coastal conditions
- Reducing vessel discharges
- Controlling coastal nonpoint pollution
- Managing dredged material
- Managing non-indigenous invasive species
- Supporting international marine pollution control.

In addition, coordinating our efforts with those of other federal agencies, states, tribes, and public and private parties is essential. Improving coastal waters will depend on successful implementation of pollution controls in inland watersheds (see Sub-objective 2.2.1). Progress in protecting and restoring coastal waters is also directly tied to geographically focused projects, such as the Chesapeake Bay Program, the Gulf of Mexico Program, and the National Estuary Program. These programs are described under Goal 4: Healthy Communities and Ecosystems.

Assess Coastal Conditions

Progress in meeting these strategic targets will be tracked through the National Coastal Condition Report, created in 2002 as a cooperative project of EPA, NOAA, USDA, and DOI. The report describes the ecological and environmental condition of U.S. coastal waters according to seven key parameters. EPA and other federal agencies will review changing conditions and periodically issue updated assessments of the health of coastal waters. In support of this work, EPA is developing indices for measuring the health of coral reefs and guidance for protecting such back-reef ecosystems as mangroves, seagrass beds, and sandflats. EPA is also developing guidance to assist states, tribes, and local governments in anticipating and responding to harmful algal blooms.

Reduce Vessel Discharges

To improve the health of the Nation's ocean and coastal waters, EPA will focus on enhancing regulation of discharges of pollution from vessels. Key work includes developing discharge standards for cruise ships operating in Alaskan waters; cooperating with the Department of Defense to develop discharge standards for certain armed forces vessels; and assessing the effectiveness of current regulations for marine sanitation devices and promoting technological advancement to reduce sewage discharges from vessels.

Implement Coastal Nonpoint Source Pollution Programs

Rapid population growth in coastal areas can result in significant increases in pollution from nonpoint sources. For the past 10 years, EPA and NOAA have been working with coastal and Great Lakes states to improve and expand programs to reduce nonpoint source pollution in the "coastal zone" identified by states. Most states have used federal grant funds to develop coastal nonpoint programs, and EPA and NOAA are working with the remaining states to complete the program by providing continued support and assistance. These nonpoint control programs, focused on the critical coastal zone areas, will play an important role in accomplishing the environmental improvements sought for coastal waters by 2008.

Manage Dredged Material

Several hundred million cubic yards of sediment are dredged from waterways, ports, and harbors every year to maintain the Nation's navigation system for commercial, national defense, and recreational purposes. All of this sediment must be disposed of safely. EPA and the U.S. Army Corps of Engineers (COE) share responsibility for regulating how and where the disposal of sediment occurs. EPA and COE will focus additional resources on improving how disposal of dredged material is managed, including evaluating disposal sites, designating and monitoring the sites, and reviewing and concurring on the disposal permits issued by COE.

EPA is also working with its state partners and other federal agencies, including COE, the Fish and Wildlife Service, and the Coast Guard, to ensure that comprehensive dredged material management plans, which include provisions for the beneficial reuse of dredged material, are developed and implemented in major ports and harbors.

Manage Invasive Species

One of the greatest threats to U.S. waters and ecosystems is the uncontrolled spread of invasive species. Invasive species commonly enter U.S. waters through the discharge of ballast water from ships. Although the majority of these organisms never become established in a new ecosystem, an increasing number of them are harming the environment and local economies and

posing risks to human health. EPA is assisting the U.S. Coast Guard in its efforts to develop ballast water exchange requirements and discharge standards and is addressing this issue at the international level.

Support International Marine Pollution Control

EPA works closely with the Coast Guard, NOAA, and the Department of State to address environmental threats to U.S. waters that require international cooperation. Recognizing the effect of international shipping on the quality of the U.S. waters, EPA is heavily involved in the negotiation of international standards at the International Maritime Organization. These standards are the principal mechanism EPA is using to address invasive aquatic species, tributyltin and other harmful antifoulants, and marine debris. Negotiations are currently underway for a global treaty designed to prevent further introductions of invasive aquatic species through ballast water. EPA is also engaged in cooperative efforts to reduce other sources of pollution affecting the Gulf of Mexico, Great Lakes, Arctic Ocean, Straits of Florida, and the Wider Caribbean Basin.

Objective 2.3: Enhance Science and Research. Provide and apply a sound scientific foundation to EPA's goal of clean and safe water by conducting leading-edge research and developing a better understanding and characterization of the environmental outcomes under Goal 2.

> **Sub-objective 2.3.1: Apply the Best Available Science.** By 2008, apply the best available science (e.g., tools, technologies, and scientific information) to support Agency regulations and decisionmaking for current and future environmental and human health hazards related to reducing exposure to contaminants in drinking water, fish and shellfish, and recreational waters and protecting aquatic ecosystems.
>
> **Sub-objective 2.3.2: Conduct Leading-Edge Research.** By 2008, conduct leading-edge, sound scientific research to support the protection of human health through the reduction of human exposure to contaminants in drinking water, fish and shellfish, and recreational waters and to support the protection of aquatic ecosystems— specifically, the quality of rivers, lakes and streams, and coastal and ocean waters.

Means and Strategies for Achieving Objective 2.3

Drawing on Clean and Safe Water Science

Meeting the goal of clean and safe water requires that EPA effectively apply basic research findings to the specific needs of water programs. The Agency will draw on the results

of basic research to prove and refine existing conclusions about drinking water safety and water quality. Critical scientific aspects of water program research include development of analytic test methods to support programs' scientific integrity; laboratory certification; and analysis of questions more commonly thought of as "social science," such as the costs and benefits of safe drinking water and healthy aquatic ecosystems.

Develop Analytic Test Methods

EPA establishes analytic test methods that describe laboratory procedures for measuring contaminant levels in drinking and surface waters. In some cases, EPA itself develops methods; in other cases, the Agency approves alternative test procedures. Approximately 550 EPA-approved analytical methods exist for nearly 300 contaminants. These test methods support the development of drinking-water standards, surface-water quality criteria and standards, industrial discharge regulations, water monitoring, discharge permitting, pretreatment, and compliance.

EPA has several goals for improving the analytic methods program over the next 5 years. These include reducing the backlog of applications for approval of alternative test procedures, many involving new technology; developing new analytic methods that support increasingly more stringent levels of protection for some contaminants; and making analytic methods readily available to the public through a new Internet-based system.

Ensure Laboratory Certification

To ensure a sound scientific basis for determining whether a system has complied with EPA's drinking-water standards, each drinking-water regulation incorporates quality control and testing procedures for the laboratories that analyze drinking-water samples for contaminants. EPA's Drinking Water Laboratory Certification Program evaluates whether Agency, state, and privately owned laboratories are analyzing drinking-water samples accurately using approved laboratory methods and procedures, and whether they are properly implementing quality assurance plans. Only certified laboratories may analyze drinking-water samples.

Over the next 5 years, EPA will work to ensure that laboratories are appropriately classified as "certified," "provisionally certified," "interim certified," or "not certified." In making certification decisions, EPA will consider laboratory certification criteria, on-site audits conducted at least once every 3 years, and analysis of test samples.

Develop Methods for Valuing Ecological and Recreation Benefits

A related scientific effort is developing improved methods to assess and value ecological and recreational benefits that result from improvements in water quality. EPA is supporting studies of the monetary value of cleaner water for aquatic life and other ecological and recreational benefits, such as boating, and will use this information to develop more precise

estimates of the benefits of water pollution control programs and requirements. This economic work is discussed in greater detail in Appendix 1.

Conducting Clean and Safe Water Research

EPA's water research program enables EPA to pursue its objectives for protecting human health and water quality. The Agency's Office of Research and Development (ORD) has developed multi-year plans for drinking water and water quality that describe the research it will conduct over the next 5 to 10 years.[37]

Conduct Research to Protect Human Health

The Safe Drinking Water Act Amendments of 1996 direct EPA to conduct research to strengthen the scientific foundation for standards that limit public exposure to drinking-water contaminants. The Amendments contain specific requirements for research on waterborne pathogens, such as *Cryptosporidium* and Norwalk virus; disinfection by-products; arsenic; and other harmful substances in drinking water. EPA is also directed to conduct studies to identify and characterize population groups, such as children, that may be at greater risk from exposure to contaminants in drinking water than is the general population.

In response to these requirements, EPA will conduct a multi-disciplinary research program that addresses exposure, health effects, risk assessment, and risk management. Research to support water quality programs will also focus on developing and implementing ambient water quality criteria to protect uses of aquatic ecosystems, including fishing and recreation.

Conduct Research to Protect Water Quality

The water quality research program supports the Agency and its partners in developing and applying criteria for designated uses and in developing tools to diagnose and assess impairment and restore and protect aquatic systems. While water quality research addresses a wide spectrum of aquatic ecosystem stressors, it pays particular attention to stressors that the Agency most often cites as impairing water bodies: embedded and suspended sediment, nutrients, and pathogens and pathogen indicators.

The products that result from these research efforts will be useful to a variety of water programs. For example, information on risk management and restoration of waters impaired by sediment will be helpful to the TMDL program, as well as to voluntary watershed protection initiatives, in developing site-specific management alternatives. A report to be developed demonstrating the use of time series analysis to identify nonpoint source impacts can be used by the Agency's nonpoint source, TMDL, and monitoring programs to identify sources of water quality impairment. And a report to be developed describing factors and processes that control

the fate of nutrients in streams will assist the Agency in determining in-stream nutrient thresholds and developing TMDLs.

EXTERNAL FACTORS

EPA's strategies for achieving clean and safe water depend on substantial contributions and investments by many public and private entities.

States are primary partners in implementing both clean water and safe drinking-water programs. Many states, however, are facing budget problems and even deficits. EPA recognizes that state budget shortfalls are an external factor that may limit progress toward clean and safe water goals.

Consistent with the federal government's unique trust responsibility to federally recognized tribes, EPA implements programs in Indian country, helps build tribal capacity to administer clean and safe water programs, and works with authorized tribes as co-regulators. Tribal resource needs are great. Unlike states, many tribes are still developing programs to administer clean and safe water programs. Inadequate progress in developing these programs will limit progress toward clean water goals.

Local governments play a critical role in implementing clean and safe water programs. Municipalities and other local entities have proven to be strong partners with states and the federal government in the financing of wastewater treatment and drinking-water systems, and continued partnership in financing these systems is essential to meeting water goals. Despite sometimes significant resource limits, municipalities are also now taking on additional responsibilities for addressing storm-water and CSOs. In the case of the drinking-water program, effective local management of drinking-water systems, including protection of source waters, is essential to maintaining high rates of compliance with drinking-water standards. Ninety-five percent of the 160,000 or more public water systems responsible for meeting drinking-water safety standards are small systems that often struggle to provide safe drinking water.[38] Continued consultation with local governments is critical to achieving clean and safe water.

Several key elements of the national water program, including nonpoint source control, source water protection, and watershed management, require broad partnerships among many federal, state, and local agencies. Over the next several years, building partnerships with the agricultural community (such as USDA, state agricultural agencies, and local conservation districts) is a top priority for meeting clean water goals. We must also continue to provide water quality data and technical assistance that can help USDA target its runoff control programs.

EPA relies on many other agencies to provide monitoring data to measure progress toward its goal of clean and safe water. States lead the effort in water quality monitoring. Other

agencies provide critical information as well, such as the USGS, which maintains water monitoring stations throughout the nation, and NOAA, which provides information on coastal waters. EPA also relies on COE to co-administer the Section 404 program of the Clean Water Act. In fact, COE acts as the lead federal agency for permitting the discharge of dredged or fill material and, as part of its civil works projects, addressing dredged material management and disposal issues in U.S. waters. In addition to the domestic activities that support the 2002 World Summit goal, EPA will continue working internationally in support of the U.S. government effort to help fulfill this goal. We will continue to work with the U.S. Agency for International Development, the U.S. Department of State, and other interested stakeholders to improve access to safe drinking water and sanitation.

Finally, all of the EPA's coastal and oceans activities are carried out in partnership with other federal agencies and, in some cases, international, state, local and private entities as well. EPA relies on its work with the Department of Defense, the Coast Guard, Alaska and other states, and a number of cruise ship and environmental and nongovernmental organizations regarding regulatory and nonregulatory approaches to managing wastewater discharges from vessels. Meeting ocean and coastal goals will also depend on the extent to which the growth in coastal areas is directed in ways that minimize effects on water quality.

Human Capital Focus For Achieving Goal 2

EPA needs to strengthen the knowledge, skills, and abilities of staff involved in implementing core water programs, including those of the scientists involved in establishing drinking water standards and developing water quality criteria. Success also depends on stakeholder partnerships and cooperation. EPA will:

- Train federal, state, local, and tribal employees in such areas as community development, communication, and effective listening
- Exchange staff with other federal agencies, such as USDA
- Enter into intergovernmental assignments between EPA and our state and tribal partners

Efficiency Measures For Goal 2

Efficiency measures relate results to the resources or time invested to achieve those results and augment effectiveness measures in evaluating performance. They help us integrate EPA's budget and performance—part of the President's Management Agenda—and demonstrate the cost-effectiveness and timeliness of program activities.

In this goal, EPA's efficiency measures will track the utilization rate—the ratio of the cumulative dollars lent to the cumulative funds available for projects—for both the Drinking Water State Revolving and Clean Water State Revolving Funds:

As a measure of efficiency, the Agency tracks each fund's utilization rate, which is the ratio of the cumulative loan agreement dollars to cumulative funds available for projects.

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GOAL 3
LAND PRESERVATION AND RESTORATION

Preserve and restore the land by using innovative waste management practices and cleaning up contaminated properties to reduce risks posed by releases of harmful substances.

Left uncontrolled, hazardous and nonhazardous wastes on the land can migrate to the air, ground water, and surface water, contaminating drinking-water supplies, causing acute illnesses or chronic diseases, and threatening healthy ecosystems in urban, rural, and suburban areas. Hazardous substances can kill living organisms in lakes and rivers, destroy vegetation in contaminated areas, cause major reproductive complications in wildlife, and otherwise limit the ability of an ecosystem to survive.

EPA will work to preserve and restore the land using the most effective waste management and cleanup methods available. We use a hierarchy of approaches to protect the land: reducing waste at its source, recycling waste, managing waste effectively by preventing spills and releases of toxic materials, and cleaning up contaminated properties. The Agency is especially concerned about threats to our most sensitive populations, such as children, the elderly, and individuals with chronic diseases.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund)[1] and the Resource Conservation and Recovery Act (RCRA)[2] provide the legal authority for most of EPA's work toward this goal. The Agency and its partners use Superfund authority to clean up uncontrolled or abandoned hazardous waste sites and return the land to productive use. Under RCRA, EPA works in partnership with states and tribes to address risks associated with leaking underground storage tanks (USTs) and with the generation and management of hazardous and nonhazardous wastes.

EPA also uses authorities provided under the Clean Air Act,[3] Clean Water Act,[4] and Oil Pollution Act of 1990[5] to protect against spills and releases of hazardous materials. Controlling the many risks posed by accidental and intentional releases of harmful substances presents a significant challenge to protecting the land. EPA uses an approach that integrates prevention, preparedness, and response activities to minimize these risks. Spill-prevention activities keep harmful substances from being released to the environment. Improving EPA's readiness to respond to emergencies through training, development of clear authorities, and provision of proper equipment will ensure that we are adequately prepared to minimize contamination and harm to the environment when spills do occur.

OBJECTIVES

Objective 3.1: Preserve Land. By 2008, reduce adverse effects to land by reducing waste generation, increasing recycling, and ensuring proper management of waste and petroleum products at facilities in ways that prevent releases.

Sub-objective 3.1.1: Reduce Waste Generation and Increase Recycling. By 2008, reduce materials use through product and process redesign, and increase materials and energy recovery from wastes otherwise requiring disposal.

Strategic Targets:

- Each year through 2008, maintain the national average municipal solid waste generation rate at no more than 4.5 pounds per person per day.[6]

- By 2008, increase recycling of the total annual municipal solid waste produced to 35 percent from 31 percent in 2002.[7]

Sub-objective 3.1.2: Manage Hazardous Wastes and Petroleum Products Properly. By 2008, reduce releases to the environment by managing hazardous wastes and petroleum products properly.

Strategic Targets:

- By the end of 2008, prevent releases from RCRA hazardous waste management facilities by increasing the number of facilities with permits or other approved controls from 79 percent at the end of FY 2002 to 95 percent.[8] (Total universe is approximately 2,750 facilities, but will be reassessed in FY 2006.[9])

- By 2008, update controls for preventing releases at the 150 facilities that are due for permit renewal by the end of 2006. (By 2006, we will complete a system for tracking the number of facilities due for permit renewals. Currently, we estimate that, through 2008, a total of 450 facilities will be due for permit renewal.)

- By 2008, reduce hazardous waste combustion facility emissions of dioxins and furans by 90 percent and particulate matter by 50 percent from 1994 levels of 880 grams/year and 9,500 tons/year, respectively.[10]

- By 2008, increase the percentage of UST facilities that are in significant operational compliance[11] with both release detection and release prevention requirements by 4 percent compared to 2004, out of a total estimated universe of approximately 263,000 facilities. (The baseline compliance rate will be determined in 2004, but is estimated to be approximately 60 percent.[12])

- Each year through 2008, minimize the number of confirmed releases at UST facilities to 10,000 or fewer. (Between FY 1999 and FY 2002, confirmed releases averaged 13,980.[13])

Means and Strategies for Achieving Objective 3.1

Reducing and Recycling Waste

EPA's strategy for reducing waste generation and increasing recycling is based on (1) establishing and expanding partnerships with businesses, industries, states, communities, and consumers; (2) stimulating infrastructure development, new technologies, and environmentally responsible behavior by product manufacturers, users, and disposers ("product stewardship"); and (3) helping businesses, government, institutions, and consumers by providing education, outreach, training, and technical assistance.

Promoting the Resource Conservation Challenge

The Resource Conservation Challenge (RCC), the Agency's primary vehicle for implementing this multi-component strategy, represents a major national effort to find flexible yet protective ways to conserve our valuable natural resources through waste reduction, recycling, and energy recovery.[14] The RCC is designed to elicit a response from all Americans, since we all have opportunities to reduce the waste we produce and to increase recycling. Through the RCC, EPA challenges Americans to make purchasing and disposal decisions that conserve our natural resources, save energy, reduce costs, and preserve the environment for future generations.

Currently, we are working with our partners to identify additional performance goals for the RCC that will supplement our existing strategic targets. These goals will reflect the expanded effort the Agency is beginning in 2003 to decrease the use and increase the recovery of materials and energy by reducing and recycling municipal, industrial, and hazardous wastes. As part of this effort, EPA will review waste generation and management practices to identify opportunities to reduce wastes, remove barriers to recycling and recovery, and promote safe beneficial uses. To further promote hazardous waste recycling, we will analyze changes in the

amount of hazardous waste recycled and the factors influencing these changes, including non-regulatory factors. Our ultimate goal is to move the Nation from a waste-oriented to a life-cycle-management way of thinking about materials. (The Agency is also encouraging industry to minimize the generation of priority-list chemicals in hazardous waste streams, an effort presented in 5.2.2 under Goal 5: Compliance and Environmental Stewardship.)

Establishing and Expanding Partnerships

EPA will establish and expand its partnerships with industry, states, and other entities to reduce waste and develop and deliver tools that can help businesses, manufacturers, and consumers. Nationally recognized programs, such as WasteWise,[15] which uses voluntary partnerships to encourage waste prevention and recycling, will serve as models for new alliances among federal, state, and local governments and businesses that capitalize on voluntary efforts to reduce waste and increase recycling. EPA and the Nation will continue to benefit from well-established programs.

Another example of an expanded partnership program is the WasteWise Building Challenge, which EPA initiated in 2002.[16] This program will continue to promote development of new tools, such as waste-hauling contracts that provide financial incentives for haulers to identify and implement cost-effective, resource-efficient source reduction and recovery.

EPA will also continue to help our tribal partners improve practices for managing solid waste on Indian lands. EPA has direct implementation responsibility for RCRA hazardous waste and UST programs in Indian country. Recognizing the unique challenges encountered on tribal lands, EPA will work with tribes on a government-to-government basis that affirms the federal government's vital trust responsibility to 572 tribal governments and recognizes the importance of conserving natural resources for cultural uses. We will conduct joint projects to upgrade tribal solid waste management infrastructure, including plans, codes and ordinances; recycling programs; and other alternatives to open dumping. These efforts will help to prevent open dumping in Indian country in the future and allow clean up of existing dumps, reducing the risks that such dumps pose to human health and the environment.

Stimulating Infrastructure Development, Product Stewardship, and New Technologies

Another key strategy for reducing waste is fostering development of infrastructure that will make it easier for businesses and consumers to reduce the waste they generate, acquire and use recycled materials, and purchase products containing recycled materials. EPA will continue to promote development of new and better recycling technologies and to explore ways to obtain energy or products from waste.

Several initiatives already underway demonstrate the potential of such efforts. EPA has established voluntary product stewardship partnerships with manufacturers, retailers, and

governmental and nongovernmental organizations to reduce the impacts that electronics and carpets can have on the environment throughout their lives. In January 2002, EPA, a carpet trade association, major manufacturers, and a variety of state and regional government organizations agreed to substantially reduce the amount of used carpet going to landfills. They also created a new industry-funded organization to support the development of recycling infrastructure and to provide for government procurement and market-development initiatives to support this undertaking.

EPA will also promote development of new and better recycling technologies and will explore ways to obtain energy or products from waste. For example, through bioreactor technology, the collection of landfill gases containing methane offers promise as a future source of energy. The Agency will continue to support initiatives that revamp technologies to reduce or eliminate the use of virgin materials, recover energy to produce power, and improve waste management.

Providing Education, Outreach, Training, and Technical Assistance

EPA will continue to work with major retailers, electronics manufacturers, and the amusement and motion picture industries to revitalize, create, and display conservation, waste prevention, and recycling messages. Communicated via movie and video trailers, posters targeted to schoolchildren, in-store displays and advertisements, and print and broadcast public service announcements, the messages will encourage consumers, young people, and underserved communities to make smarter, more responsible environmental decisions. The Agency and its partners will design activities that encourage students and teachers to start innovative recycling programs and will develop unique tools and projects to promote waste reduction, recycling, and neighborhood revitalization in Hispanic and African-American communities and on Indian lands.

Managing Hazardous Wastes and Petroleum Products

Recognizing that some hazardous wastes cannot yet be completely eliminated or recycled, the RCRA program works to reduce the risks of exposure to hazardous wastes by maintaining a "cradle-to-grave" approach to waste management.

Preventing Hazardous Releases from RCRA Facilities

EPA's strategy for addressing hazardous wastes that must be treated or stored is based on achieving greater efficiencies at waste management facilities through more focused permitting processes and tightening standards where appropriate. We will work with our state, tribal, and local government partners to ensure that hazardous waste management facilities have approved controls in place and continue to strive for safe waste management.

EPA will work with authorized states—specifically, those with a large number of facilities lacking approved controls in place—to help resolve issues and transfer successful

strategies from other states. We also plan to study the universe of unpermitted facilities and work with states to identify and resolve issues that might be preventing key categories of facilities from obtaining permits or putting other approved controls in place. To achieve greater efficiencies at facilities that treat or store hazardous waste, the Agency will also promote innovative technologies that streamline permitting processes and improve protection of human health and the environment.

Reducing Emissions from Hazardous Waste Combustion

EPA will continue to develop and issue regulations regarding emission standards for hazardous waste combustion facilities. Implementation of these regulations is key to reducing the emission of dioxins, furans, particulate matter, and acid gases. Within 2 years from the date when EPA issues new limits, facilities will conduct emission tests to demonstrate reductions. Additional periodic tests will ensure continued compliance with the limits established for emissions.

Preventing Releases from Underground Storage Tank Systems

EPA recognizes that the size and diversity of the regulated community puts state authorities in the best position to regulate USTs and to set priorities. RCRA Subtitle I allows state UST programs approved by EPA to operate in lieu of the federal program.[17] Except in Indian country, even states that have not received formal state program approval from EPA are in most cases the primary implementing agencies and receive annual grants from EPA.

While the frequency and severity of releases from UST systems have been greatly reduced, EPA and its state partners have observed that releases are still occurring. Improved release prevention and tank management practices and effective compliance assistance and enforcement activities can help reduce the number of confirmed releases.

In any given year, however, it is possible that factors such as greater field presence and discovery of older releases during site closures will increase the number of confirmed releases reported, potentially exceeding the Agency's annual strategic target numbers. Despite such apparent increases in releases, however, human health and the environment are being better protected than if the releases went undetected or unreported. EPA will continue to work with its state and tribal partners to prevent and detect petroleum releases from USTs by ensuring that compliance with release detection requirements and with release prevention requirements (e.g., spill, overfill, and corrosion protection) is a national priority. While the vast majority of the approximately 698,000 active USTs have the equipment required under the regulations, significant work remains to ensure that UST owners and operators maintain and operate their systems properly.[18] Therefore, in FY 2004, the Agency will continue its evaluation of the performance of new or upgraded UST systems to better identify the causes of releases and to determine how successful leak detection systems are in quickly identifying releases. The Agency will also continue to identify opportunities for improving UST system performance.

To protect our Nation's ground water and drinking water from petroleum releases, EPA will continue to support state programs; strengthen partnerships among stakeholders; and provide technical assistance, compliance assistance, and training to promote and enforce UST facilities' compliance. In addition, EPA will continue its work to obtain states' commitments to increase their inspection and enforcement presence if state-specific goals are not met. The Agency and states will use innovative compliance approaches, along with outreach and education tools, to bring more tanks into compliance. For example, multi-site agreements can be effective in bringing a single tank owner with multiple sites into compliance. In Region 6, EPA successfully used a multi-site agreement to achieve compliance at approximately 25 UST facilities owned by a single company.

The Agency will also provide guidance to foster the use of new technology to enhance compliance. For example, the presence of methyl-tertiary-butyl-ether (MTBE) in gasoline increases the importance of preventing and rapidly detecting releases. Because releases that contain MTBE often require complicated ground-water cleanups, they are generally more expensive and take longer to address, affecting achievement of our national cleanup goals.[19] The Agency will focus its efforts on reducing UST releases and increasing early detection of petroleum products, including MTBE, by further evaluating the performance of compliant UST systems.

Objective 3.2: Restore Land. By 2008, control the risks to human health and the environment by mitigating the impact of accidental or intentional releases and by cleaning up and restoring contaminated sites or properties to appropriate levels.

Sub-objective 3.2.1: Prepare for and Respond to Accidental and Intentional Releases. By 2008, reduce and control the risks posed by accidental and intentional releases of harmful substances by improving our Nation's capability to prepare for and respond more effectively to these emergencies.

Strategic Targets:

- Each year through 2008, improve the Agency's emergency preparedness by achieving and maintaining the capability to respond to simultaneous large-scale emergencies and by increasing response readiness by 10 percent from a baseline established by the end of 2003 using the core emergency response criteria.

- Each year through 2008, respond to 350 hazardous substance releases and 300 oil spills.

- Each year through 2008, minimize impacts of potential oil spills by inspecting or conducting exercises or drills at 6 percent of approximately 6,000 oil storage facilities required to have Facility Response Plans. (Between FY 1997 and FY 2002, 30 percent of these facilities were inspected.[20])

Sub-objective 3.2.2: Clean Up and Reuse Contaminated Land. By 2008, control the risks to human health and the environment at contaminated properties or sites through cleanup, stabilization, or other action, and make land available for reuse.

Strategic Targets:

- By 2008, perform 88,000 health and environmentally based site assessments and make 41,700 final-assessment decisions under Superfund, and assess 100 percent (approximately 1,714) RCRA baseline facilities.[21] Universe of RCRA baseline facilities will be evaluated and, if necessary, adjusted in FY 2004.

- By 2008, control all identified unacceptable human exposures from site contamination to at or below health-based levels for current land and/or ground-water use conditions at 95 percent (approximately 1,628) of RCRA baseline facilities[22] and 84 percent (1,259) of 1,494[23] Superfund human exposure sites (as of FY 2002).

- By 2008, control the migration of contaminated ground water through engineered remedies or natural processes at 80 percent (approximately 1,371) of RCRA baseline facilities[24] and 65 percent (832) of 1,275[25] Superfund ground-water exposure sites (as of FY 2002).

- By 2008, select final remedies (cleanup targets) at 30 percent (approximately 514) of RCRA baseline facilities and approximately 82 percent (1,223) of 1,498[26] Superfund sites (as of FY 2002).

- By 2008, clean up and reduce the backlog of approximately 140,000 leaking UST sites by 50 percent, and complete construction of remedies at 20 percent (approximately 343) of RCRA baseline facilities[27] and approximately 72 percent (1,086) of 1,498[28] Superfund sites (as of FY 2002). (Construction completion is a benchmark used to show that all significant construction activity has been completed, even though additional remediation may be needed for all cleanup goals to be met.)

Sub-objective 3.2.3: Maximize Potentially Responsible Party Participation at Superfund Sites. Through 2008, conserve Superfund trust fund resources by ensuring that potentially responsible parties conduct or pay for Superfund cleanups whenever possible.[29]

Strategic Targets:

- Each year through 2008, reach a settlement or take an enforcement action before the start of a remedial action at 90 percent of Superfund sites having viable, liable responsible parties other than the federal government.

- Each year through 2008, address all Statute of Limitations cases for Superfund sites with unaddressed total past costs equal to or greater than $200,000.

Means and Strategies for Achieving Objective 3.2

EPA leads the country's activities to reduce the risks posed by releases of harmful substances and by contaminated land. The most effective approach to controlling these risks incorporates developing and implementing prevention measures, improving response capabilities, and maximizing the effectiveness of response and cleanup actions. This approach will help ensure that human health and the environment are protected and that land is returned to beneficial use.

Preparedness and Response

EPA plays a major role in reducing the risks that accidental and intentional releases of harmful substances and oil pose to human health and the environment. Under the National Response System (NRS), EPA evaluates and responds to thousands of releases annually. The NRS is a multi-agency preparedness and response mechanism that includes the following key components: the National Response Center; the National Response Team (NRT), composed of 16 federal agencies; 13 Regional Response Teams; and federal On-Scene Coordinators (OSCs). These organizations work with state and local officials to develop and maintain contingency plans that will enable the Nation to respond effectively to hazardous substance and oil emergencies. When an incident occurs, these groups coordinate with the OSC in charge to ensure that all necessary resources, such as personnel and equipment, are available and that containment, cleanup, and disposal activities proceed quickly, efficiently, and effectively. EPA's primary role in the NRS is to serve as the federal OSC for spills and releases in the inland zone. As a result of NRS efforts, the Nation has successfully contained many major oil spills and releases of hazardous substances, minimizing the adverse impacts on human health and the environment.

EPA's emergency preparedness, prevention, and response staff are vital to this work. We will continue to develop technical personnel in the field, ensuring their readiness and protecting their health and safety when responding to releases of dangerous materials. In addition, EPA will strengthen its information infrastructure by making information management decisions Agency-wide and by improving operations and the security, collection, and exchange of information.

Preparing for Emergencies

Preparedness on a national level is essential to ensure that emergency responders are able to deal with multiple, large-scale emergencies, including those that may involve chemicals, oil, biological agents, or weapons of mass destruction. Over the next several years, EPA will enhance its core emergency response program to respond quickly and effectively to chemical, oil, biological, and radiological releases and will improve coordination mechanisms to enable response to simultaneous, large-scale national emergencies, including homeland security incidents. We will focus our efforts on Regional Response Teams and coordination among regions; health and safety issues, including provision of clothing that protects and identifies responders, training, and exercise; establishment of delegation and warrant authorities; and response readiness, including equipment, transportation, and outreach. The criteria for excellence in the core emergency response program will ensure a high level of overall readiness throughout the Agency and improve our ability to support multi-regional responses.

In addition to enhancing our readiness capabilities, EPA will work to improve internal and external coordination and communication mechanisms. For example, as part of the National Incident Coordination Team, EPA will continue to improve its policies, plans, procedures, and decision-making processes for coordinating responses to national emergencies. Under the Continuity of Operations/Continuity of Government program, we will upgrade and test plans, facilities, training, and equipment to ensure that essential government business can continue during a catastrophic emergency. NRT capabilities are being expanded to coordinate interagency activities during large-scale responses. EPA will coordinate its activities with the Department of Homeland Security, Federal Emergency Management Administration (FEMA), Federal Bureau of Investigation (FBI), other federal agencies, and state and local governments. EPA will also continue to clarify its roles and responsibilities to ensure that Agency security programs are consistent with the national homeland security strategy.

Responding to Hazardous Substance Releases and Oil Spills

Each year, EPA personnel assess, respond to, mitigate, and clean up thousands of releases—whether accidental, deliberate, or naturally occurring. These incidents range from small spills at chemical or oil facilities to national disasters, such as hurricanes, earthquakes, terrorist events like the 2001 World Trade Center/Pentagon and anthrax attacks, and the 2003 Columbia shuttle tragedy.

EPA will work to improve its capability to respond effectively to incidents that can involve harmful chemical, oil, biological, and radiological substances. As part of its strategy for improving effectiveness, the Agency will explore improvements in response readiness levels, including field and personal protection equipment and response training and exercises; review response data provided in the "after-action" reports prepared by EPA emergency responders following a release; and examine "lessons learned" reports to identify which activities work and which need to be improved. Application of this information and other data will advance the Agency's state-of-the-art emergency response operations.

Preventing and Preparing for Oil Spills

An important component of EPA's land strategy is preventing potential oil spills and being prepared for spills that do occur from reaching our Nation's waters. Under the Oil Pollution Act,[30] the Agency requires certain facilities (defined in 40 CFR 112.2) to develop Facility Response Plans and to practice implementing the plans by conducting drills and exercises to be prepared in the event of a spill. Compliance with these requirements reduces the number of oil spills that reach navigable waters and prevents detrimental effects on human health and the environment should a spill occur.

Controlling Risks at Contaminated Sites

Leaching contaminants can foul drinking water in underground aquifers used for wells or surface waters used by public water intakes. Contaminated soil can result in human ingestion or dermal absorption of harmful substances. Contamination can also affect subsistence resources, including resources subject to special protections due to treaties between federal and tribal governments. Furthermore, because of the risks it poses, contaminated land may not be available for use.

EPA and its partners work to clean up contaminated land to levels sufficient to control risks to human health and the environment and to return the land to productive use. The Agency's cleanup activities, some new and some well-established, include removing contaminated soil, capping or containing contamination in place, pumping and treating ground water, and bioremediation.

EPA uses a variety of tools to accomplish cleanups: permits, enforcement actions, consent agreements, Federal Facilities Agreements, and many other mechanisms. As part of EPA's One Cleanup Program Initiative, programs at all levels of government work together to ensure that appropriate cleanup tools are used; that resources, activities, and results are coordinated with partners and stakeholders and communicated to the public effectively; and that cleanups are protective and contribute to community revitalization.[31] This approach reflects EPA's efforts to coordinate across all of its cleanup programs, while maintaining the flexibility needed to accommodate differences in program authorities and approaches.

EPA fulfills its cleanup and waste management responsibilities on tribal lands by acknowledging tribal sovereignty and recognizing tribal governments as being the most appropriate authorities for setting standards, making policy decisions, and managing programs consistent with Agency standards and regulations.

Through strong policy, leadership, program administration, and a dedicated workforce, EPA's cleanup programs will merge sound science, cutting-edge technology, quality environmental information, and stakeholder involvement to protect the Nation from the harmful effects of contaminated property. To accomplish its cleanup goals, the Agency will continue to forge partnerships and develop outreach and education strategies.

Assessment, Stabilization, and Cleanup

EPA and its partners follow four key steps to accomplish cleanups and control risks to human health and the environment: assessment, stabilization, selection of appropriate remedies, and implementation of remedies. We will continue to work with our federal, state, tribal, and local government partners at each step of the process to identify facilities and sites requiring attention and to monitor changes in priorities, addressing new priority sites or removing previously identified facilities that will be addressed through other mechanisms. For example, EPA is collecting tribal program baseline data for the Superfund program and has modified the Superfund data system to record sites of concern to tribes, along with those situated on Indian lands. As they modify existing systems and approaches and create new ones, cleanup programs will also continue to develop guidance for accomplishing each of these steps.

Assessing Sites

All cleanup programs assess preliminary site information to identify potential exposures and sites or facilities that require further action. These assessments flag sites that will require priority action to protect human health and the environment and also direct site owners and operators to the appropriate authorities for followup. To establish a common base of information for all stakeholders, EPA conducts site assessments with all partners who share authority for the site.

Stabilizing Sites

"Stabilization" refers to the initial actions taken to control actual or potential exposure, based on current land and ground-water use. Site stabilization activities can include installing hazardous waste containment remedies (such as slurry walls or impermeable caps) and ground-water remedies (such as pump-and-treat systems or permeable reactive walls). Where appropriate, these actions are taken immediately to protect populations located within a reasonable distance from the site from exposure to harmful contaminants.

Selecting Site Remedies

In selecting final remedies, the Agency seeks to address all current and potential sources of contamination that threaten human health and the environment. Remedies are selected based on many criteria, including the protectiveness they offer, environmental media cleanup objectives, their short- and long-term effectiveness, implementation issues, and their acceptability to state and tribal governments and the affected community. In selecting remedies, EPA and its partners also consider reasonably anticipated future land use.

Implementing Site Remedies

Implementation or construction of the site remedy is the first step in the final remediation process. Following implementation, EPA encourages monitoring the site to ensure that the cleanup adequately protects human health and the environment.

EPA is also planning several projects to help us characterize the results of various cleanup programs. These projects are intended to evaluate: (1) the placement of Superfund sites into exposure reduction categories based on cleanup progress, (2) the degree to which ecological receptors are protected from hazardous substances through cleanup activities, and (3) the economic impact of cleanup activities.

Reusing and Restoring Land

Usable land is a valuable resource. However, where contamination presents a real or perceived threat to human health and the environment, options for future land use at that site may be limited. EPA's cleanup programs have set a national goal of returning formerly contaminated sites to long-term, sustainable, and productive use. This goal creates greater impetus for selecting and implementing remedies that, in addition to providing clear environmental benefits, will support reasonably anticipated future land use options and provide greater economic and social benefits.

We are evaluating our policies and guidelines to determine where we can refine our approach to cleanups to facilitate beneficial site reuse. We are also forming partnerships with states, tribes, other federal agencies, local governments, communities, landowners, lenders, developers, and parties potentially responsible for contamination that can help bring about reuse of formerly contaminated sites.

(Also see the discussion of EPA's Brownfields Program under Goal 4: Healthy Communities and Ecosystems.)

Maximizing Potentially Responsible Party Participation at Superfund Sites

Enforcement authorities play a critical role in all Agency cleanup programs. However, they have an additional and unique role under the Superfund program: they are used to leverage private-party resources to conduct a majority of the cleanup actions and to reimburse the federal government for cleanups financed by the Trust Fund. EPA will continue to pursue the following two strategies for limiting the use of trust funds.

Applying Superfund "Enforcement First"

The Superfund program's "Enforcement First" strategy will allow EPA to focus limited Trust Fund resources on sites where viable, potentially responsible parties either do not exist or lack the funds or capabilities needed to conduct the cleanup. By taking enforcement actions at sites where viable, liable parties do exist, EPA will continue to leverage private-party dollars so that Trust Fund money is used only when absolutely necessary to clean up hazardous waste sites.

Recovering Costs

Cost recovery is another way to leverage private-party resources through enforcement. Under Superfund, EPA has the authority to compel private parties to pay back Trust Fund money spent to conduct cleanup activities.[32] EPA will continue its efforts to address 100 percent of the Statute of Limitations cases for Superfund sites with unaddressed total past costs equal to or greater than $200,000 and to report the value of costs recovered.

Objective 3.3: Enhance Science and Research. Through 2008, provide and apply sound science for protecting and restoring land by conducting leading-edge research and developing a better understanding and characterization of environmental outcomes under Goal 3.

Sub-objective 3.3.1: Provide Science to Preserve and Remediate Land. Through 2008, provide sound science and constantly integrate smarter technical solutions and

protection strategies that enhance our ability to preserve land quality and remediate contaminated land for beneficial reuse.

Sub-objective 3.3.2: Conduct Research to Support Land Activities. Through 2008, conduct sound, leading-edge scientific research to provide a foundation for preserving land quality and remediating contaminated land. Research will result in documented methods, models, assessments, and risk management options for program and regional offices, facilitating their accurate evaluation of effects on human health and the environment, understanding of exposure pathways, and implementation of effective risk-management options. Conduct research affecting Indian country in partnership with tribes.

Means and Strategies for Achieving Objective 3.3

Science to Preserve and Remediate Land

EPA will continue to improve its capability to assess environmental conditions and determine the relative risks that contaminated land poses to health and the environment. The Agency will ensure that the environmental data it collects are of known, documented, and acceptable quality by implementing necessary field and lab procedures, practices, and controls. We will continue integrating technological advances to enhance our site investigation capabilities, implement cost-effective remedies, and improve the operation and maintenance of existing remedies. In addition, we will continue to coordinate with other agencies to identify and communicate program research priorities.

Research to Preserve and Remediate Land

To achieve our objectives for land, EPA's Office of Research and Development (ORD) has developed multi-year plans for research on contaminated sites and RCRA issues. Each of these research plans outlines our long-term goals for the next 5 to 10 years and describes targets the Agency intends to meet to reduce scientific uncertainties associated with these topics.[33]

Research to Clean Up and Reuse Contaminated Land

To support cleanup and reuse of contaminated lands, we will conduct research to provide improved methods for site characterization, risk assessment and exposure analysis, and mitigation approaches. Through the Superfund Innovative Technology Evaluation Program, we will demonstrate and verify cost-effective technologies for characterizing and remediating contaminated sites. By providing site-specific technical support to site managers, we will enhance our communication of state-of-the-art methods. In addition, we will provide research results and advice to further apply sound science in regulatory and nonregulatory efforts. More specifically, Agency research on contaminated sites will:

- Aid in selecting protective, cost-effective remedies for contaminated sediment by improving risk and site characterization and increasing understanding of different remedial options.

- Provide decision-makers with performance and cost information on alternatives to pump-and-treat remedies for ground water and tools for characterizing and assessing ground water.

- Provide tools and methods for assessing, remediating, and managing soil and land efficiently at contaminated sites.

- Provide scientific tools, methods, models, and technical support to characterize multimedia site contamination; assess, predict, and communicate risks; evaluate innovative remediation options; develop testing protocols and risk management strategies; and identify the fate and effects of oil spills.

Research to Preserve Land

EPA will provide a tested multimedia modeling system, peer-reviewed technical reports, and technical support to enable scientifically sound, consistent decisionmaking at RCRA sites and facilities. ORD is directing resources to assist in implementing RCC and will evaluate waste-derived products to ensure that materials that would otherwise require waste disposal are not presenting other environmental issues. To support our goals for increasing materials recovery and recycling, ORD is also investing in research on electronics waste recycling and plans to develop sampling guidance and risk screening, which we can provide to states and other stakeholders that are developing recycling programs to handle this new waste stream.

ORD is working on leaching issues and treatment technologies to support our commitment to evaluate the effectiveness of leaching methods and hard-to-treat wastes. To ensure that wastes are properly managed and contained and enhance the performance of landfill operations, we are evaluating different liners and landfill covers. ORD bioreactor research is supporting such current regulatory efforts as the Research Development and Demonstration rule for landfills and is producing products, such as a recently developed monitoring approach, that states can use in managing landfill sites. Finally, by evaluating dioxin/furan emissions, surrogates, and continuous monitoring systems, ORD's in-house and grants programs also support our objective for reducing hazardous waste facility combustion emissions of dioxins and furans.

EXTERNAL FACTORS

EPA's ability to respond as the federal OSC for releases of harmful substances in the inland zone will be affected by several external factors. The NRS ensures that EPA will respond when necessary, but relies heavily on the ability of responsible parties and state, local, and tribal agencies to respond to most emergencies. The need for EPA to respond is a function of the quantity and severity of spills that occur, as well as the capacity of state, local, and tribal agencies to address spills.

EPA's ability to respond to homeland security incidents may be affected by circumstances surrounding each event. For instance, if travel or communication is severely impeded, EPA's response may be delayed and its efficiency compromised. Also, in the case of a single large-scale incident, our Removal Program resources will most likely be concentrated on that response, thus reducing our ability to address other emergency releases. In severe cases, EPA's current emergency response workforce and resources may not be sufficient to address a large number of simultaneous large-scale incidents.

In addition, a number of external factors could substantially affect the Agency's ability to achieve its objectives for cleanup and prevention. These factors include Agency reliance on private-party response and state and tribal partnerships, development of new environmental technologies, work by other federal agencies, and statutory barriers. Achieving the release prevention objectives and attaining our FY 2008 targets will depend heavily on the participation of states that have been authorized or approved to be the primary implementors of these programs.

Attaining our waste reduction and recycling objectives will depend on the participation of federal agencies, states, tribes, local governments, industries, and the general public in partnerships aimed at reducing waste generation and increasing recycling rates. EPA provides national leadership in the areas of waste reduction and recycling to facilitate public and private partnerships that can provide the impetus for government, businesses, and citizens to join in the campaign to significantly reduce the amount of waste generated and ultimately sent for disposal. However, both domestic and foreign economic stresses can adversely affect markets for recovered materials.

State programs are primarily responsible for implementing the RCRA Hazardous Waste and UST programs. Our ability to achieve our goals for these programs depends on the strength and funding levels of state programs. Similarly, our success in meeting compliance standards depends on extensive training and a strong state presence. To increase UST compliance, EPA will build upon its commitment to provide states and tribes with technical support and training.

Human Capital Focus For Achieving Goal 3

EPA's workforce planning, hiring and training activities will emphasize:

- State-of-the-art techniques to detect, analyze, and respond to chemical, biological, and radiological agents
- Incident command system response management processes
- Insurance, real estate, and remediation strategies
- Characterization, monitoring, and sampling methods
- Multimedia and health/ecosystem effects estimation modeling methodologies
- Chemical treatment, land, combustion, and containment technologies.

Success also depends on using innovative education methods and providing a variety of tools to state, tribal, and local government partners to promote energy efficiency, conservation, and reuse of materials.

Efficiency Measures For Goal 3

Efficiency measures relate results to the resources or time invested to achieve those results and augment effectiveness measures in evaluating performance. They help us integrate EPA's budget and performance—part of the President's Management Agenda—and demonstrate the cost-effectiveness and timeliness of program activities.

Under this goal, the RCRA Corrective Action Program is developing an efficiency measure that tracks the cost over time of meeting current objectives, such as controlling unacceptable human exposures from site contamination or the migration of contaminated ground water through engineered remedies or natural processes.

Notes

1.42 *U.S. Code* 9601-9675

2.42 *U.S. Code* 6901-6992k

3.42 *U.S. Code* 7401-7671q

4.33 *U.S. Code* 1251-1387

5.33 *U.S. Code* 2701-2761

6.U.S. Environmental Protection Agency. June 2002. *Characterization of Municipal Solid Waste in the United States - 2000 Update*. Washington, DC: Government Printing Office. Available online at http://www.epa.gov/epaoswer/non-hw/muncpl/msw99.htm Last updated October 29, 2002.

7.U.S. Environmental Protection Agency. June 2002. *Characterization of Municipal Solid Waste in the United States - 2000 Update.* Washington, DC: Government Printing Office. Available online at http://www.epa.gov/epaoswer/non-hw/muncpl/msw99.htm Last updated October 29, 2002.

8.U.S. Environmental Protection Agency. *Resource Conservation and Recovery Act Information System (RCRAInfo)*, Hazardous Waste Facility Permitting Accomplishments. Available online at http://www.epa.gov/epaoswer/hazwaste/permit/charts/charts.pdf; EPA Office of Solid Waste. Last updated July 1, 2003.

9.Approximately 2,750 hazardous waste management facilities are currently regulated under RCRA. EPA plans to reassess this "universe" in FY 2006. Facilities that started activities subject to hazardous waste permitting after October 1, 1997, will be included in the count; facilities that should not have been counted (such as those coded as "never regulated," "protective filers," or "state regulated") will be removed.

10.Information derived from: Data base of permit and compliance demonstration test results. Data base available at http://www.epa.gov/epaoswer/hazwaste/combust/comwsite/cmb-noda.htm
Data availability was also published in 67 *Federal Register* 44452 - 44460, July 2, 2002 and 65 *Federal Register* 39581, June 27, 2000.

11.Determination of "significant operational compliance" begins in FY 2004. Previously, compliance depended on two determinations. Recently, an EPA/state workgroup adjusted the definition of significant operational compliance to increase consistent national reporting. Therefore, the current baseline of 60 percent compliance is uncertain, since FY 2004 is the first reporting period.

12. Memorandum from Sammy K. Ng, Acting Director, EPA Office of Underground Storage Tanks to Underground Storage Tank Regional Program Managers. November 19, 1999. *FY99 End of Year Semi-Annual Activity Report.*

Memorandum from Cliff Rothenstein, Director, EPA Office of Underground Storage Tanks to Underground Storage Tank Regional Program Managers. November 16, 2000. *FY00 End of Year Semi-Annual Activity Report.*

Memorandum from Cliff Rothenstein, Director, EPA Office of Underground Storage Tanks to Underground Storage Tank Regional Division Directors, Regions 1-10. January 29, 2002. *FY2001 Semi-Annual (End of Year) Activity Report.*

Memorandum from Cliff Rothenstein, Director, EPA Office of Underground Storage Tanks to Underground Storage Tank Regional Division Directors, Regions 1-10. December 23, 2002. *FY 2002 End-of-Year Activity Report.*

13. Memorandum from Sammy K. Ng, Acting Director, EPA Office of Underground Storage Tanks to Underground Storage Tank Regional Program Managers. November 19, 1999. *FY99 End of Year Semi-Annual Activity Report.*

Memorandum from Cliff Rothenstein, Director, EPA Office of Underground Storage Tanks to Underground Storage Tank Regional Program Managers. November 16, 2000. *FY00 End of Year Semi-Annual Activity Report.*

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RCRA baseline facilities are RCRA facilities with corrective action obligations that EPA and the authorized states have identified as highest priority. In FY 2004, EPA and the authorized states will reevaluate and, if necessary, adjust the current list of 1,714 facilities.

22. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Corrective Action/Facility Information Web Site: http://www.epa.gov/epaoswer/hazwaste/ca/facility.htm#RCRA. Washington, DC. Last updated October 8, 2002.

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RCRA baseline facilities are RCRA facilities with corrective action obligations that EPA and the authorized states have identified as highest priority. In FY 2004, EPA and the authorized states will reevaluate and, if necessary, adjust the current list of 1,714 facilities.

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RCRA baseline facilities are RCRA facilities with corrective action obligations that EPA and the authorized states have identified as highest priority. In FY 2004, EPA and the authorized states will reevaluate and, if necessary, adjust the current list of 1,714 facilities.

28. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Superfund Accomplishment Figures, Summary Fiscal Year 2003 Web Site: http://www.epa.gov/superfund/action/process/numbers.htm. Washington, DC. Last updated April 7, 2003.

29. The Superfund Program began when Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980. The law created a revolving Trust Fund, which is also known

as the Superfund. This large pot of money is used by EPA and other agencies to clean up hazardous waste sites. The Trust Fund is used primarily when those companies or people responsible for the contamination at Superfund sites cannot be found or cannot perform the cleanup or pay for the cleanup work. To make sure that those responsible clean up or pay for the cleanup as much as possible, EPA's Superfund Enforcement program identifies the companies or people responsible for contamination at a site and negotiates with them to do the cleanup. If EPA pays for some or all of the cleanup at a site and then finds the people responsible, EPA can recover from them the money it spent. The Fund was largely financed by a tax on crude oil and 42 commercially used chemicals. The taxing authority expired December 31, 1995.

30.33 *U.S. Code* 2701-2761

31.U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. One Cleanup Program Web Site: http://www.epa.gov/swerrims/onecleanupprogram/index.htm. Washington, DC. Last updated May 9, 2003.

32.42 *U.S. Code* 9601-9675, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Sec. 107.

33.For more information on ORD's multi-year plans, visit: U.S. Environmental Protection Agency, Office of Research and Development. Research Directions, Multi-Year Plans Web Site: http://www.epa.gov/osp/myp.htm. Last updated August 26th, 2003.

GOAL 4
HEALTHY COMMUNITIES AND ECOSYSTEMS

Protect, sustain, or restore the health of people, communities, and ecosystems using integrated and comprehensive approaches and partnerships.

To protect, sustain, or restore the health of communities and ecosystems, EPA must bring together a variety of programs, tools, approaches, and resources; create strong partnerships with federal, state, tribal, and local government agencies; and enlist the support of many stakeholders. Because Goal 4 is unique in its cross-media, cross-Agency approach, building a cohesive, integrated strategy is critical for achieving results.

EPA must manage environmental risks to watersheds, communities, homes, and workplaces to protect human health and the environmental integrity of ecosystems. The Agency will employ a mix of regulatory programs and alternative voluntary approaches to achieve results efficiently and in innovative, sustainable ways. For example, preventing pollution at the source is the preferred strategy for reducing risk and environmental impact. However, where programs to prevent pollution or ecosystem damage are not viable, EPA promotes waste minimization, avoidance of impact on habitat, and disposal and remediation. In managing risk, EPA will direct its efforts toward the greatest threats in our communities, homes, and workplaces, including threats to sensitive populations, such as children, the elderly, and Native Americans.

A key component of this goal is protecting human health and the environment by identifying, assessing, and reducing the risks presented by the thousands of chemicals on which our society and economy have come to depend. These include the pesticides used to meet national and global demands for food and the industrial and commercial chemicals found in products and throughout our homes and workplaces.

Some pest control methods used to ensure an abundant and affordable food supply can cause unwanted environmental or health effects. Apart from agriculture, effective pest control is also essential for homes, gardens, highways and utility lines, hospitals, and drinking water treatment facilities. Pesticides are an important part of pest management in each of these settings. Licensing pesticides helps to ensure that they can be used safely and beneficially while avoiding unintended harm to human health or environment. EPA must also address the emerging challenges posed by a growing array of biological organisms—naturally occurring and, increasingly, genetically engineered—that are being used in industrial and agricultural processes.

Building a community's capability to make decisions that affect the environment is at the heart of the community-centered work under this goal. EPA's Brownfields Program encourages

community development through funding to inventory, assess, and clean up the hundreds of thousands of brownfields properties that have been abandoned or unused due to previous industrial, commercial, or other use. EPA's efforts to share information and build community capacity offer the public the tools it needs in considering the many aspects of planned development or redevelopment.

EPA's ecosystem protection programs encompass a wide range of approaches that address specific at-risk regional areas along with larger categories of threatened systems, such as estuaries and wetlands. Locally generated pollution, combined with pollution carried by rivers and streams and through air deposition, can collect in these closed and semi-closed ecosystems, degrading them over time.

Large water bodies, such as the Gulf of Mexico, the Great Lakes, and Chesapeake Bay, are surrounded by industrial and other development and have been exposed to substantial pollution over many years at levels higher than current environmental standards permit. As a result, the volume of pollutants in these water bodies has exceeded their natural ability to restore balance. Working with stakeholders, EPA has established special programs to protect and restore these unique resources by addressing their vulnerabilities. At the Mexican Border, for example, addressing local pollution and infrastructure are priorities for the Mexican and the U.S. governments under the Border 2012 agreement. Safe drinking water is a particular priority. Coastal estuaries and wetlands are also vulnerable. As the population in coastal regions grows, the challenges to preserve and protect these important ecosystems increase. Coastal areas are testing grounds for combining innovative and community-based approaches with national guidelines and inter-agency coordination to achieve results.

Children and the elderly face significant and unique health threats from a range of environmental exposures. Pound for pound, children breathe more air, drink more water, and eat more food than adults, and their behavior patterns may increase their exposure to potential toxics. Because their systems are still developing, children may be more vulnerable to environmental risks, including air pollution that may exacerbate asthma, lead-based paint in older homes, microbes that may be resistant to treatment in drinking water, and persistent chemicals that may cause cancer or induce reproductive or developmental changes.

Due to the normal decrease in biological capacity that accompanies the aging process, even older Americans in good health may be at increased risk from exposure to environmental pollutants. As people age, their bodies are less able to detoxify and eliminate toxins. Native Americans represent another segment of the population with a different risk profile. Their traditional foods and ways of life may lead to higher levels of exposure to certain toxics. EPA will focus on these sensitive populations by increasing our understanding of these issues, building infrastructure and capacity, and providing information and tools needed to assess and prevent adverse impacts.

All of EPA's activities will rely on the latest and best scientific information. Sound science must be the basis of standard-setting and guide us in identifying and addressing emerging issues, as well as updating and advancing our understanding of long-standing human health and environmental challenges. Goal 4 includes a substantial amount of the Agency's scientific research. In this *Strategic Plan*, research directed toward achievement of a particular environmental outcome has been included under the goal with which it is associated. However, EPA conducts much of its research to learn more about broad areas of protecting human health and the environment. The contribution of such research can advance many of the Agency's programs and might do so in unpredictable ways. This research—not directly linked to any single environmental outcome—is described under Goal 4. To help us focus our resources most effectively, EPA will also continue directing research under Goal 4 to improve its development and use of environmental indicators.

OBJECTIVES

Objective 4.1: Chemical, Organism, and Pesticide Risks. Prevent and reduce pesticide, chemical, and genetically engineered biological organism risks to humans, communities, and ecosystems.

Sub-objective 4.1.1: Reduce Exposure to Toxic Pesticides. Through 2008, protect human health, communities, and ecosystems from pesticide use by reducing exposure to the pesticides posing the greatest risk.

Strategic Targets:

- Through 2008, systematically review pesticides in the marketplace to ensure that they meet the most current safety standards: reregistration (100 percent by 2008) , tolerance reassessment (100 percent by 2006), and registration review (12 percent by 2008, based on 15-year review cycle for all registrations).

- Each year through 2008, protect endangered and threatened species by ensuring that none of the 15 species on the EPA/Fish and Wildlife Service (FWS)/U.S. Department of Agriculture (USDA) priority list of threatened or endangered species will be jeopardized by exposure to pesticides.

- By 2008, reduce by 30 percent the number of mortalities to nontargeted terrestrial and aquatic wildlife caused by pesticides compared to 1995 levels of 80 reported bird incidents and 65 reported fish incidents (3-year average 1994-1996). (Baseline: 15 percent reduction by 2006)

- Through 2008, develop 10 (cumulative total) biogeographical modules which enable the Agency to factor unique tribal pesticide exposure scenarios into all appropriate pesticide reviews. (Baseline: pilot of 2 modules in FY 2003; total number of modules to be determined, 16-18 current estimate.)

- By 2008, decrease by 30 percent the occurrence of residues of carcinogenic and cholinesterase-inhibiting neurotoxic pesticides on foods eaten by children from their average 1994-1996 levels. (Baseline: 15 percent reduction as of 2006)

- By 2006, reduce by 10 percent the reregistration decision time, from the initiation of public participation to the signed Reregistration Eligibility Decision, compared to the FY 2002 baseline of 30 months.

- By 2008, reduce by 20 percent the inventories of obsolete persistent organic pesticides from the key source countries of Russia and Mexico[1] (i.e., those pesticides with the greatest potential for contributing to long-range environmental transport to the United States). (2003 baseline of over 21,000 tons for the Russian Federation; 2001 baseline of 1,151 tons for Mexico)

Sub-objective 4.1.2 License Pesticides Meeting Safety Standards. Through 2008, protect human health, communities, and ecosystems from pests and disease by ensuring the availability of pesticides, including public health pesticides and antimicrobial products, that meet the latest safety standards.

Strategic Targets:

- By 2008, at least 11 percent of acre treatments[2] will use applications of reduced-risk pesticides. (Baseline: 3.6 percent in 1998.)

- Each year through 2008, expedite the registration of 4 to 6 new active ingredients which meet the criteria for reduced-risk pesticides or organophosphate alternatives to make safer pest management tools available sooner. (Expedited registration time is 24 months versus the standard 40 months.) (Baseline: In 2002, 4 expedited registrations were done for reduced-risk conventional active ingredients.)

- By 2008, reduce registration decision times by 10 percent for conventional new active ingredients and 5 percent for reduced-risk new active ingredients from the 1995-2002 baseline of 40 months for conventional new active ingredients and 24 months for reduced-risk conventional new active ingredients.

- Each year through 2008, ensure new pesticide registration actions (including new active ingredients, new uses) meet new health standards and are environmentally safe. (In 2002, there were registration actions for 26 active ingredients and 720 new uses.)

- Each year through 2008, maintain the timeliness of Section 18 emergency exemption decisions (2002 baseline of 35 days).

Sub-objective 4.1.3: Reduce Chemical and Biological Risks. Through 2008, prevent and reduce chemical and biological organism risks to humans, communities, and ecosystems.

Strategic Targets:

- Through 2008, eliminate or effectively manage risks associated with High Production Volume (HPV) chemicals identified as priority concerns through EPA's assessment of Screening Information Data Set and other information.[3]

- Through 2008, complete risk assessments for at least 10 chemicals to which children may be exposed to enable effective management of identified risks. (Baseline is 0 chemicals with completed risk assessments in FY 2003)

- Through 2008, increase the efficiency of EPA's efforts to eliminate or effectively manage risks associated with HPV chemicals and chemicals to which children may be exposed by employing collaborative strategies with chemical producers and users and leveraging strategies with other governmental entities upon initial identification of such risks. Efficiency will be measured in terms of EPA's per-chemical review costs compared to 2005.

- Each year through 2008, prevent the introduction of new chemicals or organisms into commerce which pose unreasonable risks to workers, consumers, or the environment, through review of Pre-Manufacture

Notifications (PMNs), and disapproval as necessary. (Baseline to be developed in FY 2004)[4]

- Through 2008, increase the efficiency of EPA's efforts to prevent the occurrence of new unreasonable human health and environmental risks associated with the entry of new chemicals into U.S. commerce by training chemical developers to use EPA's risk screening tools early in research and development, so that the Agency receives at least 40 pre-screened PMNs per year. Efficiency will be measured in terms of EPA's per-chemical review costs compared to 2002. (Baseline to be developed in FY 2004 for number of PMNs)[5]

- Through 2008, reduce relative risks to chronic human health associated with environmental releases of industrial chemicals in commerce by 7 percent from 2001 levels, as measured by EPA's Risk Screening Environmental Indicators model.[6]

- By 2008, establish short-term exposure limits for 75 percent of the chemicals identified as highest priority by the Acute Exposure Guideline Levels (AEGL) Program. (Baseline is 0 chemicals with AEGL values in 1996. There are approximately 240 chemicals on the highest priority list.)

- Through 2008, reduce the number of childhood lead poisoning cases to 90,000, from approximately 400,000 cases in 1999/2000.[7]

- By 2008, the health risks associated with air pollution from leaded gasoline use in numerous countries will be mitigated by eliminating the use of leaded gasoline worldwide.

- Through 2008, reduce the potential for risks from leaks and spills by ensuring the safe disposal annually of 9,000 large capacitors and 5,000 transformers containing polychlorinated biphenyls (PCBs). (Current information for the last 3 years for which data are available [1999-2001] indicates a downward trend in PCB disposal. In 2001, there were 9,494 large capacitors and 4,885 transformers safely disposed.)[8]

- By 2008, reduce by 20 percent the inventories of PCBs in Russia that have the greatest potential for contributing to the long-range environmental transport of these pollutants to the United States. (2000 baseline is 35,000 tons)[9]

- By 2008, decrease releases of persistent bioaccumulative toxic (PBT) chemicals by 15 percent and toxic chemicals (including dioxin) by 10 percent as reported in the Toxic Release Inventory (TRI), compared to 2001 levels. (Baseline: 462,635,529 pounds of PBT chemicals and 5,744,530,557 pounds of all other toxic chemicals, including 328 pounds of dioxin)

Sub-objective 4.1.4: Reduce Risks at Facilities. Through 2008, protect human health, communities, and ecosystems from chemical risks and releases through facility risk reduction efforts and building community infrastructures.

Strategic Targets:

- By 2008, 30 percent of those facilities with hazardous chemicals, including Risk Management Plan facilities, will have reduced their risk of a major chemical accident out of a universe of approximately 15,000 facilities. (This includes reducing inventories of chemicals; reducing chemical accidents; improving chemical processes; replacing hazardous chemicals used in a process to a less hazardous chemical; and reducing vulnerability zones surrounding the chemical facility.)

- By 2008, 50 percent of local communities or Local Emergency Planning Committees (LEPC) will have incorporated facility risk information into their emergency preparedness and community right-to-know programs out of a universe of approximately 3,200 LEPCs.

Means and Strategies for Achieving Objective 4.1

Chemicals, microorganisms, and pesticides can pose risks to individuals, communities, and ecosystems. Under this objective, EPA aims to prevent or significantly reduce these risks by:

- Identifying and assessing potential risks from chemicals, pesticides, and microorganisms
- Setting priorities for addressing these risks
- Developing and implementing strategies aimed at preventing risks and managing those risks that cannot be prevented
- Implementing regulatory measures, such as systematic review of pesticides and new chemicals, and developing and implementing procedures for safe production, use, storage, and handling of chemicals, pesticides, and microorganisms
- Employing innovative voluntary measures, such as promoting the use of reduced-

risk pesticides and challenging companies to assess and reduce chemical risks and develop safer and less polluting new chemicals, processes, and technologies
- Conducting outreach and training and establishing partnerships
- Reducing or eliminating risks from potential chemical releases.

In coordination with our state and tribal co-regulators and co-implementors and with the support of industry, environmental groups, and other stakeholders, EPA will use these approaches to address risks associated with chemicals and pesticides. Improving communities' ability to address local problems is a critical part of our efforts to reduce risk.

Reducing Exposure to Pesticides

Pesticides are essential for controlling insects, weeds, bacteria, and other pests on farms and in homes, gardens, and hospitals. It is estimated that pesticides are used on more than 1 million farms and in 90 million households.[10] These products are regulated and held to safety standards prescribed by the Federal Insecticide, Fungicide, and Rodenticide Act.

Exposure to Pesticides in Food

People can be exposed to pesticides through their food. EPA is working to reduce this exposure, particularly to the more toxic pesticides. One of our priorities is to review older pesticides in light of Food Quality Protection Act (FQPA) safety standards. We will complete pesticide reregistration eligibility decisions by 2008 (food use by 2006) and, in tandem with that work, meet our FQPA statutory goal of reassessing the 9,721 existing tolerances by August 2006.

FQPA added cumulative, aggregate, and other new risk assessment requirements for reviewing pesticides and provided for EPA to establish a program to review pesticides on a 15-year cycle.[11] As the reregistration program draws to a close, this registration review program will ensure that pesticides in the marketplace continue to meet the most current FQPA safety standards. The cyclical registration review program will allow EPA continually to apply new science and risk criteria to ensure that risk evaluation and risk management information remain current. These changes will help to reduce the risks posed by newly licenced pesticides in food and the risks of exposure that workers, farm families, and vulnerable populations may face.

We will continue to improve our processes to reflect lessons learned, additional information from scientific advances, more sophisticated methods and tools, and identification of new risks or benefits. For example, the use of biotechnology to improve crops' agricultural qualities is an accelerating trend, which is producing an array of new and unique products, including genetically engineered plants and microorganisms. EPA will continue to work closely with USDA and the Food and Drug Administration to ensure the safety of the food supply and to identify additional scientific reviews or data that may be needed for these products.

Other Exposures

Pesticide and pest control issues extend beyond the farm. Public health officials and homeowners use pesticides to control a variety of pests, protect human health, and benefit consumers. EPA registers antimicrobials used by public drinking water treatment facilities and by food processing plants and hospitals to disinfect surfaces. Effective antimicrobials are of growing importance as many serious disease-causing organisms become resistant to antibiotic procedures. To provide environmental, public health, and economic benefits, we will continue to work to make new pesticides available and to address emergency health or pest damage issues flexibly and efficiently.

EPA is also working to protect employers, applicators, handlers, and the public from the potential dangers posed by pesticides by implementing certification and training and worker protection programs. The Agency conducts outreach and education on using pesticides properly as well as implementing risk mitigation measures spelled out during the pesticide licensing process.

Since pesticide use also affects ecosystems, our reviews consider impacts to water resources, soil, and wildlife to prevent unreasonable harm. For example, EPA is collaborating with FWS and the National Marine Fisheries Service to improve our efforts to protect endangered species. We will be working to identify changes to existing policies, regulations, and the regulatory processes that will enhance protection of endangered species with minimal impact on food producers and pesticide users.

Outreach, training, and partnerships will play an integral role in meeting our goals. Providing information on alternatives for pest control, translating materials into other languages for nonnative speakers, and emphasizing the importance of following pesticide labels will help to reduce risks associated with using pesticides in and around the home. In addition, to complement ongoing outreach to reduce use of the riskier pesticides, our TRI program will develop a voluntary program with pesticide manufacturers, processors, and certain users.

Finally, because international sources of pesticides are also a concern, the Agency will work to promote a better understanding of the impact of pollutants from other countries and regions on the United States, and the impact of U.S. emissions on other countries. We will reduce pollution sources abroad through outreach, pollution prevention, and capacity-building measures, such as cost-effective and appropriate technology transfer.

Reducing Risks from Chemicals and Microorganisms

Screening, Assessing, and Reducing Risk

EPA's strategy to prevent and reduce risks posed by chemicals and microrganisms consists of three primary approaches: (1) preventing the introduction of chemicals and organisms that pose unreasonable risks into U.S. commerce; (2) effectively screening the stock of chemicals already in use for potential risk; and (3) developing and implementing action plans to reduce the use of and exposure to chemicals that have been demonstrated to harm humans and the environment. EPA intends to work with states and tribes, other federal agencies, the private sector, and international entities to implement this strategy and, in particular, to make protecting children and the elderly a fundamental goal of public health and environmental protection.

The Toxic Substances Control Act (TSCA) requires that EPA review all new chemicals and organisms prior to their production or import and be notified of significant new uses for certain chemicals that have already been reviewed.[12] EPA's PMN review typically assesses 1,500 to 2,000 new chemicals and organisms every year, a rate expected to continue through 2008. While TSCA gives EPA a 90-day review period, new criteria, such as preventing the introduction of PBTs or considering the use of new chemicals as potential weapons of terror, continue to emerge. An expanded set of screening tools will increase EPA's and industry's efficiency by using the data that companies provide in their PMN submissions to predict potential hazards, exposures, and risks quickly and effectively. Tools include the PBT Profiler and other models that estimate the fate and concentrations of chemicals released to the environment, including chemicals that may be released from consumer products, and models to estimate workplace exposures.[13] These tools will be critical for meeting the zero-tolerance standard implicit in our 2008 strategic target for these reviews.

Such tools are also a critical component of EPA's sustainable futures strategy to discourage development of potentially risky new chemicals at the earliest stages of product, process, and service design. The Sustainable Futures-P2 Framework initiative[14] provides chemical manufacturers with the same screening tools that EPA uses to evaluate potential risks to workers and the public and possible impacts to the environment. Over the next several years, the Agency will provide these tools and training to companies, enabling them to design and develop safer, less risky chemicals. Under the current pilot project, participating companies will be offered expedited review of their qualifying chemicals, which will allow manufacture to begin 45 days earlier. The intense interest expressed thus far suggests that this will be a powerful incentive for many companies to conduct their own hazard/risk screening. Effective use of these tools by companies that submit PMNs should decrease the number of problematic PMNs submitted to EPA.

Organisms will continue to pose new challenges to the review program. EPA has reviewed a number of proposed microbial products that posed risks to humans and/or the

environment because of genes introduced into the bacteria (for traits such as antibiotic resistance and/or altered metabolic pathways) or because of inherent pathogenicity associated with the parent microorganism. In 2002, for example, the Agency issued a proposed Significant New Use Rule covering at least eight microorganisms that, if used improperly, can be fatal to individuals with cystic fibrosis. Newly developed risk evaluation procedures will address exposure and hazard profiles for an increasing number organisms we have never before encountered.

By 2008, EPA will make substantial progress in screening, assessing, and reducing risks posed by the 66,600 chemicals that were in use prior to the enactment of TSCA.[15] Thousands of these chemicals are still used today, and nearly 3,000 of them are HPV chemicals, produced or imported into the United States in quantities exceeding 1 million pounds per year. More than 300 companies and 101 consortia are voluntarily providing data that EPA will make publicly available and screen for potential hazards and risks. We will then identify and set priorities for further assessment and determine whether future action is necessary to eliminate or effectively manage the risks identified. To support these efforts, we will draw on data already obtained through the TSCA Inventory Update Rule, particularly on new exposure-related data to be provided beginning in 2005.

EPA is also working to complete detailed risk assessments of at least 10 chemicals to which children may be disproportionately exposed. The Agency is using a new strategy under which companies' assessments are submitted to an outside peer consultation panel composed of national experts in chemical risk assessment. In consultation with stakeholders, EPA had determined that an independent, scientifically rigorous review of the assessments was essential to ensure a process that could be recognized as impartial and of significant technical merit and value. EPA will also continue to identify and reduce the risks associated with other chemicals and classes of chemicals already in commerce.

By 2008, the broader risk screening and data assessment to be conducted through these efforts will provide a much better knowledge base from which to assess and reduce chemical risks. The chemical risk information developed under this goal is critical to EPA's success in achieving its other goals, providing the basis for virtually all chemical risk assessments that support EPA's air, water, and waste programs. The Agency will work to increase the availability of useful health and environmental information, including information about toxic releases, tools to increase access to and analysis of TRI data, and incentives for source reduction by facilities that report to TRI.

Protecting First Responders

In the event of a chemical emergency, protecting first responders or other on-site personnel is critical. Many chemicals that pose a potential threat emit toxic fumes, are toxic when in contact with skin, or present other direct effects. To increase the Nation's preparedness, EPA, in collaboration with other federal, private, and academic organizations, is increasing the

pace for developing AEGLs.[16] These guidelines are short-term exposure limits, representing three tiers of health effect endpoints (i.e., discomfort, disability, and death) for five different exposure durations. EPA will provide emergency personnel with information they need to take necessary precautions and treat individuals who may be on the scene.

Addressing Lead and High-Risk Chemicals

In certain instances, risk-reduction efforts are targeted at specific chemicals. Foremost among these is the federal government's commitment to eliminate the incidence of childhood lead poisoning. Since 1973, we have reduced environmental lead levels by phasing out leaded gasoline and addressing other sources of exposure. Since the 1990s, EPA has focused on reducing children's exposure to lead in paint and dust through a regulatory framework, through federal interagency collaboration, and by educating parents and the medical community about prevention.

As a result of these efforts, in the United States, children's blood-lead levels have declined nearly 90 percent since the mid-1970s, and the incidence of childhood lead poisoning has declined from 900,000 cases in the early 1990s to approximately 400,000 cases in 1999-2000.[17] EPA will collaborate with industry and other federal agencies on a campaign to increase lead-safe work practices in home renovation and remodeling and to improve handling of lead paint on buildings and structures through market-based incentives and other innovative approaches.

On the international front, EPA is working to eliminate the use of leaded gasoline, which is responsible for up to 95 percent of airborne lead particles globally. We have succeeded in reducing the use of leaded gasoline internationally from 1993 to 1997 by two-thirds, from 249 million metric tons to 166 million metric tons.[18] EPA has formed partnerships with international and regional groups, such as the World Bank, the World Health Organization, the Asian Development Bank, the National Safety Council, and the Alliance to End Childhood Lead Poisoning. By leveraging resources from other U.S. government agencies, including the U.S. Agency for International Development, the U.S. Department of State, and the Centers for Disease Control we have established on-the-ground technical assistance projects in several parts of the world. The *Implementer's Guide to Lead Phase-Out*, an important technical-assistance tool, outlines fundamental policy, technical, and operational elements that will help countries manage the transition to unleaded gasoline.[19]

EPA is employing a multimedia, cross-Agency strategy to focus on other high-risk chemicals and classes of chemicals. For example, we are working to prevent new PBTs from entering commerce and to reduce risks associated with PBTs—including mercury—that are currently in use or have been used in the past. New information to be developed through the Dioxin Reassessment will support strategies for reducing exposure to this dangerous class of chemicals. Recommendations to be provided to EPA in 2003 and 2004 from a panel of national

experts on asbestos will assist the Agency in designing strategies to address asbestos risks. We will expand successful pilots to encourage companies to retire from service large capacitors and transformers containing PCBs to meet ambitious new targets for safe disposal by 2008. Because these chemicals represent various levels and exposure pathways, data sets are often uneven. Through 2008, therefore, EPA intends to examine possible measurement opportunities to better track the environmental and human health results of our high-risk chemical programs.

Long-range and transboundary atmospheric transport and deposition of persistent organic pollutants and other PBTs, such as mercury, are a continuing threat to human health and the ecosystems in North America. These pollutants can be transported and released far from their sources, enter the ecosystem, and bioaccumulate through the food chain. EPA believes that to reduce the recognized risks these pollutants pose to the American public, we will need to address their international sources. For example, we can most immediately reduce the risks posed by PCB emissions by cooperating with appropriate domestic and international partners to reduce existing stockpiles of equipment that generate these emissions and providing needed technical assistance and capacity building.

Reducing Risks at Facilities

To reduce or eliminate the risks associated with chemical releases, EPA must first identify and understand potential chemical risks and releases. During 2003 and 2004, EPA will review and analyze data it has already collected, as well as the information it will receive under the Agency's Risk Management Plan program. This analysis will provide information on the geographic locations and facility types with the greatest potential for chemical accidents and releases. Additionally, EPA will identify areas where susceptible and sensitive populations may be at higher risk from chemical releases. EPA will also use information generated by other Agency efforts, such as the Emergency Planning and Community Right-to-Know Act and the Spill Prevention Control and Countermeasure program, to supplement data on potential chemical risks and to develop voluntary initiatives and activities aimed at high-risk facilities and/or geographic areas.

The majority of this work will be accomplished through our partnerships. EPA will work with communities to provide chemical risk information on local facilities. The Agency will also assist states and communities in understanding how these chemical risks could affect them and how to reduce those risks and prepare to address and mitigate risks should a chemical release occur.

Objective 4.2: Communities. Sustain, clean up, and restore communities and the ecological systems that support them.

Sub-objective 4.2.1: Sustain Community Health. By 2008, 220 U.S. communities, working with EPA, will adopt and begin to implement environmental planning and management processes for sustaining local ecosystems and pursuing ecologically compatible development. (2002 baseline of 0 communities) On the international front, EPA will work with selected trading partners to address potential sources of environmental degradation associated with trade-related development. All trade agreements negotiated between 2003 and 2008 will contain environmental protection provisions and commitments to enforce environmental laws and regulations effectively.

Sub-objective 4.2.2: Restore Community Health. Through 2008, facilitate the restoration of communities impacted by environmental problems. By 2008, increase by 50 percent the number of communities, working with EPA, that have addressed disproportionate environmental impacts and risks through comprehensive, integrated planning and environmental management, compared to the 2002 baseline of 30 communities.

Sub-objective 4.2.3: Assess and Clean Up Brownfields. By 2008, provide funding to eligible grant recipients, and, working with our state and tribal partners, assess and promote the cleanup and reuse of 9,200 brownfields properties, leveraging 33,700 jobs and $10.2 billion in cleanup/redevelopment funding. (Second quarter FY 2003 baselines are 4,300 properties assessed, 24,900 jobs leveraged, and $5.0 billion leveraged.)

Sub-objective 4.2.4: Sustain and Restore U.S.-Mexico Border Ecosystems. In the U.S.-Mexico Border Region, sustain and restore community health and preserve the ecological systems that support them.

Strategic Targets:

- By 2012, assess significant shared and transboundary surface waters and achieve a majority of water quality standards currently being exceeded in those waters. (The baseline is the shared and transboundary surface waters as defined, identified, and evaluated for the United States in the Clean Water Act §305(b) reports and for Mexico by the Secretariat for the Environment and Natural Resources.)

- By 2005, protect the health of 1.5 million people in the Mexico border area by providing adequate water and wastewater sanitation systems funded through the Border Environmental Infrastructure Fund.

(Cumulative.) (1998 Baseline: 0 additional people provided with access to potable water and wastewater collection and treatment systems; estimated 2002 baseline of 790,000 persons provided with access.)

Means and Strategies for Achieving Objective 4.2

People often feel most closely connected to the environment in their communities, where they experience first-hand the benefits of safe drinking water, clean air, and healthy lakes, streams, and rivers that are safe for swimming and fishing. Decisions are made every day at the local level that affect air and water quality, habitat and biodiversity, and land use. For example, transportation and land-use planning, water supply and treatment, and waste management are all primarily local activities, and community decisions can either systematically advance clean air, clean and safe water, and restored and preserved land or can incrementally chip away at these goals. Because healthy, sustainable communities are the components of a healthy, sustainable country, EPA is committed to sustaining and restoring community health and the ecological systems that support it.

EPA will work in partnership with states and tribes, local governments, community groups, and other stakeholders to protect and sustain healthy communities and local natural resources. The Agency will work to restore the health of communities that are vulnerable to environmental impacts—for example, by addressing environmental justice issues and cleaning up and redeveloping brownfield sites. EPA will also develop stronger partnerships in communities, such as those along the U.S.-Mexico Border, that can influence neighboring jurisdictions.

Sustaining Healthy Communities

One of the most important strategies for achieving healthy communities and ecosystems is protecting and sustaining natural resources that are at risk. EPA will use four approaches to facilitate community-based protection of local natural resources.

First, EPA recognizes its important role in supporting local resource protection by serving as a primary source of information about new community assessment and planning tools, the latest research, and examples of what other communities are doing to address similar issues. To better inform local decisionmaking, EPA will continue to improve methods for information exchange and access to environmental data and information at the community level.

Second, we will strive to build local capacity by developing and distributing tools that integrate media-specific information; supporting multimedia planning; and developing training for local agencies and community groups on how to use data, information, and tools effectively in environmental assessment and planning and how to work collaboratively and cooperatively with a range of stakeholders. EPA will continue to identify and provide opportunities for public participation in environmental decisionmaking.

Third, the Agency recognizes that real-world, on-the-ground successes often galvanize neighboring communities into adopting integrated, comprehensive approaches to environmental management. Therefore, EPA will continue to facilitate local successes by providing technical and financial assistance directly to communities and by helping them coordinate environmental management processes and develop strategic partnerships. As a result of ongoing Administration efforts to negotiate international free trade agreements, our assistance to communities also extends to specific trading partners. In this context, EPA will undertake the environmental reviews and technical assistance necessary to promote ecologically compatible development.

Finally, EPA will work to ensure that national policies and programs support, rather than hinder, comprehensive, integrated local resource management. To this end, EPA will review new policies and regulations to ensure that programs are compatible and promote overall environmental improvement. The Agency will work to integrate existing programs to optimize their impacts and make them more compatible with local processes. In addition, EPA will partner with other federal agencies and national standard-setting organizations to create incentives for and remove barriers to smart growth and integrated environmental management.

Restoring Healthy Communities: Environmental Justice

"Environmental justice" is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA works to integrate environmental justice into all aspects of the Agency's programs and to promote constructive engagement and collaborative problem-solving among all stakeholders, especially in communities that have been disproportionately exposed to environmental hazards and risks.

EPA will continue to manage the Environmental Justice Community Small Grants program, which provides seed money to assist community-based organizations that are working to develop solutions to local environmental issues and to learn more about exposure to environmental hazards and risks and, consequently, protect their families and their communities.

The National Environmental Justice Advisory Council was created specifically to provide an Agency forum for communities disproportionately impacted by hazardous risks. The council's six subcommittees (Air/Water, Enforcement, Health/Research, Indigenous People, International, and Waste/Facility Siting) will continue to address the implications of multiple sources of environmental degradation on the health of communities and to develop recommendations for the Agency.

EPA will also continue to chair the Interagency Working Group (IWG) on Environmental Justice, which is composed of 11 federal departments and agencies, as well as White House offices. The IWG will collaborate with all levels of government and with the private sector to

address the environmental, health, economic, and social challenges facing our communities. One tool will be demonstration and revitalization projects that focus attention on diverse urban and rural communities.

Training is essential to foster the integration of environmental justice into federal programs, policies, and activities. EPA's Fundamentals Workshop on Environmental Justice aids in training Agency employees and external stakeholders. By 2005, the Agency will add modules that promote consideration of environmental justice issues in permitting under the Resource Conservation and Recovery Act, the Clean Water Act, and the Clean Air Act. In addition, EPA will be expanding a 2002 pilot that emphasized training and multi-stakeholder partnering to increase Agency and community capacity to address issues through alternative dispute resolution.

Assessing and Cleaning Up Brownfields

Brownfields are defined (with certain exclusions) as real properties, where expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Brownfields include abandoned industrial and commercial properties, drug labs, mine-scarred land, and sites contaminated with petroleum or petroleum products. EPA will continue to provide for the assessment and cleanup of these properties, leverage redevelopment opportunities, preserve green space, clarify liability, and offer job training.

The Small Business Liability Relief and Brownfields Revitalization Act, signed into law in 2002, expands federal grants for assessment, cleanup, and job training. To encourage revitalization and reuse of brownfield sites, the law limits the legal liability related to brownfield properties. In addition, the law provides for establishing and enhancing state and tribal response programs, which play a critical role in successfully cleaning up and revitalizing brownfields.[20]

Brownfields grants will continue to provide several types of support to communities. Brownfield assessment grants provide funding to inventory, characterize, assess, and conduct planning and community involvement activities related to brownfields. Brownfield revolving-loan fund grantees can capitalize a revolving loan and make subgrants to carry out cleanup activities. Cleanup grants, newly authorized by the Brownfields Law, will fund cleanup activities by grant recipients. Expanded authorities within the new law also address the potential for limited funding for institutional controls, insurance, and health monitoring. EPA will provide limited funding for grants that provide technical assistance, training, and research to brownfield communities. We will also provide funding to create local environmental job training programs, ensuring that the economic benefits derived from brownfield revitalization efforts remain in the community.

EPA will continue to work in partnership with state cleanup programs to address brownfield properties. We will provide states and tribes with tools, information, and funding they can use to develop response programs for sites contaminated with hazardous wastes and petroleum. The Agency will continue to encourage the empowerment of state, tribal, and local officials to oversee brownfield activities and the implementation of local solutions to local problems.

Reducing Transboundary Threats Along the U.S.-Mexico Border

EPA is working along the U.S.-Mexico Border to reduce transboundary threats to human and ecosystem health in North America. The U.S.-Mexico Border 2012 Program, a joint effort between the U.S. and Mexican governments, will work with the 10 border states and with border communities to improve the region's environmental health.[21]

Border communities face unique challenges in addressing environmental problems and coordinating efforts. To promote coordination, a number of regional workgroups and policy forums will collaborate with local communities to set priorities and plan and implement projects. These groups will also assist in establishing objectives, defining indicators, and measuring progress. The United States and Mexico will work to improve water quality along their border through a range of pollution control sanitation projects; our goal is to restore the quality of at least half of the currently impaired significant shared and transboundary surface waters by 2012.

Inadequate water and sewage treatment cause border residents to suffer disproportionately from hepatitis A and other waterborne diseases. Increasing the number of connections to safe drinking water systems and the number of homes with access to basic sanitation will reduce health risks to residents. Our planned assessment of transboundary surface waters will facilitate the development of environmental data essential for effective water management. To achieve Border 2012's goal of increasing by 25 percent the number of homes with access to safe drinking water and wastewater treatment systems, we are working with Mexican officials to determine the number of homes currently lacking access to these basic sanitation services.

In addition to water issues, EPA will focus on the environmental and human health risks posed by pesticides. By training migrant farm workers and others who routinely handle pesticides, we will reduce both the long-term chronic health effects of pesticide exposure as well as the incidence of acute pesticide poisoning.

Objective 4.3: Ecosystems. Protect, sustain, and restore the health of natural habitats and ecosystems.

Sub-objective 4.3.1: Protect and Restore Ecosystems. Facilitate the ecosystem-scale protection and restoration of natural areas.

Strategic Targets:

- By 2008, improve the overall aquatic system health of the 28 estuaries that are part of the National Estuary Program (NEP) compared to 2006, as measured using the National Coastal Condition Report and NEP indicators. (Baseline to be determined in 2006)

- By 2008, working with NEP partners, protect or restore an additional 250,000 acres of habitat within the study areas for the 28 estuaries that are part of the NEP. (2002 Baseline: 0 acres of habitat restored)

Sub-objective 4.3.2: Increase Wetlands. By 2008, working with partners, achieve a net increase of 400,000 acres of wetlands with additional focus on biological and functional measures. (2002 Baseline: annual net loss of an estimated 58,500 acres.)

Strategic Targets:

- Annually, beginning in FY 2004, work with the U.S. Army Corps of Engineers (COE) and other partners to achieve no net loss of wetlands under Section 404 of the Clean Water Act regulatory program.

- By 2006 and each year thereafter, work with COE and other partners to obtain no net loss in wetland function based on quantifying functions gained and lost through mitigation for authorized wetlands impacts.

Sub-objective 4.3.3: Improve the Health of Great Lakes Ecosystems. By 2008, prevent water pollution and improve the overall aquatic ecosystem health of the Great Lakes by at least 2 points. (2002 Baseline: Great Lakes rating of 20 on a 40-point scale, where the rating uses select Great Lakes State of the Lakes Ecosystem indicators, based on a 1 to 5 rating system for each indicator in which 1 is poor and 5 is good.)

Strategic Targets:

- By 2007, the average concentrations of PCBs in whole lake trout and walleye samples will decline by 25 percent. (2000 Baseline: concentration for Lake Superior of 0.9 ug/g; for Lake Huron, 0.8 ug/g; for Lake Michigan, 1.6 ug/g; for Lake Erie, 1.8 ug/g; and for Lake Ontario, 1.2 ug/g.)

- By 2008, the annual concentrations of toxic chemicals in the air in the Great Lakes basin will decline by 30 percent. (2002 Baseline: concentration for Lake Superior of 60 pg/m^3; for Lake Huron, 19 pg/m^3; for Lake Michigan, 87 pg/m^3; for Lake Erie, 183 pg/m^3; and for Lake Ontario, 36 pg/m^3.)

- By 2010, restore and delist a cumulative total of at least 10 Areas of Concern within the Great Lakes basin. (2002 Baseline: 0 Areas of Concern restored)

- By 2008, a cumulative total of at least 3.3 million cubic yards of contaminated sediment in the Great Lakes will be remediated. (2002 Baseline: 2.1 million cubic yards of contaminated sediments from the Great Lakes have been remediated from 1997 through 2001.)

Sub-objective 4.3.4: Improve the Aquatic Health of the Chesapeake Bay. By 2008, prevent water pollution and improve the overall aquatic ecosystem health of the Chesapeake Bay so that there are 120,000 acres of submerged aquatic vegetation. (2002 Baseline: 85,252 acres.)

Strategic Targets:

- By 2008, reduce nitrogen loads entering Chesapeake Bay by 94 million pounds per year, from 1985 levels. (2002 Baseline: 51 million pounds per year reduced.)

- By 2008, reduce phosphorus loads entering Chesapeake Bay by 9.7 million pounds per year, from 1985 levels. (2002 Baseline: 8 million pounds per year reduced.)

- By 2008, reduce sediment loads entering Chesapeake Bay by 1.37 million tons per year, from 1985 levels. (2002 Baseline: 0.8 million tons per year reduced.)

Sub-objective 4.3.5: Improve the Aquatic Health of the Gulf of Mexico. Prevent water pollution and protect aquatic systems in order to improve the overall health of the Gulf of Mexico.

Strategic Targets:

- By 2008, prevent water pollution and improve the overall aquatic ecosystem health of coastal waters of the Gulf of Mexico by 0.2 on the "good/fair/poor" scale of the National Coastal Condition Report. (2002 Baseline: southeast rating of fair/poor or 1.9 where the rating is based on a 5-point system in which 1 is poor and 5 is good and is expressed as an areal-weighted mean of regional scores using the National Coastal Condition Report indicators addressing water clarity, dissolved oxygen, coastal wetland loss, eutrophic conditions, sediment contamination, benthic health, and fish tissue contamination.)

- By 2015, reduce releases of nutrients throughout the Mississippi River Basin to reduce the size of the hypoxic zone in the Gulf of Mexico to less than 5,000 km^2, as measured by the 5-year running average of the size of the zone. (Baseline: 1996-2000 running average size is 14,128 km^2.)

Means and Strategies for Achieving Objective 4.3

EPA is working to protect, sustain, and restore the health of natural habitats and ecosystems by identifying and evaluating problem areas, developing tools, and improving community capacity to address problems. Some activities will continue to be targeted to such high-priority areas as Long Island Sound, Lake Champlain, Lake Pontchartrain, and South Florida. Targeted watershed grants that provide tools, training, and technical assistance will support community efforts to expand and improve existing watershed protection measures. These various placed-based ecosystem protection efforts provide an opportunity to increase federal involvement in critical watersheds and to develop and implement water quality control practices and other ecosystem management tools that can be transferred to other place-based efforts nationwide.

Protecting and Restoring Ecosystems: The National Estuaries Program

Estuaries are among the most productive ecosystems on Earth, providing numerous ecological, economic, cultural, and aesthetic benefits and services. They are also among the most threatened ecosystems, largely as a result of rapidly increasing growth and development. About

half of the U.S. population now lives in coastal areas, and coastal counties are growing three times faster than counties elsewhere in the Nation.[22] Overuse of resources and poor land use practices have resulted in a host of human health and natural resource problems.

EPA plans to implement key activities under the NEP to help address these growing threats to the Nation's estuarine resources.[23] The NEP, which provides inclusive, community-based planning and action at the watershed level, is an important initiative in conserving our estuarine resources. We will facilitate the ecosystem-scale protection and restoration of natural areas by supporting continuing efforts of all 28 NEP estuaries to implement their Comprehensive Conservation and Management Plans to protect and restore estuarine resources. In addition, EPA will provide more focused support for several priority needs the NEP has identified, including problems of invasive species; air deposition of pollutants, such as mercury and nitrogen; and nutrient overenrichment. EPA will support the NEP in developing monitoring protocols for aquatic nuisance species and rapid response plans, expanding mercury deposition monitoring, and developing and implementing nutrient management strategies.

The health of the Nation's estuarine ecosystems also depends on the maintenance of high-quality habitat. Diminished and degraded habitats are less able to support healthy populations of wildlife and marine organisms and perform the economic, environmental, and aesthetic functions on which coastal populations depend for their livelihood.

Increasing Wetlands

Over the years, the United States has lost more than 115 million acres of wetlands to development, agriculture, and other uses.[24] Today, the Nation loses an estimated 58,000 acres of wetlands every year, and other wetlands are being degraded by excessive sedimentation, nutrient overenrichment, pesticides, invasive species, habitat loss, and fragmentation.[25]

The Administration is committed to a regulatory program aimed at no net loss of wetlands and to initiatives and partnerships to improve their overall condition. In December 2002, COE, in cooperation with EPA, issued a Regulatory Guidance Letter to improve wetland protection through better compensatory mitigation. Also, the Administration unveiled a National Wetlands Mitigation Action Plan[26] listing 17 action items that federal agencies will undertake to improve the effectiveness of wetland mitigation and restoration.

EPA will work with its state and tribal partners to develop and implement broad-based, integrated monitoring and assessment programs for wetlands that strengthen water quality standards, improve decisionmaking, target restoration within the watershed, address significant stressors, and report on condition. EPA will work for national gains in wetland acreage by implementing an innovative and partner-based wetlands and stream corridor restoration program. Working with states, COE, and other partners, we will build our capacity to measure wetland

function and condition, as well as wetland acreage. The Agency will assist its federal, state, and tribal partners in building capacity to implement more effective wetland programs, including those that protect wetlands and waters not covered by the Clean Water Act. EPA's support will help avoid or minimize wetland losses and provide for full compensation for unavoidable losses of wetland functions. We will continue to focus on wetlands and stream corridor restoration to regain lost aquatic resources.

Improving the Aquatic Health of the Great Lakes Ecosystem

The Great Lakes are the largest system of surface freshwater on Earth, containing 20 percent of the world's surface freshwater and accounting for more than 90 percent of the surface freshwater in the United States. The watershed includes two nations, eight American states, a Canadian province, more than forty tribes and is home to more than one-tenth of the U.S. population. To further restore the chemical, physical, and biological integrity of the Great Lakes ecosystem, EPA is implementing Clean Water Act core water protection programs and has launched the Great Lakes Strategy 2002: A Plan for the New Millennium, on behalf of the U.S. Policy Committee.[27] The strategy presents a basin-wide vision for Great Lakes protection and restoration, identifying the major environmental issues in the Great Lakes; establishing common goals for federal, state, and tribal agencies; and helping to fulfill U.S. responsibilities under the U.S.-Canada Great Lakes Water Quality Agreement.[28]

The Great Lakes Strategy incorporates the Great Lakes Binational Toxics Strategy, a groundbreaking international toxics reduction effort that targets a common set of persistent, toxic substances for reduction and elimination.[29] The Toxics Strategy applies voluntary and regulatory tools focused on pollution prevention to a targeted set of substances, including mercury, PCBs, dioxins/furans, and certain canceled pesticides. The strategy outlines activities for states, industry, tribes, nongovernmental organizations, and other stakeholders.

These efforts will be reinforced by the Great Lakes Legacy Act, which targets additional resources to clean up contaminated sediments. Sediment contamination is a significant source of Great Lakes toxic pollutants and can threaten human health via the bioaccumulation of toxic substances through the food chain.

Improving the Aquatic Health of the Chesapeake Bay Ecosystem

EPA's Chesapeake Bay work is based on a unique regional partnership formed to direct and conduct restoration of the bay. Partners include Maryland, Virginia, and Pennsylvania; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; EPA, which represents the federal government; and participating citizen advisory groups. Chesapeake 2000, a comprehensive and far-reaching agreement, will guide restoration and protection efforts through

2010 and will focus on improving water quality as the most critical element in the overall protection and restoration of the bay and its tributaries.[30]

One of the key measures of success in achieving improved bay water quality will be the restoration of submerged aquatic vegetation (SAV). SAV produces oxygen; nourishes a variety of animals; provides shelter and nursery areas for fish and shellfish; reduces wave action and shoreline erosion; absorbs nutrients, such as phosphorus and nitrogen; and traps sediments. While recent improvements in water quality have contributed to a resurgence in SAV (from a low of 38,000 acres in 1984 to more than 85,000 acres today[31]), more improvements are needed.

To achieve improved water quality and restore SAV, partners have committed to reducing nutrient and sediment pollution loads sufficiently to remove the bay and the tidal portions of its tributaries from the list of impaired waters. Key elements of state strategies to achieve these reductions include implementing advanced treatment of wastewater to reduce nutrient discharges, a range of management practices to reduce nutrients and sediments from farms, and the restoration and protection of riparian forests that serve as a buffer against sediment and nutrient pollution that enters waterways from the land.

Improving the Aquatic Health of Gulf of Mexico Ecosystem

EPA's efforts in the Gulf of Mexico represent a broad, multi-organizational partnership. EPA, Gulf states, and stakeholders are developing a regional, ecosystem, and watershed-based framework for restoring and protecting the Gulf of Mexico in ways consistent with the economic well-being of the region. Partners voluntarily identify key environmental problems and work at the regional, state, and local levels to define and recommend solutions.

Gulf of Mexico issues can be broadly categorized as affecting water quality, public health, and habitat loss. The first step in restoring and protecting the biological integrity of the waters and important habitats of the Gulf of Mexico is to restore the full aquatic life and recreational uses (including safe consumption of seafood) of high-priority coastal watersheds and estuaries, including the watersheds of the Mississippi River Basin. Continued implementation of EPA's core Clean Water Act water protection programs[32] and efforts to address the hypoxic zone will help to restore the waters of the Gulf and its tributaries. Restoring aquatic life and recreational uses will directly benefit communities as well.

Objective 4.4: Enhance Science and Research. Through 2008, provide a sound scientific foundation for EPA's goal of protecting, sustaining, and restoring the health of people, communities, and ecosystems by conducting leading-edge research and developing a better understanding and characterization of environmental outcomes under Goal 4.

Sub-objective 4.4.1: Apply the Best Available Science. Through 2008, identify and synthesize the best available scientific information, models, methods and analyses to support Agency guidance and policy decisions related to the health of people, communities, and ecosystems.

Sub-objective 4.4.2: Conduct Relevant Research. Through 2008, conduct research that contributes to the overall health of people, communities, and ecosystems. Focus research on pesticides and toxics; global climate change; homeland security; and comprehensive, cross-cutting studies of human, community, and ecosystem health.

Means and Strategies for Achieving Objective 4.4

Providing the Best Available Science

Protecting, sustaining, and restoring the health of people, communities, and ecosystems requires the commitment and coordination of a number of EPA programs; brings together expertise and resources from across the Agency; and cultivates relationships with our external partners and stakeholders. To meet this goal, EPA must use the best available science and apply its findings effectively to make sound decisions and meet a broad range of program needs.

Environmental Indicators

Environmental indicators are an important tool for analyzing and communicating information about environmental conditions and human health. EPA will continue to implement the Environmental Indicators Initiative to establish a set of performance indicators that measure environmental status.

For environmental indicators to signal change effectively, they must be scientifically valid for answering environmental questions from many perspectives. In many cases, one environmental indicator may not be sufficient to address local, state, regional, or national questions. Therefore, as explained in our 2003 *Draft Report on the Environment*, EPA and its partners must select environmental indicators carefully.

To adequately report on environmental conditions, by 2008 EPA will work with other federal agencies to develop scientifically valid environmental indicators that reflect national, regional, and state interests and address six ecological attributes: landscape condition, biotic condition, chemical and physical characteristics, ecological processes, hydrology/geomorphology, and natural disturbances regimes. In addition, based on sound science, EPA regions and states will identify ecosystems with highest priority for protection and restoration.

Geospatial Tools and Public Access

In coordination with other federal agencies, we will develop new geospatial tools and information that will allow EPA and its partners to assess ecosystem conditions holistically. This approach will indicate where environmental stressors are located and will enable us to develop more comprehensive natural resource and environmental programs to improve ecosystem health.

EPA's regional offices will continue to improve their ability to identify baseline community and ecosystem health conditions in priority geographic areas. The Agency will continue to assess the status and trends of ecosystem health and develop community and ecosystem indicators.

We will continue to ensure that high-quality environmental data are used to make sound environmental decisions by conducting laboratory evaluations and investigations, data validations, quality assurance management and project plan reviews, and geographic information system analyses and by managing regional quality assurance programs and analytical services/support contracts. State and tribal organizations that receive EPA funds will provide quality management plans for EPA review and approval. EPA regional offices will continue to provide environmental monitoring and technical assistance to federal, state, tribal, and local agencies to assist them in evaluating and addressing problem facilities and priority geographic areas. We will continue working to improve public access to environmental information that we, our partners, and our stakeholders collect.

Endocrine Disruptors

Over the last several years, concern has grown about exposure to endocrine-disrupting, or hormonally active, chemicals. Evidence suggests that exposure to chemicals that mimic hormones (endocrine disruptors) may cause adverse health effects in wildlife and may affect human health as well.[33] EPA is working to reduce uncertainty in our knowledge of endocrine disruptors, determine chemicals' potential for endocrine disruption, and identify the nature of adverse effects.

The Agency needs valid tests to assess new chemicals' and pesticides' potential for endocrine disruption. We will complete validation of screens and tests that are necessary before large-scale reviews can take place, and a Federal Advisory Subcommittee will continue to provide EPA with scientific and technical advice. We are working to minimize the use of animals for these tests.

Regional Laboratories

Through its regional offices, EPA will participate in the National Environmental Laboratory Accreditation Conference (NELAC), an association of state and federal agencies and

private organizations formed to establish and promote mutually acceptable performance standards for the inspection and operation of environmental laboratories. We will support implementation of the NELAC standards to ensure that decisions are made from a sound technical, scientific, and statistical basis and that laboratories deliver quality data. EPA will also update its own outdated laboratory equipment to increase our investigative, monitoring, and analytical capabilities.

Conducting Research

To enable us to meet our regulatory and policy objectives for healthy people, communities, and ecosystems, EPA's Office of Research and Development has developed multi-year plans for research on safe food, pesticides, and toxics; global change; ecological assessment; human health; endocrine disruptors; and mercury. These plans lay out long-term research goals for the next 5 to 10 years and annual milestones needed to achieve these goals.[34] In addition, we will conduct research on computational toxicology and PBT pollutants.

Safer Food, Pesticides, and Chemical Products

The Safe Food Research Program, developed in response to FQPA, builds on earlier research to reduce scientific uncertainty in risk assessment. Research will provide data needed to develop refined aggregate and cumulative risk assessments, develop appropriate safety factors to protect children and other sensitive populations, refine risk assessments, and provide risk mitigation technologies to reduce risks to humans. By 2008, EPA will provide scientific tools that can be used to characterize, assess, and manage risks addressed under FQPA.

Additional research on pesticides and toxics provides results that support the Federal Insecticide, Fungicide, and Rodenticide Act and TSCA. EPA's multi-year plans for safe pesticides/safe products outline research designed to enhance the Agency's human health and ecological risk assessment and risk management capabilities and includes the development of predictive tools used in testing requirements, research on probabilistic risk assessment methods, biotechnology, and other areas of high interest and utility to the Agency's pesticide, pollution prevention, and toxic substances programs.

Global Change

The Global Change Research Act of 1990 establishes a coordinated, comprehensive, interagency research program on global change, in which EPA participates. In conducting research and analysis on the potential impacts of global climate change, EPA will make certain that our work is coordinated and consistent with the Climate Change Science Program (CCSP) *Strategic Plan* that was released on July 24, 2003. Further, we will collaborate closely with the CCSP Director (who also serves as the Deputy Administrator of the National Oceanographic and Atmospheric Agency) to assist in ensuring appropriate prioritization, efficiency, avoidance of

duplication, and a consistently high standard of scientific review for all aspects of supported studies and analyses across the federal government.

Ecosystem Protection

Global change, loss and destruction of habitat due to sprawl and exploitation of natural resources, invasive species, nonpoint source pollution, and the accumulation and interaction of these effects present emerging ecological problems. EPA will conduct research to strengthen our ability to assess and compare risks to ecosystems, to protect and restore them, and to track progress in terms of ecological outcomes. For example, as part of our long-term research goals, we will work to provide environmental managers and researchers with a better understanding of the links between human activities, natural dynamics, ecological stressors, and ecosystem conditions; with tools they can use to predict stressors on ecological resources; and with scientifically defensible methods for protecting and restoring ecosystem conditions.

Human Health

EPA's human health research represents the Agency's only comprehensive program to address the limitations in human health risk assessment. Scientists across the Agency will use the measurement-derived databases, models, and protocols developed through this research program to strengthen the scientific foundation for human health risk assessment. EPA's human health research will focus on a unified risk assessment approach that incorporates biological modes of toxicity, aggregate and cumulative exposures, susceptible subpopulations, and evaluations of public health outcomes resulting from risk management actions.

Endocrine Disruptors

To support our regulatory mandates, EPA's research will focus on improving our scientific understanding of exposures to, effects from, and management of endocrine-disruptor chemicals and advancing our screening and testing program. We will also conduct research to determine the extent of the impact that endocrine-disrupting chemicals may have on humans, wildlife, and the environment.

Mercury

A 1997 *EPA Mercury Study Report to Congress* discussed the magnitude of mercury emissions in the United States and concluded that a plausible link exists between human activities that release mercury from industrial and combustion sources in the United States and methylmercury concentrations in humans and wildlife. Regulatory mandates require EPA to address these risks. The Agency's risk management research will address managing emissions from coal-fired utilities (critical information for rule-making) and noncombustion sources of mercury; the fate and transport of mercury to fish; regionally-based ecological assessments of the

effects of methylmercury on birds; assessing methylmercury in human populations; and developing risk communication methods and tools.

Persistent, Bioaccumulative Toxic Pollutants (PBTs)

EPA is developing a strategy for identifying and reducing risks to humans and the environment posed by current and future exposures to priority PBT chemicals. Our research will help us establish action priorities for a select list of PBT pollutants; screen and select additional priority PBT pollutants for action; and develop a cross-cutting PBT routine monitoring strategy.

Computational Toxicology

To enhance the scientific basis and diagnostic/predictive capabilities of existing and proposed chemical testing programs, EPA will use *in vitro* tests (carried out in test tubes or artificial environments instead of in living organisms) or such other approaches as molecular profiling, bioinformatics, and quantitative structure-activity relationships. The term "computational toxicology" refers to using these alternative approaches in conjunction with highly sophisticated computer-based models. Computational toxicology is expected to greatly reduce the use of animal testing to obtain chemical toxicity information.

Homeland Security

In pursuing our mission to protect human health and safeguard the environment, EPA has developed unique scientific and technical expertise and possesses capabilities that complement other federal agencies' homeland security efforts. As a key agency charged with crisis and consequence management responsibilities under the National Strategy for Homeland Security, EPA must be ready to deploy its expertise to help detect, prevent, protect against, respond to, and recover from a terrorist act against the United States. To meet this responsibility, EPA will perform a number of functions.

EPA will continue to identify and evaluate biological agents that terrorists may use as weapons against the United States. We have begun to conduct scientific assessments and develop test protocols to determine the efficacy and safety of products that can be used against these potential biological threats and to develop detection and decontamination processes. To provide added protection, we will work to educate our partners and the public about these pesticides, strengthen the certification and training program, and improve storage and disposal procedures.

To support homeland security, EPA conducts research in three main areas: building decontamination, water security, and rapid risk assessment.

- Research on decontamination of buildings will focus on methods and technologies for (1) preventing, detecting, and containing biological and chemical agents intentionally introduced into large buildings or structures; (2) decontaminating building surfaces and content; and (3) safely disposing of residual materials. This work will result in more efficient and effective cleanup of contaminated buildings and prevention measures.

- Water security research will focus on enhanced methods for preventing, detecting, treating, and containing biological and chemical agents intentionally introduced into drinking-water and wastewater systems.

- Rapid risk assessment research will focus on developing practices and procedures that provide elected officials, decision-makers, the public, and first responders with rapid risk assessment protocols for chemical and biological threats. For more efficient emergency response, EPA will also inventory the Agency's, the federal government's, and the private sector's expertise to provide quick access to nationally recognized, highly specialized experts in such homeland security areas as biology, chemistry, exposure assessment, and detection and treatment technologies.

EPA will also provide technical expertise to federal, state, and local governments and to other institutions. We will use customized situational analysis tools for emergency management that deliver secure, reliable, and timely data access and communications to on-scene coordinators, emergency response teams, and field investigators.

EXTERNAL FACTORS

EPA's ability to achieve its strategic objectives depends on many factors over which the Agency has only partial control or little or no influence. Partnerships, voluntary cooperation, international collaboration, global harmonization, industry, economic influences, industrial accidents, natural disasters, litigation, and legislation play critical roles, affecting the Agency's results. Changes in the focus, level of effort, or status of any of these components could affect the success of the Agency's programs under Goal 4. Consequently, EPA must consider these factors as it establishes annual performance measures and targets.

Leveraging Partnerships

EPA depends on its partnerships with other federal agencies, states, tribes, local governments, and regulated parties to achieve results. We use information from a variety of federal, state, and international organizations and agencies to protect our health and our environment from hazardous or higher-risk pesticides and toxics. We rely especially on states as co-implementors of our Nation's environmental protection programs.

The Brownfields Program, which partners EPA with more than 21 agencies and departments as well as with local communities, exemplifies the effectiveness of the collaborative approach. Although federal and state programs may be in place to address the difficult issues communities face, too often the programs operate in isolation. Successfully bringing to bear the diverse expertise and experience offered by collaborating agencies will help make federal efforts more effective. Similarly, local action is key to the success of EPA's lead program, which depends on our state partners to encourage homeowners to correct lead-based hazards in their homes. The lead program also depends on schools and parents to screen children for high blood levels of lead. Disrupting these partnerships will significantly compromise our ability to achieve our risk reduction goals

EPA often relies on such agencies as the U.S. Department of Health and Human Services, USDA, the U.S. Department of Housing and Urban Development (HUD), COE, and USFWS to carry out aspects of environmental protection programs. The success of EPA's lead program, for example, partly depends on HUD's ability to renovate the Nation's public housing. Annual or biannual tracking of wetlands inventory information will depend upon the ability of USFWS and/or USDA to deliver national wetlands inventory information more frequently. Similarly, USDA's successful implementation of the Farm Bill's wetlands provisions is critical for reducing wetland losses in rural areas.

As we rely on other federal agencies and our state and local government partners, EPA's pesticide programs depend, in part, on the voluntary cooperation of the private sector and the public. Farmers favor broad-spectrum pesticides that are cheaper and easier to apply. While EPA reviews pesticides to ensure that they meet the current health and safety standards, we have limited influence in the adoption of registered pesticides. Thus once a pesticide is registered, it is difficult to predict how extensively it will be used.

International Cooperation

International collaboration, guideline harmonization, information sharing, and building other nations' capacity to reduce risk also contribute to achieving our risk reduction goals. For example, it will be essential for both the United States and Mexico to invest the necessary resources to achieve the goals of the Border 2012 binational effort and to collect the data needed to measure progress.

Continued ecological improvement in the Great Lakes will rely on local, state, federal, and the Canadian government's participation in the Great Lakes Strategy under the Great Lakes Water Quality Agreement. Until invasive species can be prevented from entering the Great Lakes through cargo ships, they will likely continue to impede the achievement of Great Lakes ecosystem goals.

Industry Response

Progress in reducing risks is often highly dependent on industry's response to EPA assistance and initiatives. EPA has no direct control over the pace and volume at which industry develops new chemicals or pesticides; we primarily concentrate on providing industry with tools, such as the PBT Profiler and Pollution Prevention Framework, or incentives, such as the priority review of reduced-risk pesticides, to help screen out high-risk chemicals before they are submitted for EPA review. Voluntary programs, such as the HPV Challenge Program, operate exclusively on the basis of industry commitments for participation. If industry fails to respond to such initiatives, the Agency will be less able to achieve effective new chemical screening efficiently.

Economic and Technological Change

Economic growth and changes in producer and consumer behavior could also influence the Agency's ability to achieve its objectives over the coming years. New technology or unanticipated complexity or magnitude of pollution problems could delay our progress. Economic conditions will affect EPA's ability to achieve its brownfields objectives, since the ability of grant recipients to leverage needed cleanup and redevelopment funding and to create jobs depends on economic conditions external to EPA.

Finally, large-scale accidental releases, such as chemical spills, or rare catastrophic natural events, such as hurricanes or large-scale flooding, could hinder our ability to achieve objectives in the short term. Newly identified environmental problems and priorities could have a similar effect on long-term goals. For example, pesticide use may be affected by unanticipated pest infestations or disease factors, which would require EPA to review emergency uses to avoid unreasonable risks to health or the environment.

Human Capital Focus For Achieving Goal 4

EPA will require staff with very specialized technical and coalition-building expertise:

- Developmental and molecular biologists, toxicologists, modelers, engineers, chemists, and statisticians to develop methodologies, data, models, risk-assessment guidance, and toxicity testing methods and protocols
- Land-use attorneys, public health experts, and other professionals with experience at the local level in land-use planning, geographic information systems, and facilitation
- Chemical engineers with experience at industrial facilities
- Professionals with communication, facilitation, and consensus-building skills.

Efficiency Measures For Goal 4

Efficiency measures relate results to the resources or time invested to achieve those results and augment effectiveness measures in evaluating performance. They help us integrate EPA's budget and performance—part of the President's Management Agenda—and demonstrate the cost-effectiveness and timeliness of program activities.

Among the strategic targets in this goal are three efficiency measures, including one that targets a reduction in the length of time EPA requires to make registration decisions for conventional and new reduced-risk pesticide active ingredients:

By 2008, reduce registration decision times by 10 percent for conventional new active ingredients and 5 percent for reduced-risk new active ingredients from the 1995-2002 baseline of 40 months for conventional new active ingredients and 24 months for reduced-risk conventional new active ingredients.

Notes

1.Source citation for Mexico: Food and Agriculture Organization, Rome 2001.

2."Acre treatments" relate the use of a pesticide to the number of acres treated and the number of treatments applied. For example, treating 50 acres of a crop with a pesticide, then applying it a second time later in the growing season, yields 100 acre treatments. Considering pesticide use in terms of acre treatment provides a better sense of exposure levels.

3. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. *OECD SIDS Manual Sections 3.4 and 3.5*. Washington, DC. Available online at: http://www.epa.gov/chemrtk/sidsappb.htm: High Production Volume (HPV) Challenge Program. Accessed August 28, 2003.

Organisation for Economic Co-operation and Development (OECD). April 2003. *Manual for Investigation of HPV Chemicals (SIDS Manual).* Paris, France. Available on the Internet at: http://www.oecd.org and enter "HPV Chemicals" at the search window. Accessed September 9, 2003.

4. Under Section 5 of TSCA, EPA is mandated to determine whether "the manufacture, processing, distribution in commerce, use, or disposal of a 'new' chemical substance or any combination of such activities presents or may present an unreasonable risk of injury to health or the environment." Methods for determining unreasonable risk under TSCA Section 5 are contained in an internal document that is not currently made available to the public. Information from: U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. New Chemicals Program: TSCA 5(e) Exposure-Based Policy: Criteria Web Site. Available online at: http://www.epa.gov/oppt/newchems/expbased.htm. Accessed September 9, 2003.

5.Investigations are underway for baseline development by an internal EPA New Chemicals Program Performance workgroup. Results are expected by January 2004 and may be available in the FY 2005 Annual Performance Plan to Congress submitted in late January 2004.

6.U.S. Environmental Protection Agency. February 2004. *FY 2005 Annual Performance Plan Verification and Validation of Annual Performance Measures.* Washington, DC: Government Printing Office.

7.Centers for Disease Control, National Center for Health Statistics. *National Health and Nutrition Examination Survey: 1999–2002.* Available online at http://www.cdc.gov/nchs/nhanes.htm.

Morbidity and Mortality Weekly Report. Volume 49, Number 50, page 1133. December 22, 2000. To order a copy, visit http://www.cdc.gov/mmwr/.

Blood Lead Levels in Young Children--United States and Selected States, 1996-1999. December 22, 2000. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Date of access: September 24, 2003.

U.S. Environmental Protection Agency. February 2004. *FY 2005 Annual Performance Plan Verification and Validation of Annual Performance Measures.* Washington, DC: Government Printing Office.

8.U.S. Environmental Protection Agency. February 2004. *FY 2005 Annual Performance Plan Verification and Validation of Annual Performance Measures.* Washington, DC: Government Printing Office.

40 CFR 761.180(a) requires storers and disposers of PCB waste to submit an annual report to their respective regional offices. The annual report is based on a calendar year but is not required until the following July resulting in a delay in generation of the trend summary. The regions send summaries of annual report data to Headquarters for generation of an annual report summary. These data provide PCB disposal trends. Current information for the last 3 years (1999-2001) indicate a downward trend in PCB disposal.

9.Arctic Monitoring and Assessment Programme (AMAP Report 2000.3), *PCBs in the Russian Federation: Inventory and Proposals for Priority Remedial Actions*, p.7-8, 23, Center for International Projects, Moscow, 2000.

10.U.S. Environmental Protection Agency, Office of Pesticide Programs. December 1999, *Biennial Report, FY 1998/1999.* EPA 735-R-99-02. Washington, DC.

11.Federal Food, Drug and Cosmetic Act (FFDCA), as amended by Food Quality Protection Act (FQPA), Sec 408(a)(2)(B).

12.Toxic Substances Control Act Section 5: Manufacturing and Processing Notices, *Public Law* 94-469, October 11, 1976.

13. U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. PBT Profiler Web Site, http://www.PBTProfiler.net. Washington, DC. Accessed September 3, 2003.

U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. Pollution Prevention (P2) Framework Web Site, http://www.epa.gov/oppt/p2framework/. Washington, DC. Accessed September 9, 2003.

U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxics. January 2003. *Pollution Prevention (P2) Framework.* EPA-748-B-03-001. Washington, DC: Government Printing Office.

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"Data Collection and Development on High Production Volume (HPV) Chemicals." EPA OPPTS-42213; AR-201; FRL-6754-6. Available online at: http://www.epa.gov/chemrtk/ts42213.htm.

16.National Research Council. 2001. *Standing Operation Procedures for Developing Acute Exposure Guideline Levels for Hazardous Chemicals.* Washington, DC: National Academy Press.

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GOAL 5
COMPLIANCE AND ENVIRONMENTAL STEWARDSHIP

Improve environmental performance through compliance with environmental requirements, preventing pollution, and promoting environmental stewardship. Protect human health and the environment by encouraging innovation and providing incentives for governments, businesses, and the public that promote environmental stewardship.

This goal is designed to protect human health and the environment by improving environmental behavior through regulatory and nonregulatory means. Under this goal, EPA will work to ensure that government, business, and the public meet federal environmental requirements and will empower and assist them to do more. EPA programs designed to ensure compliance with federal environmental laws and regulations, to increase voluntary and self-directed actions to minimize or eliminate pollution before it is generated (pollution prevention), and to promote environmental stewardship behavior all contribute to the achievement of this goal.

EPA uses the term "environmental stewardship" to describe behavior that includes but also exceeds required compliance. Stewards of the environment recycle wastes to the greatest extent possible, minimize or eliminate pollution at its sources, and use energy and natural resources efficiently to reduce impacts on the environment. Under this goal, EPA will strive to use science and research more strategically and effectively to inform Agency policy decisions and to guide compliance, pollution prevention, and environmental stewardship efforts. Finally, EPA will work to provide necessary environmental protection to the Nation's tribes and will assist them in building the capacity to implement environmental programs where needed and feasible.

OBJECTIVES

Objective 5.1: Improve Compliance. By 2008, maximize compliance to protect human health and the environment through compliance assistance, compliance incentives, and enforcement by achieving a 5 percent increase in the pounds of pollution reduced, treated, or eliminated[1], and achieving a 5 percent increase in the number of regulated entities making improvements in environmental management practices.[2] (Baseline to be determined for 2005.)

> **Sub-objective 5.1.1: Compliance Assistance.** By 2008, prevent noncompliance or reduce environmental risks through EPA compliance assistance by achieving: a 5 percentage point increase in the percent of regulated entities that improve their

understanding of environmental requirements; a 5 percent increase in the number of regulated entities that improve environmental management practices; and a 5 percentage point increase in the percent of regulated entities that reduce, treat, or eliminate pollution. (Baseline to be determined for 2005.)[3]

Sub-objective 5.1.2: Compliance Incentives. By 2008, identify and correct noncompliance and reduce environmental risks through a 5 percentage point increase in the percent of facilities that use EPA incentive policies to conduct environmental audits or other actions that reduce, treat, or eliminate pollution or improve environmental management practices. (Baseline to be determined for 2005.)[4]

Sub-objective 5.1.3: Monitoring and Enforcement. By 2008, identify, correct, and deter noncompliance and reduce environmental risks through monitoring and enforcement by achieving: a 5 percent increase in complying actions taken during inspections; a 5 percentage point increase in the percent of enforcement actions requiring that pollutants be reduced, treated, or eliminated; and a 5 percentage point increase in the percent of enforcement actions requiring improvement of environmental management practices. (Baseline to be determined for 2005.).[5]

Means and Strategies for Achieving Objective 5.1

Environmental laws and regulations are designed to protect human health and safeguard the environment. But they can achieve their purpose only when companies and facilities comply with requirements. Companies or facilities that do not comply with statutory or regulatory requirements can gain an unfair economic advantage over those that invest the resources necessary to comply. EPA works cooperatively with state, local, and tribal agencies to secure and maintain compliance by the maximum number of the Nation's 41 million regulated entities.[6] To reduce noncompliance and the environmental risks that can result, EPA and its partners provide compliance assistance to promote understanding of environmental regulations; offer incentives that encourage facilities to identify violations; monitor compliance through inspections and investigations; and conduct civil and criminal enforcement actions to correct violations and deter future noncompliance. By combining these tools appropriately to address specific problems, we and our partners can prevent and reduce pollution, thereby protecting human health and the environment.

We will continue to improve our working relationships with state, local, and tribal environmental compliance programs to produce maximum compliance by regulated facilities. Specifically, EPA will (1) work with states to ensure a consistent level of effort in state enforcement and compliance assurance programs; (2) expand the role of its partners in identifying national priorities for the federal enforcement and compliance assurance programs;

(3) better integrate strategic planning efforts at the state, regional, and national levels; (4) share information about patterns of noncompliance or emerging risks which need to be addressed; and (5) explore development of common performance measures for state enforcement and compliance assurance programs.

The four elements of EPA's compliance program—assistance, incentives, monitoring and enforcement—are described in more detail below.

Compliance Assistance

To assist regulated facilities in complying with environmental regulations, EPA will continue to use a mix of tools and strategies to address particular compliance problems that exist in specific industrial, commercial, and government sectors or that are associated with certain regulatory requirements. We will continue to partner with state and local governments and to collaborate with trade associations to equip those working directly with the regulated community with compliance information. We will continue to serve as a national repository and point of contact for information and materials. Our 13 virtual Compliance Assistance Centers will provide assistance directly to the regulated community. We will also interact directly with regulated entities through training, on-site visits, and workshops, and we will assess the results of our assistance efforts.[7]

The Agency's partnership activities also include a compliance assistance exchange forum for sharing information on best practices, outcome measurement, and new compliance assistance materials; an interagency roundtable of representatives from federal compliance assistance programs; and a clearinghouse of compliance assistance materials available from federal, state, and local governments, academia, and trade associations.[8] We will continue to publicize our compliance assistance efforts to help the regulated community anticipate and prevent violations of federal environmental laws that could lead to enforcement actions.

Compliance Incentives

EPA offers a suite of incentives to encourage government, industry, and business facilities to assess their overall compliance with environmental requirements and voluntarily correct and report compliance problems. The Agency will continue to make the Audit Policy (Self-Policing Policy)[9] and other compliance incentives available to the regulated community, including reduced penalties for violations, extended time for correction, and potentially fewer or less frequent inspections. EPA also encourages owners of multiple facilities to disclose environmental violations because such disclosures encourage these regulated entities to review their operations more comprehensively, providing a greater overall benefit to the environment.

We will continue to work with stakeholders to improve opportunities for industries voluntarily to self-disclose and correct violations. The Small Business Compliance Policy has recently been modified to encourage greater participation by small businesses.[10] As part of the marketing and outreach it conducts to support this approach, EPA will work with small business compliance assistance providers to develop tools small businesses can use to understand applicable environmental requirements and take advantage of the flexibility offered by the policy. EPA also will continue to encourage states to adopt and communities to use the policy.

Compliance Monitoring and Enforcement

EPA uses monitoring and enforcement activities—inspections, civil and criminal investigations, administrative actions, and civil and criminal judicial enforcement—to identify the most egregious violators and return them to compliance as quickly as possible. Federal environmental regulations establish a baseline for consistent compliance levels nationwide. States that have been delegated responsibilities for specific programs may make these baseline standards more stringent and enforce against the more stringent standards.[11]

We will continue to base our compliance monitoring and enforcement efforts on inspections, investigations, and enforcement actions carried out by the Agency and our state, tribal, and local government regulatory partners. To address the most significant risks to human health and the environment, including disproportionate burdens on certain populations, we will target inspections, civil investigations, and criminal investigations to achieve the greatest reduction in pollution. For example, we and our partners review compliance data, the results of inspections and investigations, and citizen "tips" and complaints to target those areas that present high rates of noncompliance and significant risks to human health and the environment.

Objective 5.2: Improve Environmental Performance through Pollution Prevention and Innovation. By 2008, improve environmental protection and enhance natural resource conservation on the part of government, business, and the public through the adoption of pollution prevention and sustainable practices that include the design of products and manufacturing processes that generate less pollution, the reduction of regulatory barriers, and the adoption of results-based, innovative, and multimedia approaches.

> **Sub-objective 5.2.1: Prevent Pollution and Promote Environmental Stewardship by Government and the Public.** Through 2008, reduce pollution and improve environmental stewardship practices of all levels of government. Demonstrate how government agencies can serve as stewards of the environment and assist them in meeting their responsibilities under the National Environmental Policy Act (NEPA). Raise the public's awareness of actions it can take to prevent pollution.

Strategic Targets:

- By 2006, reduce Toxic Release Inventory (TRI)-reported toxic chemical releases at federal facilities by 40 percent, from a baseline year of 2001.[12]

- By 2008, EPA will go beyond compliance with executive orders to "green" federal government operations in its purchases of "green" products and services from a baseline year of 2002.[13]

- By 2008, all federal agencies will have defined Environmentally Preferable Purchasing programs and policies in place and will be expanding their purchases of available "green" products and services, from a baseline of one federal agency in 2002.[14]

- Through 2008, 70 percent of significant impacts identified by EPA during the NEPA review of all major proposed federal actions are mitigated.

- Through 2008, 90 percent of EPA projects subject to NEPA Environmental Assessment or Environmental Impact Statement requirements result in a finding of no significant environmental impact.

Sub-objective 5.2.2: Prevent Pollution and Promote Environmental Stewardship by Business. Through 2008, reduce pollution and improve environmental stewardship practices in business operations by adopting more efficient, sustainable, and protective policies, practices, materials, and technologies.

Strategic Targets:

- By 2008, reduce by 40 percent TRI chemical releases to the environment from the business sector per unit of production ("Clean Index"), and reduce by 20 percent TRI chemicals in production-related wastes generated by the business sector per unit of production ("Green Index"), from the baseline year of 2001.[15]

- By 2008, reduce waste minimization priority list chemicals in hazardous waste streams reported by businesses to TRI by 50 percent from 1991 levels.

- By 2008, reduce pollution by 76 billion pounds, conserve 360 billion BTUs of energy and 2.7 billion gallons of water, and save $400 million, from a baseline year of 2003.[16]

- By 2008, reduce 165 thousand metric tons of carbon dioxide (CO_2) emissions through the Green Chemistry Challenge Awards, from a baseline year of 1996.[17]

Sub-objective 5.2.3: Business and Community Innovation. Through 2008, achieve measurably improved environmental performance through sector-based approaches, performance-based programs, and assistance to small business.

Strategic Targets:

- By 2008, Performance Track members collectively will achieve an annual reduction of: 1.5 billion gallons in water use; 3,300,000 MMBTUs in energy use; 25,000 tons in materials use; 450,000 tons of solid waste; 10,000 tons of air releases; and 19,000 tons in water discharges compared to 2001.[18]

- Through 2008, the Sector Strategies Program will work with participating business and service sectors to achieve aggregate reductions in environmental impacts of 15 percent in water use, energy use, waste generation or disposal, air releases, or water discharges. (Improvements will be measured from baselines selected in 2004 for individual sectors.)

Sub-objective 5.2.4: Environmental Policy Innovation. Through 2008, achieve measurably improved environmental and economic outcomes by testing, evaluating, and applying alternative approaches to environmental protection in states, companies, and communities. This work will be targeted at improving the cost effectiveness and efficiency for regulatory agencies as well as regulated entities.

Strategic Targets:

- By 2008, facilities that partner to demonstrate alternative regulatory or technological approaches will collectively achieve an environmental improvement of 10 percent in water use, energy use, waste generation or disposal, air releases, or water discharges, or an increase of 10 percent in cost effectiveness or efficiency while achieving equal or improved environmental results. (Improved environmental performance from alternative approaches will be measured against the baseline year in which each project is initiated.[19])

- By 2008, state projects conducted under the State Innovation Grant Program, Environmental Results Program, and the Joint EPA/State Agreement to Pursue Regulatory Innovation will collectively achieve an environmental improvement of 15 percent in water and energy use, waste generation or disposal, releases of contaminants into the air or water, or habitat quality, or an increase of 15 percent in cost effectiveness or efficiency while achieving equal or improved environmental results. (Improved environmental performance from alternative approaches will be measured against the baseline year in which each project is initiated.[20])

Means and Strategies for Achieving Objective 5.2

Pollution Prevention

The Pollution Prevention Act of 1990 establishes pollution prevention as a "national objective" and the pollution prevention hierarchy as national policy.[21] The Act declares that pollution should be prevented or reduced at the source wherever feasible; that pollution that cannot be prevented should be recycled in an environmentally safe manner; and that, in the absence of feasible prevention or recycling opportunities, pollution should be treated. Disposal or other release into the environment should be used as a last resort.

EPA intends to achieve its pollution prevention goals through voluntary partnerships. The Agency will work with industry to build pollution prevention into the design of manufacturing processes and products and will team with states, tribes, and governments at all levels to find simple, voluntary, and cost-effective pollution prevention solutions. EPA will promote the principles of responsible stewardship, sustainability, and accountability in developing approaches to prevent pollution.

Environmentally Preferable Purchasing

Executive Order 13101 mandates that EPA assist executive agencies in making purchasing decisions that minimize damage to the environment.[22] The Agency established the Environmentally Preferable Purchasing (EPP) program to provide guidance and carry out a variety of initiatives and outreach activities for a wide constituency, including federal agencies.[23] Under the EPP program, EPA will help purchasers conduct thorough life-cycle analyses to identify those products that generate the least pollution, consume fewest nonrenewable natural resources, and are least threatening to human health and to wildlife. Our strategy harnesses the purchasing power of government to stimulate demand for "greener" products and services, thereby fostering manufacturing changes. We will identify environmental performance standards

by which products can be evaluated (e.g., criteria and standards to evaluate chemical cleaning products and their impacts on the environment). The Agency will also invest in the development of tools, such as life-cycle analysis tools, that businesses and purchasers can use to identify key environmental attributes and evaluate the environmental performance of products. In developing and distributing these tools, we will coordinate and cooperate with businesses, states, tribes, and environmental groups and will rely on the expertise of other federal agencies, such as the National Institute of Standards and Technology.

Biobased Products and Energy

Under Executive Order 13134 and the Farm Bill[24], EPA has an important role in developing and promoting biobased products and energy. Biobased products are made from renewable agricultural, animal, or forestry materials, such as vegetable-based lubricants, biofuels, and compost. The Order sets a goal of tripling U.S. use of bioenergy and bioproducts by 2010. To meet this goal, EPA will work closely with the U.S. Department of Agriculture not only to promote the use of these renewable resources, but also to ensure that they protect the environment.

Pollution Prevention State Grant Program

EPA remains committed to helping industry further prevent pollution by adopting more efficient, sustainable, and protective business practices, materials, and technologies. A vital component of our strategy is the continuation of the Pollution Prevention State Grant program.[25] Annually, EPA provides $6 million to states and tribes to support their efforts to provide industry with technical assistance, information sharing, and outreach. The grants also support promising, innovative ideas for preventing pollution. Finally, states will require adequate resources dedicated to pollution prevention to implement strategies successfully. EPA will monitor state resource levels and work with states to expand resource commitments for pollution prevention.

Pollution Prevention at Federal Facilities

Apart from its work with business, the Agency will continue to target prevention of hazardous chemical releases and wastes generated by federal facilities. Working with the states, in coordination with other federal agencies, and armed with pollution prevention tools, technologies, and data generated through TRI, we will work to reduce toxic chemical releases at federal facilities by 40 percent (from a 2001 baseline) by 2006.[26] To help achieve this goal, and to continue reducing other environmental impacts at federal facilities, we will promote the use of environmental management systems (EMSs) under Executive Order 13148.[27] These systems help to address environmental impacts through measured problem identification and response, rather than crisis management. Leading by example, EPA will be implementing EMSs at 34 of its own facilities.

Green Chemistry

EPA's Green Chemistry Program[28] supports research and fosters development and implementation of innovative chemical technologies to prevent pollution in a scientifically sound, cost-effective manner. Through voluntary partnerships with academia, industry, and other government agencies, Green Chemistry supports fundamental research in environmentally benign chemistry and provides a variety of educational and international activities, including sponsoring conferences and meetings and developing tools. The Presidential Green Chemistry Challenge Award program recognizes superior achievement in the design of chemical products.

Green Engineering and Design for the Environment

Traditionally, engineering approaches to pollution prevention have been focused on waste minimization and have not addressed such risk factors as exposure, fate, and toxicity. EPA's Green Engineering (GE) program[29] promotes consideration of these factors in the design, commercialization, and use of chemical products and the development of feasible, economical processes that minimize generation of pollution at the source. A goal of the GE program is to incorporate "green" or environmentally conscious thinking and approaches in the daily work of engineers, especially of chemical and environmental engineers. Similarly, EPA's Design for the Environment (DfE) Industry Partnership Program[30] promotes integration of cleaner, cheaper, and smarter pollution prevention solutions into everyday business practices. DfE will continue to work with industry sectors to reduce risks to human health and the environment, improve performance, and save costs associated with existing and alternative pollution prevention technologies or processes.

Waste Minimization and Recovery

To reduce priority chemicals in hazardous wastes going to landfills, EPA will focus on key waste streams and waste generators through a variety of mechanisms, including the Waste Minimization Partnership Program (part of the Agency's Resource Conservation Challenge, or RCC). This program encourages EPA, state and local governments, manufacturers, and other nongovernmental organizations to form voluntary partnerships to reduce the generation of hazardous wastes containing any of 30 priority chemicals. Companies that become Waste Minimization Partners are publicly recognized for their contribution to the national reduction goal. In 2003, EPA worked with a limited number of Charter Members in a pilot effort to ensure that all aspects of the program were operating smoothly. EPA will now be accepting applications from additional companies that meet membership criteria, with the goal of recruiting 100 new partners, including Fortune 500 companies and small businesses, over the next 5 years. Our primary goal, however, will remain not the number of program participants, but the reductions in chemical wastes that can be achieved.

The RCC also focuses on recovering materials and energy, either by converting wastes into products and energy directly or as a result of process and product redesigns that produce these benefits. We will closely coordinate our RCC efforts with the Agency's other pollution prevention activities, potentially revising our strategies or targets to focus on materials and energy recovery through recycling when source reduction is not a feasible solution. The Agency is also working with its partners to identify additional goals that will reflect our expanded effort, beginning in 2003, to increase recovery of materials and energy and reduce releases of priority chemicals in waste. We expect these new goals to be in place by 2004, as the program becomes fully operational.

Innovation

EPA is committed to developing and promoting innovative strategies that achieve better environmental results, reduce costs, and reward stewardship. In collaboration with its state and tribal partners, the Agency will continue to focus its efforts on innovations that will assist small businesses and communities in improving both their environmental performance and their bottom lines. EPA has prepared an Innovations Strategy to guide our efforts in this and other areas. The strategy relies on continued outreach to states, tribes, and business to help identify innovative approaches that merit testing, evaluation, and implementation.

Improving Business and Community Environmental Performance

EPA will continue to advance environmental protection through innovative and collaborative approaches with business and other governmental entities. EPA's National Environment Performance Track program, for example, recognizes and rewards superior environmental performance and motivates improvement. Through Performance Track, the Agency will continue to recruit high-performing facilities that have the environmental policies and management systems needed to deliver better results and will create mechanisms and resources for sharing information that can help other Performance Track members and prospective members improve their performance.

Under its Sector Performance Improvement Program, EPA tailors environmental performance improvement efforts to particular industry sectors. The Agency will continue to select sectors based on criteria, such as their impact on national and regional priorities, trade association interest, and facility-level EMS development. The Agency will designate a staff liaison with expertise on the sector to develop and maintain partnerships and facilitate quick responses to sector-specific questions and issues. Through its website, the Agency will also continue to provide an array of sector-specific information on pollution prevention, voluntary partnerships, best practices, sector performance, and other topics.

Improving Environmental Protection Policy

To foster innovation in environmental protection, the Agency reaches out to states, tribes, businesses, and others to identify new approaches that merit further testing, development, and potential dissemination. Over the next 5 years, EPA plans to test and demonstrate various innovations. In partnership with states and industry, and through programs and agreements that have been created since the mid-1990s, we will focus on priority environmental problems to improve environmental protection while increasing efficiency and cost savings. For example, the State Innovation Grant Program will fund projects that use innovative approaches to permitting. The program will broaden its solicitation of state and tribal projects and will continue to provide direct assistance on a number of the most promising projects. The Agency also will continue to collect, review, approve, and help implement state proposals through the Joint EPA/State Agreement to Pursue Regulatory Innovation.

EPA will continue to promote promising innovations that provide for the use of more flexible and performance-based regulation, multimedia approaches, incentives for superior performance, market-based approaches, public involvement processes, and programs tailored for small sources. In some cases these improvements will be brought about through changes in national rules or policies; in others, they may occur through a more gradual process of adopting new techniques across states or Agency programs. EPA will facilitate these processes by encouraging Agency, state, and tribal staff to submit innovative ideas and suggestions to a central point; using the Agency's Innovation Action Council as a forum to obtain senior-level endorsement of promising innovations; identifying pilot projects that can be mined for "lessons learned;" holding national symposia during which federal, state, and tribal officials can share information and experiences; and using Web-based tools to disseminate information about ongoing projects to Agency staff and management.

Implementation of the National Environmental Policy Act

EPA actions that are subject to NEPA requirements include wastewater and drinking water treatment plant construction and other grants, EPA-issued new-source water discharge permits, and EPA facility construction. For actions that may impact the environment, EPA prepares either an environmental assessment that supports a finding of no significant impact or an environmental impact statement. The Agency will continue to comply fully with NEPA requirements and to implement mitigation measures to ensure that EPA-sponsored activities result in no significant environmental impact.

Section 309 of the Clean Air Act requires EPA to review and make public its comments on other federal agencies' environmental impact statements. EPA performs this role in consultation with the White House Council on Environmental Quality. EPA also promotes environmental stewardship by establishing strong working relationships with other agencies. For

example, EPA helps other agencies scope out their environmental impact statements; assists them in developing projects to avoid environmental impacts; supports streamlined environmental review processes; participates in rotational assignment programs; participates in interagency work groups; and provides training and guidance.

Objective 5.3: Build Tribal Capacity. Through 2008, assist all federally recognized tribes in assessing the condition of their environment, help in building their capacity to implement environmental programs where needed to improve tribal health and environments, and implement programs in Indian country where needed to address environmental issues.

Strategic Targets:

- By 2008, increase tribes' ability to develop environmental program capacity by ensuring that 100 percent of federally recognized tribes have access to an environmental presence. (FY 2002 baseline: 82 percent of tribes)[31]

- By 2008, develop or integrate 15 (cumulative) EPA and interagency data systems to facilitate the use of EPA Tribal Enterprise Architecture information in setting environmental priorities and informing policy decisions. (FY 2003 baseline: 2)[32]

- By 2008, eliminate 20 percent of the data gaps for environmental conditions for major water, land, and air programs as determined through the availability of information in the EPA Tribal Enterprise Architecture. (FY 2003 baseline: 26 data gaps)[33]

- By 2008, increase implementation of environmental programs in Indian country to 189 (cumulative total) as determined by program delegations, approvals, or primacies issued to tribes and EPA direct implementation. (FY 2002 Baseline: 149)[34]

- By 2008, increase by 52 the number of EPA-approved quality assurance plans for tribal environmental monitoring and assessment activities. (FY 2003 baseline: approximately 243 plans)[35]

- By 2008, increase by 50 percent the number of EPA agreements with tribes that reflect holistic program integration and traditional use of natural resources. (FY 2003 baseline: 45 Performance Partnership Grants and EPA/Tribal Environmental Agreements)[36]

Means and Strategies for Achieving Objective 5.3

EPA's strategy for achieving its objectives in Indian country has three major components. First, the Agency will work to develop the information technology infrastructure needed to measure environmental conditions in Indian country and related lands and measure the environmental results that accrue from the implementation of environmental programs on those lands. Second, EPA will continue to distribute Indian General Assistance Program capacity-building grants with the goal of establishing an environmental presence in all 572 federally recognized tribes in the United States.[37] Third, EPA's American Indian Environmental Office will continue to coordinate closely with Agency programs to guide and track the timely and appropriate implementation of those programs directly on Indian lands.[38] This work is closely related to efforts described under the tribal component of EPA's cross-goal partnership strategy in the following chapter.

EPA will continue to construct an information technology infrastructure that organizes environmental data on a tribal basis, enabling a clear, up-to-date picture of environmental activities in Indian country. We will take advantage of new technology to establish direct links with other federal agencies (including the U.S. Geological Survey, Bureau of Reclamation, and Indian Health Service) to create an integrated, comprehensive, multi-agency Tribal Enterprise Architecture. This interactive system will allow tribes and EPA regional offices to supply management information that supplements data collected by the national tribal systems.

In addition, EPA will develop Strategic Plan Tracking Systems (Government Performance and Results Act [GPRA] tracking systems) to follow progress in achieving tribal objectives, sub-objectives, and strategic targets on a real-time basis. The Agency will use data available through the Tribal Enterprise Architecture and allied GPRA tracking systems to adjust approaches and activities as necessary to achieve improved results on tribal lands and to report to the tribes on the Agency's progress. These tools will also help EPA determine the resources and skills needed over the 5-year cycle of the *Strategic Plan*.

Consultation and direct partnerships with tribes are integral to EPA's strategy. The Tribal Caucus, which has advised the Agency on tribal issues for several years, will serve as the focal point for work under this objective and will help facilitate continued development of EPA-tribal partnerships. To improve the environment in Indian country, the Agency will also engage other EPA-sponsored tribal groups, such as the Tribal Committee of the Forum on State and Tribal Toxics Action,[39] the Tribal Pesticides Program Council,[40] and the Tribal Science Council.[41]

Objective 5.4: Enhance Science and Research. Through 2008, strengthen the scientific evidence and research supporting environmental policies and decisions on compliance, pollution prevention, and environmental stewardship.

Sub-objective 5.4.1: Strengthening Science. By 2008, all (100 percent of) routine National Enforcement Investigations Center environmental measurements (field or laboratory) will be accredited by an internationally recognized, third-party organization. (FY 2001 baseline: 30 areas of environmental data collection.)[42]

Sub-objective 5.4.2: Conducting Research. Conduct leading-edge, sound scientific research on pollution prevention, new technology development, socioeconomics, and decision making. By 2008, the products of this research will be independently recognized as providing critical and key evidence in informing Agency policies and decisions and solving problems for the Agency and its partners. (Also see *Research*, under Cross-Agency and Support-Program Evaluations in Appendix 2 of this *Strategic Plan*.)

Means and Strategies for Achieving Objective 5.4

EPA is working to strengthen the science that it needs to make sound decisions and establish effective compliance and enforcement policies. The Agency is continuing to conduct research on pollution prevention, new and developing technologies, social and economic issues, and decisionmaking. We will use the results of these studies to develop products and tools that EPA, its partners, and stakeholders can use to promote energy and natural resource conservation, pollution prevention, recycling, and other aspects of environmental stewardship. Besides benefitting the Agency and its partners, advancing science and research will also help clarify requirements and expectations for members of the regulated community and will provide tools and strategies to help them meet those requirements.

Strengthening Science

EPA's science work under Goal 5 has a two-fold purpose: (1) to improve the science that supports compliance monitoring, inspections, investigations, case support, and selected regulations; and (2) to continue to provide premier investigatory work to support the Agency's enforcement and compliance assistance activities. To accomplish these ends, EPA's National Enforcement Investigations Center (NEIC)[43] and EPA regional laboratories will implement a nationally and/or internationally recognized quality system that provides for third-party oversight and features both technical/scientific and the forensic elements of environmental data collection and measurement. Through NEIC and our regional laboratories, we will also work to improve field and laboratory measurement techniques and to advance innovative analytical approaches to support compliance and enforcement efforts.

Conducting Research

EPA will work with its partners and stakeholders to identify research needs, set priorities, and develop project plans. We will concentrate on (1) research that will help identify best practices and approaches that promote, at a minimum, compliance with all regulatory requirements and (2) research that may yield innovative approaches to improve performance and results in such areas as pollution prevention and sustainable development.

For example, over the next 5 years the Agency's Office of Research and Development will conduct research and prepare reports and assessments on renewable resources, metal processing fluids, fuel cells, and buildings. We will share these products with industry, academia, and other agencies to further their work in preventing pollution.

Other research efforts will result in four generic, sustainable environmental system methodologies for watershed management (using market incentives, ecological food-web models, hydrological models, and pest resistance management frameworks); an evaluation of the effectiveness and efficiency of market-based incentive approaches, as compared to traditional environmental regulation; and efforts to make innovative environmental technologies commercially available, such as technologies EPA would use for building decontamination and water security.

EPA has developed Multi-Year Research Plans that describe the research we will conduct on pollution prevention and new technologies and on economics and decision sciences during the next 5 to 10 years. The plans lay out long-term research goals as well as the annual milestones needed to achieve these goals.[44]

Pollution Prevention and New Technologies

Over the last decade, the Agency has increasingly focused on pollution prevention in addressing high-risk human health and environmental problems. A preventive approach requires (1) innovative design and production techniques that minimize or eliminate adverse environmental impacts; (2) holistic approaches that make the most of our air, water, and land resources; and (3) fundamental changes in how goods and services are created and delivered to consumers.

As part of its multi-year plan, EPA has established long-term goals for pollution prevention and new technologies research. These goals focus on developing tools, technologies, and sustainable environmental systems approaches and on continuing to prevent and control pollution by targeting sources and sectors that pose the greatest risks to human health and the environment. For example, this research will provide credible performance data for commercial environmental technologies to aid vendors in marketing innovative technologies, buyers in

making purchasing decisions, and permitters in making decisions about environmental technologies. Research results can assist EPA and states in improving compliance performance by providing information and tools for cleaner, cost-effective industrial processes and new technologies and verifying the performance of commercial technologies. Research results will also provide technical options and alternatives for improving environmental management. Approaches to sustainable environmental systems developed through this research will provide cost-effective methods of protecting sensitive ecosystems. For instance, this research can help build tribal capacity by providing holistic, multimedia solutions at the watershed scale that take local cultural values into account and promote sustainable practices.

Economics and Decision Sciences

EPA conducts economics and decision-sciences research to increase our understanding of human behavior toward the environment, enabling us to develop policies that can alter behaviors that contribute to environmental problems. This research also informs state and other federal agencies on how to best and most cost-effectively accomplish three overarching responsibilities: (1) anticipating, identifying, and setting priorities for managing environmental problems to protect ecological and human health; (2) developing policies to address the selected environmental priorities; and (3) implementing the policies to achieve better environmental outcomes.

Our multi-year plan for economics and decision sciences establishes long-term research goals for understanding and changing environmentally damaging behaviors, developing tools to assess the highest-priority issues based on public preferences, and developing implementation strategies that provide incentives for desirable behavioral responses to government interventions. For example, this research will help us understand the motivations driving human behavior toward protecting the environment, the techniques for implementing environmental policy most effectively and efficiently (e.g., traditional regulation, market and economic incentives, information disclosure), and the monetary value society attaches to healthy people and healthy ecosystems.

The results of our research on compliance behavior of regulated entities will help EPA and states improve compliance performance and promote environmental stewardship. We and our partners will rely on research into market-based approaches and economic incentives to develop innovative alternatives to traditional regulatory approaches. As we establish regulations to protect human health and the environment, research on valuation will enable us to make informed decisions on which environmental problems to address and the public benefits to be derived from various types of standards and levels of stringency.

EXTERNAL FACTORS

EPA's ability to meet its objectives for compliance and environmental stewardship could be affected by a number of factors. For example, natural catastrophes—such as floods, significant chemical spills, and the new challenges associated with homeland security and responding to real or potential terrorist threats—may require the Agency to revise its priorities and redirect its resources.

The Agency relies heavily on its partnerships to advance protection of human health and the environment. For example, many of the strategic targets the Agency has set under this goal are predicated on the assumption that states and tribes will be able to maintain or increase their levels of compliance and enforcement work, or that the U.S. Department of Justice will accept or prosecute cases.

In the area of pollution prevention, for example, the Agency's work is almost entirely dependent on voluntary partnerships, collaboration, and persuasion, since there are few environmental regulations that set specific source-reduction requirements. The DfE Program seeks partnerships with industry trade associations to engage jointly in the development and marketing of products that generate less pollution. The Green Chemistry Program challenges industry and the academic community to step forward with new chemical formulations that pose fewer risks to human health and the environment. And EPA's strategy of "greening the supply chain" depends on the willingness of large manufacturers to voluntarily require their suppliers to provide environmentally preferable products. These efforts all depend on our partners' continued willingness to cooperate in joint endeavors that might not realize an immediate payoff. EPA's ability to carry out its voluntary pollution prevention initiatives could be reduced if partners begin to believe that the initiatives are not worthwhile, are too risky, or are otherwise contrary to their best interests.

The community that contributes to and uses EPA's data and information is also evolving. As states and tribes develop the ability to integrate their environmental information, EPA will need to adjust its systems to ensure that it can receive and process reports from states and industry under Agency statutory requirements. Citizen and community organizations and the public at large are also increasingly involved in environmental decisionmaking, and their need for quality information and more sophisticated analytical tools is growing.

Finally, the regulated community's willingness to comply with the law and to exceed minimum requirements is an obvious factor in the Agency's achievement of its compliance and environmental stewardship goals. A key component of our waste minimization strategy for reducing priority chemicals from waste streams, for example, is the commitment that small and large businesses make to work with EPA and other governmental organizations to address the targeted chemicals.

Human Capital Focus For Achieving Goal 5

EPA will provide focused training and development opportunities in:

- The compliance and enforcement requirements under all major environmental statutes, including facility inspections and investigations
- The regulatory development process
- Collaboration and communication
- Grant management
- Federal Indian legal and other issues

We will also use a range of flexible hiring authorities to quickly recruit skilled scientists, researchers, and others, and we will further develop our existing workforce by rotating senior-level managers and staff across air, water, and land programs.

Efficiency Measures For Goal 5

Efficiency measures relate results to the resources or time invested to achieve those results and augment effectiveness measures in evaluating performance. They help us integrate EPA's budget and performance—part of the President's Management Agenda—and demonstrate the cost-effectiveness and timeliness of program activities.

Under our enforcement program in Goal 5, efficiency measures will track the pounds of pollutants reduced against the time EPA staff spends in enforcement activities:

For FY 2005, the two efficiency measures will be pounds of pollutants reduced per FTE, and dollars of injunctive relief collected per FTE. Since achievement of the Civil Enforcement Program's annual and long-term goals is highly dependent on the enforcement cases concluded in a given year, there can be significant variability in a measure from one year to the next. To partially address this variability these efficiency measures are based on 3-year rolling averages.

Notes

1."Pounds of pollutants reduced, treated, or eliminated" is an EPA measure of the quantity of pollutants that will no longer be released to the environment as a result of a noncomplying facility returning to its allowable limits through the successful completion of an enforcement settlement. (Facilities may further reduce pollutants by carrying out voluntary Supplemental Environmental Projects.) Online compliance information is available to the public via EPA's Enforcement and Compliance History Online (ECHO) Web Site: http://www.epa.gov/echo/: EPA's Office of Enforcement and Compliance Assurance. Washington, DC. Accessed August 28, 2003.

2."Environmental management practices" refers to a specific set of activities EPA tracks to evaluate changes brought about through assistance, incentives, and concluded enforcement actions. Implementing or improving environmental management practices—for example, by changing industrial processes; discharges; or testing, auditing, and reporting—may assist a regulated facility in remaining in compliance with environmental requirements. Further information on environmental management practices is available in EPA's *Case Conclusion Data Sheet Training Booklet*, available online at: www.epa.gov/compliance/resources/publications/planning/caseconc.pdf: EPA's Office of Enforcement and Compliance Assurance. Washington, DC.

3.The performance results achieved in FY 2005 will serve as the baseline from which future performance results will be compared. EPA will establish this objective's baseline in FY 2005 by analyzing data collected through EPA's Reporting Compliance Assistance Tracking System (RCATS), Office of Enforcement and Compliance Assurance, Washington, DC.. RCATS is an internal tracking system and not available to the public.

4.The performance results achieved in FY 2005 will serve as the baseline from which future performance results are compared. EPA will establish this objective's baseline in FY 2005 by analyzing data collected through EPA's Integrated Compliance Information System (ICIS), Office of Enforcement and Compliance Assurance, Washington, DC. ICIS is an internal EPA database and not available to the public

5.The performance results achieved in FY 2005 will serve as the baseline from which future performance results will be compared. EPA will establish this objective's baseline in FY 2005 by analyzing data collected through EPA's Integrated Data for Enforcement Analysis, (IDEA) database and data collected manually on Inspection Conclusion Data Sheets (ICDS), Office of Enforcement and Compliance Assurance, Washington, DC. Accessed September 10, 2003. Information on IDEA is available at: http://www.epa.gov/compliance/planning/data/multimedia/idea/users.html .

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18.These improvements are beyond existing regulatory requirements.

19.For every EPA-supported project, assistance agreements or other mechanisms will include a provision requesting recipients to quantify changes (i.e., improvements) to their environmental media, cost effectiveness, or workload efficiency. These changes will be measured against a baseline year in which the projected is initiated.

20.For every EPA-supported project, assistance agreements or other mechanisms will include a provision requesting recipients to quantify changes (i.e., improvements) to their environmental media, cost effectiveness, or workload efficiency. These changes will be measured against a baseline year in which the projected is initiated.

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CROSS-GOAL STRATEGIES

Many of EPA's efforts—strengthening our partnerships with states and tribes, improving the quality and availability of the environmental and health information on which we base our decisions, and improving our management systems to achieve better results—contribute to our progress toward all five of our goals. This cross-Agency, cross-media work includes both support functions, such as administrative and financial management or legal services, and the strategies or means we employ to help accomplish our objectives, such as science and research or information management.

Each of these efforts is a significant component of our work and plays a critical role in the accomplishment of all of our goals. This chapter highlights a few of these cross-goal strategies: Partnerships, Information, Innovation, Human Capital, Science, Homeland Security, and Economic and Policy Analysis. For each, we will discuss the Agency's approach, explain how the strategy will contribute to the achievement of our goals, and describe some of the activities we will conduct and results we hope to achieve using this approach.

Partnerships

The advances made in protecting our Nation's health and environment since EPA was established would not have been possible without state, tribal, and local government participation and support. EPA is committed to strengthening these partnerships and, recognizing the unique concerns and contributions that each of us brings to the table, to working together to address environmental problems and achieve results. The discussion that follows outlines our approach to establishing and improving our partnerships with states and tribes.

State Partnerships

EPA's partnership strategy is based on the belief that states and EPA are equal partners in the national effort to protect human health and the environment. Progress toward all five of our *Strategic Plan* goals depends not only on EPA's efforts, but on the efforts of all 50 states, the District of Columbia, Puerto Rico, the Virgin Islands, and the Islands of the Pacific Insular areas.

Most of the Nation's environmental laws envision a strong role for state governments in managing environmental and human health protection programs. National laws set certain goals, standards, and approaches for environmental protection to which EPA and our state partners are

committed. But environmental issues and problems can vary from region to region, and EPA is also committed to adapting to these situations.

As state environmental authority and management capacity have grown over the past three decades, EPA has delegated or authorized primary responsibility to states for implementing many day-to-day program activities, such as issuing permits, conducting compliance and enforcement programs, and monitoring environmental conditions. States' direct administration of environmental and human health protection programs—along with EPA oversight to ensure, through compliance with federal statutes and achievement of national objectives, that all Americans have a healthy environment—has brought about significant improvements in the environment and human health across the country.

In 1995, the states and EPA agreed on the series of principles that guide our collaborative work. Articulated in the *Joint Commitment to Reform Oversight and Create the National Environmental Performance Partnership System*, the "NEPPS Agreement," these principles call upon the states and EPA to set priorities jointly; develop performance agreements to define their roles, responsibilities, and accountability; encourage innovative environmental and human health protection strategies; agree upon performance measures; and jointly evaluate the results achieved.

The states and EPA use a variety of tools to define their relationship and guide their implementation of the Nation's environmental laws and the principles of the NEPPS Agreement. These tools include performance partnership agreements (PPAs), performance partnership grants (PPGs) and/or categorical program grants to states, enforcement agreements, and primacy delegation or authorization agreements. In addition to the Performance Partnership System, EPA works with a variety of associations representing state environmental agencies, such as the National Governor's Association, the Environmental Council of the States, and other organizations that deal with specific environmental media, such as the Association of State and Interstate Water Pollution Control Administrators. We also work with state agricultural and public health agencies on environmental protection efforts.

In 2002 and 2003, state environmental commissioners and senior EPA managers conducted a joint evaluation of the Performance Partnership System. They found the Partnership to be based on sound principles, which guide a flexible process for adapting environmental goals to local conditions. The evaluation indicated that, by breaking down organizational and media-program barriers, states and EPA regional offices are building trust. Increased joint planning and priority setting have focused state and EPA regional office efforts on achieving results, increased work sharing and emphasized cross-media approaches, allowed more flexibility in funding, and reduced oversight and reporting that is not value-added.

In addition to these positive findings, the joint evaluation identified several problem areas for improvement. These included concerns that EPA's priority-setting and planning processes

(including PPAs, issuance of national program guidance, budgeting, and accountability systems) are not aligned in a way that fosters joint planning and priority setting across media program lines.

In addition, transaction costs for developing PPAs were believed to be too high for the benefits obtained. States enter EPA's planning process too late to enable the PPA to reflect a true partnership, hampering the use of the PPA as a definitive agreement to guide EPA-state operating relationships.

Improving Alignment

Working with our state partners, we intend to better align our priority setting, planning and budgeting processes and develop PPAs that can definitively guide our relationship. Aligning EPA and state strategic planning processes will allow us to better inform, influence, and reflect one another's priorities and approaches to achieving our environmental protection goals. In developing this *Strategic Plan*, for example, EPA has sought earlier state input on strategies and priorities. Similarly, soliciting state input early in developing EPA's new Regional Plans will influence how EPA Regions will work with their state and tribal partners to help achieve the Agency's strategic goals and objectives.

This early consultation with our partners is also important as we develop National Program Guidance and conduct our annual planning and budgeting. We are reforming these processes to lower transaction costs by focusing on results, synchronizing processes across program areas, and reducing targets and indicators to the fewest necessary to ensure accountability for results and inform national program management. We will continue to work with our partners to develop and use better performance measures that focus on outcomes and provide accountability.

Improving Performance Partnership Agreements and Grants

We are working to make development of PPAs less burdensome and more meaningful by engaging with our state partners early and through more transparent processes. Early state input to EPA's *Strategic Plan*, regional plans, *Annual Plan and Budget*, and national program guidance will lower transaction costs of developing PPAs by minimizing surprises and reducing conflicts that can arise during the preparation of the PPA itself. Resolving potential conflicts early on will enable states and EPA to rely on the final PPA to define roles, responsibilities, and accountability of all partners, thereby making the PPA definitive for the program areas and time period it addresses. Such a definitive agreement will address environmental performance expectations and provide for joint EPA-state performance evaluations that will hold both accountable. We will continue to work with our state partners through a joint evaluation process to identify ways to improve and advance PPAs and the methods by which they are developed and negotiated.

Further, recognizing that states and their environmental issues and concerns are diverse, EPA will continue to develop a range of PPAs tailored to state needs. These PPAs will contain elements essential to ensure alignment, accountability, and a clear definition of the agreement. We will base priorities, strategies, and activities on a level of reasonable strategic thinking. The PPA will be related to architecture presented in EPA's *Strategic Plan*, will include both programmatic and environmental measures, and will outline a process for possible changes during its term.

In addition, EPA is working with states to achieve greater value from PPGs. We are conducting a structured, three-part effort to evaluate and remove barriers that prevent EPA and states from taking greater advantage of the flexibility that PPGs provide. First, we will identify and assess legal and administrative barriers. Next, state and federal front-line grant managers and negotiators will develop plans for reducing barriers and increasing use of PPG flexibility. Finally we will build on these efforts to develop a training module and a best practices guide.

The movement across all levels of government to focus work on achieving performance results continues to grow. Our efforts to manage for better results; improve environmental indicators; promote innovation; and establish an exchange network that will allow EPA, states, and the public better access to environmental data demonstrate our support for this burgeoning movement. Strengthening our working relationship with the states is an important part of this performance management effort. Together, these initiatives will help to focus the entire national environmental protection system on achieving improved results.

Tribal Partnerships

EPA's mission—to protect human health and the environment—applies to all our Nation, including Indian country and Alaska Native Villages. In carrying out our mission, we will build on our strong foundation of working with our tribal partners to ensure that our efforts encompass all U.S. lands, regardless of ownership status or jurisdiction.

Tribes have unique cultural, jurisdiction, and legal issues that present special challenges to the coordination and implementation of environmental management activities in Indian country. EPA's 1984 Indian Policy formally recognized the uniqueness of tribal jurisdictional lands. Vital to that policy is the principle that EPA works with tribes on a government-to-government basis that reaffirms the federal trust responsibility to tribes. Therefore, EPA's work toward a comprehensive plan of environmental protection activities in Indian country and Alaska Native Villages must use innovative approaches and coordinated programs that complement tribal government structures, incorporate tribal priorities, and recognize tribal cultural considerations.

EPA's work with tribes is about more than physical landscapes, rules, regulations, matters of jurisdiction, and funding. We recognize that Indian people have distinct ways of life that set them apart from other Americans. Their cultural survival depends on the protection and vitality of their tribal homelands. Therefore, protecting that environment and ensuring equitable environmental protection in Indian country and Alaska Native Villages is critical to maintaining the vibrancy of tribal culture.

The Agency will collaborate with tribes by tailoring environmental programs to protect the natural resources and traditional ways of life and to complement tribal government structures. The improvements and benefits of PPAs and PPGs are also available to tribes. As we strive to advance consistency and equitable environmental protection in Indian country and for Alaska Native Villages, EPA will promote development of metrics under all of our strategic goals that indicate performance and environmental results for tribes. Where we lack environmental data for Indian country, we will continue our work to reduce those data gaps.

Information

Accurate, timely, and usable information is the foundation for decisions and actions taken by EPA, states, and others responsible for protecting human health and the environment. Effective information management is vital to the success of EPA's mission, and contributes to the achievement of all Agency strategic goals. The federal community has recognized and commended EPA for ensuring that information investments are made wisely to achieve environmental results.

EPA's Cross-Cutting Environmental Information Strategy

Enhance environmental results through the improved use of quality environmental information by EPA decision-makers, states, tribes, other partners, and the public to:

- *Promote environmentally beneficial action*
- *Improve environmental decisions*
- *Promote more environmentally responsible attitudes*
- *Improve knowledge.*

EPA develops, collects, analyzes, and provides integrated access to information to promote more knowledgeable and environmentally responsible attitudes, decisions, and actions. EPA strives to provide the right information, at the right time, in the right format, to the right

people. This means making quality environmental and management information available for developing environmental policies and priorities. It means making environmental data publicly accessible to support individual and community involvement in decisions that can affect environmental quality and public health. And it means building the necessary infrastructure to provide secure information, reliable data, efficient and timely access, and analytic information tools.

New ways of conducting business are required to meet new, more complex information challenges, especially for EPA's vital responsibility to work with federal, state, and local partners to ensure homeland security. The Agency's cross-cutting information strategy, developed in the framework of the President's Management Agenda, is a three-pronged approach to meeting these challenges. To achieve EPA's mission, over the next 5 years EPA's information strategy will focus on:

Analytic Capacity—Providing access to new analytic tools that facilitate data interpretation and enable users to respond to environmental problems; assess risk; set priorities; make sound decisions; and manage for results, using integrated resource and performance information.

Governance—Adopting an Agency-wide approach to managing information, including administrative and programmatic systems, data, and investment priorities.

Excellence in Information Service Delivery—Working collaboratively with states, tribes, other federal agencies, and key stakeholders to improve the efficiency and utility of environmental information.

Finally, the need to make environmental information accessible and usable by the American public, including populations that have been historically disenfranchised, is critical to solving problems and addressing challenges.

Decisions regarding Agency information management can affect EPA employees; state, tribal, and local partners; and the regulated community. EPA employees rely on the Agency's information management systems, central information services, and special information resources to achieve the Agency's mission. EPA has adapted information models that show the clear linkages between information investments and achievement of efficient, effective environmental results. These logical models are part of the business case methodology that EPA uses to evaluate proposed investments in information technology.[1] We will continue to ensure that information technology and data initiatives directly support EPA's mission, and are fully coordinated within EPA and with the efforts of our federal, state, tribal, and local agency partners to avoid duplication, reduce burden, and increase effectiveness.

Analytic Capacity

Desired Outcome by 2008

Improved use of environmental information to strengthen EPA's, states', and the public's decisions.

Environmental data are most meaningful when examined from a holistic perspective, when users are able to examine all of the data about a particular situation, location, or source at once.

Integrated analytic capacity is fundamental to meeting the Agency's five goals. To meet the objectives under each goal, EPA, other federal agencies, states, tribes, and other partners require specific information on environmental and human health conditions and analytic tools capable of isolating specific stressors associated with those conditions. These capabilities must be designed to meet the needs of specific objectives—whether assessing global issues, such as stratospheric ozone depletion; regional issues, such as haze; state-level issues, such as watershed protection; or local issues, such as ambient air quality protection within a particular metropolitan area.

Improved capacity to integrate and analyze environmental data will support cross-media solutions to complex environmental and human health problems. Better analytic tools will also help EPA fulfill its homeland security responsibilities by providing a clear picture of spatial relationships and corporate ownership of regulated facilities.

What We Intend to Accomplish

Better analytic capabilities will help managers to assess existing baseline conditions, isolate data gaps and identify research needs, track the implementation of specific solutions, and develop methods for evaluating the results achieved. By 2008, EPA will provide analytic tools to support decisionmaking, results-based management, and the public's right to know. Over the next 5 years, EPA will:

- **Continue to implement the Environmental Indicators Initiative.** EPA will establish a set of performance indicators of environmental and human health conditions, to support assessments of the effectiveness of environmental programs.

- **Implement a suite of customized tools for emergency management.** These tools will deliver secure, reliable, and timely data access and communications to on-scene coordinators, emergency response teams, and investigators from field locations.

- **Continue to increase the availability of useful health and environmental information.** EPA will continue to implement the Toxics Release Inventory (TRI) Program to provide the public with information on releases of toxic chemicals to the

environment.[2] The Agency will build on the foundation of existing public access tools, such as Envirofacts[3] and Window to My Environment[4] (a geographic portal to community-based environmental information), by providing additional access to information collected by EPA, its partners and stakeholders, and the public.

Governance

EPA recognizes that successful organizations align technology, people, and processes with goals. Information governance is the Agency's strategy to ensure efficient, coordinated management of information assets across all EPA programs. An Agency-wide approach to information will allow EPA to make key information, technology, and funding investments that improve the efficiency and effectiveness of services and operations. Ultimately, this enterprise-wide approach to environmental information management will benefit EPA and its partners by streamlining access to and exchange of information.

Desired Outcomes by 2008

- *Improved Agency operations including the security, collection, and exchange of information by implementing an EPA-wide approach to managing technology and information.*
- *A highly diverse, well-trained workforce able to fully benefit from information technology investments and deliver quality and timely information products and services.*

In 1998, through the State/EPA Information Management Workgroup (IMWG), states and EPA committed to a partnership for building locally and nationally accessible, cohesive, and coherent environmental information systems. This commitment was codified in the IMWG's "Vision and Operating Principles." Improvements made through this partnership will help ensure that public and regulatory agencies have access to information to document environmental performance, understand environmental conditions, and make sound decisions that ensure environmental protection.

Now, with more than 5 years of joint experience, the IMWG has developed a more specific vision for how this partnership could be realized. The National Environmental Information Exchange Network[5] is expected to revolutionize the management of environmental information by improving the quality of environmental data, providing regulatory agencies and the public ready access to data, and increasing their ability to use this information to protect human health and the environment. The Network will be standards-based, highly interconnected, dynamic, flexible, and secure and will operate with the broad-based, voluntary participation of state environmental agencies and EPA. Over the next 5 years, EPA will:

- **Continue to develop its enterprise architecture.** Enterprise architecture involves identifying the business processes that support Agency goals, the data needed for measuring environmental results, and the technology that most efficiently secures and delivers the data. Enterprise architecture promotes wise investments in information technology.[6]

- **Continue to focus on partnering.** EPA will continue to strengthen emerging partnerships, identify collaborative goals, promote integrated planning, and foster interagency coordination with other federal agencies, states, and tribes. The foundation for meeting these goals is access to the collective data resources of all partners.

- **Improve existing governance processes.** EPA will continue to pursue an investment strategy to support a strong Agency information architecture program and investment management process, as outlined by the Federal Chief Information Officer Council and as required by the Clinger-Cohen Act.[7] The architecture and investment review processes that use integrated information systems or more advanced applications of the Exchange Network will govern funding for individual systems development and modernization.

Excellence in Information Service Delivery

Desired Outcome by 2008

Enhanced information integrity, analysis, and access strengthened by software tools and the collection of quality and appropriate data.

Information technology is transforming the way EPA conducts the business of environmental protection. But EPA faces information management challenges similar to those faced by many other private and public organizations. The Agency must continually adapt to emerging technologies, such as electronic-commerce and web services that enable organizations to become more productive, effective, and proactive in service delivery. Three major themes of change in information service delivery are streamlining management processes, linking data partners, and improving information access.

Streamlining Management Processes

EPA, like other public and private organizations, is exploiting information technology to streamline internal management processes. New administrative systems for financial, personnel, and program management will integrate data, eliminating database fragmentation and limited information access. Groupware applications are enhancing the traditional Agency workgroup

process by improving information flow, facilitating meeting scheduling, and encouraging more frequent team member involvement. In other organizational settings, changes such as these have been shown to deliver measurable improvements in the quality and efficiency of administrative work processes.

Linking Data Partners

Networks will link EPA to federal, state, tribal, and other public and private agency partners throughout the country to exchange policy, research, management, and performance information. In the U.S. economy, distributed network technology is quickly eliminating time and distance as obstacles to business collaboration. Today, vast webs of suppliers are able to contribute to work products in a global marketplace according to their specialized expertise. The result: greater innovation and resource productivity.

Improving Information Access

Explosive growth in data processing and storage capacity has opened up new opportunities for accessing data from multiple sources. Fine-resolution data from local monitoring organizations can be assembled into geographic information systems, providing holistic environmental pictures on large and small geographic scales. Mountains of data collected using advanced monitoring technologies in space, in the air, and on the ground can be placed at the public's fingertips in usable formats. Integrated public information has been shown to deliver bottom-line improvements in environmental programs, by closing the behavioral gap between environmental policy and private actions.

Improved information service delivery is key to the implementation of many of the objectives detailed under the Agency's five strategic goals. The utility of environmental information, from ambient monitoring data to compliance assistance material, will depend largely upon the Agency's ability to ensure that the right information is provided to the right user at the right time.

By 2008, EPA will increase the operational efficiency of all Agency business processes through the use of information technology. Over the next 5 years, EPA will:

- **Solicit partner feedback**. Through various techniques, EPA will solicit feedback to systematically improve information usability, clarity, accuracy, reliability, completeness, and scientific soundness.[8] Other efforts to improve information will include working with the Environmental Data Standards Council on developing and implementing necessary data standards and associated registries to improve the consistency, quality, and comparability of data managed in national environmental systems. EPA will require that data quality is known and appropriate for intended uses. Usability testing and customer

satisfaction baselines will ensure that the information the Agency provides is meeting the needs of its customers.

- **Streamline information collection.** Streamlining will help regulated entities meet regulatory requirements, while eventually easing burdens placed on states and the Agency to collect information. The Agency will continue to assess the information reporting burdens placed on its partners and on the regulated community, and will align information collection requirements with specific needs. EPA will improve the timeliness and completeness of requests for information by implementing an Agency-wide electronic records and document management system. The Agency plans to develop and acquire the necessary software and hardware to begin phased implementation of the system throughout the Agency.[9]

- **Continue to develop the Exchange Network.** The Exchange Network is a comprehensive, integrated information exchange program designed to strengthen the partnership and facilitate information sharing among EPA, states, other federal agencies, tribes, localities, the research community, and the regulated community. The Exchange Network will provide a wide range of shared environmental information and will improve environmental decisionmaking through increased availability of quality data, enhanced security of sensitive data, avoidance of data redundancy and conflict, and reduced burden on those who provide and those who access information. It uses an Internet-based, multimedia approach to environmental information exchange that is standards-based, highly connected, flexible, and secure. Additionally, through the National Environmental Information Exchange Grant Program begun in 2002, states and tribes will be better positioned to participate in the Exchange Network.[10]

  The Central Data Exchange (CDX)[11] is the electronic portal of the Exchange Network, through which information is securely received, translated, and forwarded to EPA's data systems. We anticipate that, by 2004, the CDX infrastructure will service 46 states, and more than 25,000 facilities, companies, and laboratories will use it to provide data to EPA electronically. By widely implementing an electronic reporting infrastructure, CDX will reduce reliance on less efficient, paper-based processes, resulting in reduced reporting burden and the creation of new opportunities for simplifying the reporting process. Electronic reporting through CDX will be possible for all of the national environmental systems. CDX will serve as the Agency's node on the Exchange Network, providing data exchange services for states and other EPA partners. The Agency will make strategic investments in the information infrastructure that supports our 10 regional offices.

- **Continue to focus on data quality.** EPA plays a key role in working with data partners to develop and promote consistent, complete, current, and reliable data to support full and effective information sharing, environmental monitoring, and enforcement. EPA will

continue to develop Agency-wide policies and procedures for planning, identifying data needs, documenting, implementing, and assessing data collection and use in Agency decisions. EPA will continue to work with data partners to develop and implement data standards. The Agency will also continue to implement its Information Quality Guidelines, to help ensure that information EPA provides to the public is of the highest quality.[12]

Federal Innovation in Information Management

All of EPA's emerging information capabilities will continue to support and further the President's Management Agenda Electronic Government (e-Gov) Strategy for improving service to individuals, business, and others while increasing efficiencies.[13] EPA will continue to collaborate with other federal agencies; states; tribes; environmental, public health, and research organizations; and local partners to expand Internet access, improve the quality of services, and drive down the cost of basic government functions. The approach of the e-Gov Strategy is to simplify processes and unify operations to better serve citizens' needs. EPA will continue to implement this vision and eliminate redundancies and overlaps in such functions as small business compliance, payroll and other resource functions, and geospatial information.

Overall, EPA is participating as a partner in 14 designated e-Gov projects and is the lead agency for the government-wide Online Rulemaking Initiative to make the rule-making process more transparent to individuals and businesses.[14] By implementing this information strategy, EPA will keep pace with the rapid advances in information technology and meet the growing demand for reliable, quality environmental information.

In addition, the Federal Financial Assistance Management Improvement Act of 1999 mandates that federal agencies work together to streamline grant application and reporting requirements for all grants and to develop a central electronic portal for grant application and reporting. EPA continues to deploy the Integrated Grant Management System that is moving the Agency from a paper-based grants culture to an electronic culture by fully automating the grants process within the Agency. The system will also be capable of exchanging data with the E-Grant electronic storefront for recipient application and reporting, creating an all-electronic grant process. Grant information will be available online to every grant manager and project officer in the Agency for better decisionmaking. The system, which supports tracking of grant milestones, products, and post-award management activities, will save time and resources by eliminating duplicate data entry, avoiding mail and photocopy costs, and reducing the time it takes to track grants or build and maintain separate grant tracking systems.

Innovation

EPA and many other environmental policy leaders see a critical need for environmental innovation.[15] The U.S. environmental protection system is widely recognized as one of the strongest in the world. For more than 30 years, this system has succeeded in cleaning up some of the most visible and egregious forms of pollution and has provided Americans with strong environmental and public health protection.

But that legacy of progress is challenged by an increasingly complex set of environmental problems, such as global climate change and polluted runoff, that will require a broader set of tools than we have relied upon in the past. At the same time, EPA and other agencies are experiencing the reality of tight budgets and pressure to be more accountable for results. Other factors spurring environmental innovation include the availability of powerful new information technologies that can advance environmental knowledge and public and private interests in making environmental management a value-added endeavor. Yet another factor is the need to address sustainability, environmental justice, and other issues with interwoven social, economic, and environmental dimensions. Together, such challenges make environmental innovation an absolute imperative.

EPA's Innovation Strategy

- Enable state and tribal innovation
- Use innovation to solve priority problems
- Develop problem-solving tools and approaches
- Create a culture and organizational systems to foster innovation

In 2002, EPA released a strategy to strengthen environmental protection through the power and promise of innovation. *Innovating for Better Environmental Results: A Strategy To Guide the Next Generation of Environmental Protection* is designed to drive innovation in environmental programs and provides a vision for what our environmental protection system should be.[16] That vision—one that is now widely shared in the environmental policy community—is for a system that puts more emphasis on results; that focuses on environmental responsibility, not just pollution control; and that uses multimedia approaches to address problems comprehensively rather than piecemeal. The system envisioned would rely more on incentives to motivate better environmental performance and on partnerships that help to leverage ideas and resources for greater environmental gain.

The Strategy's Four Elements

Developed in consultation with states, the Innovation Strategy consists of four interconnected elements that will enable progress toward this long-term vision and, in the shorter term, progress under EPA's *Strategic Plan*.

Promoting State and Tribal Innovation

The first element of the Innovation Strategy is designed to strengthen our partnership with states and tribes. With shared responsibilities for environmental programs, states and tribes are EPA's most important partners, and they share our interest in innovations that can improve results. The Innovation Strategy lays out a set of actions designed to enable state and tribal innovation. These include finding ways to improve the National Environmental Performance Partnership System and the Joint State/EPA Agreement to Pursue Regulatory Innovations—two policy tools that provide a means for jointly advancing innovation initiatives. Another priority is providing states with opportunities for earlier, more meaningful input in EPA's planning and budgeting processes, where decisions about resources for innovation are made.

Using Innovation to Solve Priority Problems

The second element focuses on using innovation to solve a set of priority environmental problems—greenhouse gases, smog, degrading water quality, and deteriorating water infrastructure. While there is a need for innovation in solving many environmental problems, these are especially important because they are persistent, widespread problems that are not being adequately addressed with the tools and approaches that exist today. From partnerships with industry sectors, to market-based trading programs that create an economic incentive for environmental improvement, to new information tools that support decisionmaking, the Innovation Strategy calls for a suite of creative approaches for making progress on these priority problems.

Developing Problem-Solving Tools and Approaches

The problems described in the previous section highlight the importance of continuously developing new tools and approaches that can expand and enhance environmental problem-solving. The third element of the Innovation Strategy focuses EPA on the continued development of tools that have already proven effective on a limited scale and that have applicability across many environmental programs. They include information tools that can improve our understanding of problems and solutions, environmental management systems (EMSs)[17] that can foster a more comprehensive approach to environmental protection, incentives that can motivate better environmental performance, environmental technologies that can improve results and lower costs, and performance measures that show how well innovations are working.

Creating a Culture and Organizational Systems to Foster Innovation

Finally, the Innovation Strategy focuses on what may be the most important element of all—creating a culture and set of organizational systems that foster innovation throughout EPA. The goal is to have each individual within the EPA workforce view his or her job more broadly, as an environmental problem-solver, a partner, a facilitator, and a leader, as well as a program implementor. Communicating results from innovations, rewarding the innovators, and ensuring that successful approaches are considered for broader replication are just some of the ways we will work to realize our innovation potential.

Innovative Approaches For Achieving National Goals

With its comprehensive focus and detailed plan for implementation, EPA's Innovation Strategy identifies a number of actions that will drive innovation throughout the Agency and ensure progress toward each of our national environmental goals.

Clean Air and Global Climate Change

From indoor environments to global climate change, EPA faces the challenge of developing air strategies that are workable on very different scales and for very different circumstances. We will meet this challenge by innovating in air programs, policies, and regulations. For example, our strategy for reducing smog calls for national leadership—creating new inherently innovative programs, such as the Clear Skies Initiative, a new market-based cap-and-trade program modeled after the acid rain trading program.[18] We will continue to develop new regulations where needed, but those regulations will be crafted in innovative ways to improve results, ease implementation, and decrease costs. Outside the regulatory arena, we will work to reduce smog and greenhouse gas emissions by developing new cleaner technologies and promoting the use of those developed by others. We are also creating a range of partnership and information programs to catalyze improvements across the nation.

But federal government actions alone are not the solution. That is why we will continue to work at the international, regional, state, tribal, and local levels, providing information and tools to empower individuals, community groups, air quality officials, and other interested stakeholders who want to work for cleaner, healthier air.

The Innovation Strategy also calls for management actions that will lead to more efficient and effective regulatory approaches to clean air. One action is to evaluate pilot projects that can show whether an innovation has value. For example, in the mid-1990s, EPA launched a series of innovative air permitting projects designed to streamline the regulatory process and foster pollution prevention. The results show that flexible air permits can help companies achieve equal or greater environmental protection, improve competitiveness, and encourage pollution prevention, while still retaining practicable enforceable capabilities.[19]

Over the years we have developed a number of innovative programs and new tools to achieve environmental improvements. Now the key is to learn from these innovative approaches and use our experience to create additional options for cleaning the air. In this way, we can tailor clean air strategies, using new and traditional tools, to ensure that we are using the approach that will achieve the best possible results.

Clean and Safe Water

The national water program focuses on watersheds—those naturally defined areas that encompass and affect our rivers, streams, and lakes. By looking at the watershed as a whole, rather than as a set of unrelated components, watershed management offers a more advanced and effective approach for improving water quality. To support this approach, the Innovation Strategy commits EPA to issuing a national policy on water-quality trading. This policy, along with a new policy on watershed-based permitting, will lead to more cost-effective approaches to meeting water quality goals. In addition, EPA has launched a new national Watershed Protection Initiative that, in its first year, awarded $15 million in grants to support protection and restoration activities in 20 priority watersheds.[20]

Another priority for the national water program—and one that can clearly benefit from innovative solutions—is water infrastructure. A 2002 EPA study revealed a critical funding gap for meeting U.S. wastewater and drinking-water infrastructure needs.[21] Recognizing this gap, the Innovation Strategy called for a national forum to discuss innovative management mechanisms, such as EMSs, that can reduce the life-cycle costs of infrastructure and more flexible financial mechanisms to fund improvements. EPA held that forum in January 2003,[22] and many of the ideas that emerged are reflected in this *Strategic Plan*.

Preserved and Restored Land

The Innovation Strategy's emphasis on testing, evaluating, and implementing innovative approaches to environmental problems; fostering a more innovative friendly culture within EPA; and working through partnerships and stakeholder collaboration will promote better waste management and the cleanup of contaminated waste sites. In particular, innovative tools and approaches will be used for land revitalization; consistency and enhanced effectiveness in site cleanups; and waste minimization, recycling, and energy recovery of hazardous and nonhazardous wastes.

Building upon the success of its Brownfields Program, EPA will pilot projects that integrate land reuse into all land cleanup processes, explore the use of innovative public and private property reuse and stewardship mechanisms, and actively seek out opportunities for policy reforms. We will do so by working with partners and stakeholders to enhance coordination, planning, and communication across the full range of federal, state, tribal, and local cleanup programs. These efforts will improve the pace, efficiency, and effectiveness of site cleanups, as well as more fully integrate land reuse into cleanup programs.

Recognizing that many changes have taken place since the Resource Conservation and Recovery Act[23] was passed, EPA is launching a national Resource Conservation Challenge that is designed to find flexible, yet more protective, ways to conserve our natural resources through waste reduction and energy recovery.[24] This new program will take a comprehensive, integrated approach that includes traditional waste management programs and lesser recognized avenues, inside and outside of EPA, for promoting waste minimization and natural resource conservation. This approach will involve forming diverse partnerships to test innovative approaches to waste reduction and to stimulate development of new environmental management infrastructure and technologies.

Healthy Communities and Ecosystems

The Innovation Strategy recognizes the value of community-based approaches that integrate environmental management with human needs, consider long-term ecosystem health, and highlight the positive correlations between environmental well-being and economic prosperity. Many actions planned under the Innovation Strategy demonstrate this kind of comprehensive, community-based focus. For example, the national air program is supporting the development of a regional strategy to comprehensively address multiple air quality problems, as well as economic growth, land-use patterns, transportation, and energy issues, in a growing urban area along the North Carolina-South Carolina border. Likewise, the national water program's watershed strategy will enable a more comprehensive, stakeholder-driven approach to achieving water quality goals.

The Innovation Strategy also calls for environmental protection tools and approaches that can be used to protect people, communities, and ecosystems. For example, improving the use and deployment of information resources and technology means we will have more powerful tools to make environmental management decisions. It will also enable us to give citizens information they can use in their own lives, and if they choose, to become more involved in environmental decisionmaking. The emphasis on developing results-based performance goals and measures will have similar consequences, creating information that agencies can use to manage programs and provide public accountability.

Finally, the plans for strengthening our partnership with states and tribes are designed to improve the environmental and public health effectiveness of our individual levels of government. Engaging states earlier in national planning and budgeting processes; facilitating state innovations; and reaching out to build working relationships with agriculture, transportation, and other agencies with environmental interests are just some of the means through which we will enhance protection for people, communities, and ecosystems.

Compliance and Environmental Stewardship

The vision described in the Innovation Strategy would raise the bar for environmental performance by creating an environmental protection system that encourages greater environmental stewardship across all parts of society. Getting there means finding ways to bring together compliance, pollution prevention, and environmental leadership initiatives in a way that facilitates environmental management and maximizes environmental results. It also means meeting the various needs that exist along the environmental performance spectrum, from the leaders who are pursuing advanced environmental improvements to those enterprises, such as small businesses, that require assistance in meeting regulatory responsibilities.

One way toward these ends is by working in partnership with industry sectors on tailored environmental management strategies that recognize the unique issues affecting their operations. Through its Sector Strategies Program,[25] EPA works with industries to address sector-specific barriers to improving performance and develop EMSs and other innovative tools that are designed with each sector's needs in mind. Sector-based programs enable EPA to better understand the industries we oversee and to tap into the creative thinking of others who can help us devise new and better ways of improving environmental and economic results.

The Innovation Strategy calls for more support and encouragement for environmental leaders by expanding the National Environmental Performance Track.[26] This unique program offers rewards and recognition for strong environmental performance. The Innovation Strategy focuses on making membership even more valuable by offering additional regulatory incentives and a higher level of membership for the very top performers. While the program clearly benefits members, its greatest value is in creating role models and mentors from whom other facilities can learn as they pursue their own environmental improvements.

The Innovation Strategy also recognizes the value of smart and strategic compliance assurance in helping companies meet their environmental responsibilities. To this end, it focuses EPA on using the full range of compliance assurance tools and combining them in ways that improve environmental management by regulated entities, maximize compliance, and address the needs of environmental justice communities. These integrated approaches include voluntary compliance incentives, such as the Audit, Small Business, and Small Communities Policies[27] to encourage self-auditing, reporting and correction; the use of EMSs in enforcement settlements to address serious environmental management problems; and creative supplemental environmental projects that return significant, tangible benefits to communities harmed by noncompliance.

The award-winning environmental results program represents another successful approach.[28] Pioneered by Massachusetts, this program merits expansion because it improves the performance of small businesses, results in savings for those businesses, and allows EPA and states to focus resources on priority environmental problems.

Providing smart, strategic compliance assurance also means providing additional tools to help facilities understand environmental laws and regulations. EPA partners with compliance assistance providers to provide easy access to compliance information through the National Compliance Assistance Clearinghouse and "virtual" compliance assistance centers that support specific industry sectors and national environmental program priorities.[29] These innovative resources harness the power of the Internet to meet small business needs. The Innovation Strategy will direct more attention to small business needs, starting with a national small business environmental summit and development of a comprehensive small business assistance strategy.

Managing Innovation at EPA

The complexity of today's environmental challenges, coupled with the need to achieve environmental results more cost-effectively, make environmental innovation an imperative. But innovation brings its own set of challenges. As EPA pursues new approaches for improving environmental results, we are faced with the difficulty of crafting multimedia solutions within a single-medium-based organization, the complexity of sharing responsibilities across several layers of government, and the need to maintain baseline environmental protections while still creating room for experimentation.

EPA's Innovation Action Council provides experienced leadership for addressing these and other challenges. This group of EPA's most senior career managers provides overall direction for innovation, demonstrated most recently through the development of the Innovation Strategy. The Innovation Action Council also helps resolve policy issues that invariably arise when exploring new approaches.

EPA is also making strategic organizational changes to support and facilitate innovation. In 2003, EPA formed a National Center for Environmental Innovation to advance innovation in environmental programs.[30] Combining staff who have led some of EPA's most innovative initiatives, and the Center has several unique roles. First and foremost, it is a focal point for strategic thinking on innovative approaches to environmental management and provides a point of contact for organizations that share EPA's interests in environmental innovation. The Center acts as a partner with organizations that want to test and evaluate innovative approaches and as a proponent for replicating innovations that prove successful. The Center also stays at the forefront of scientific, economic, and other social trends to bring the value of new developments to EPA's strategic thinking, planning, and management.

While the National Center for Environmental Innovation will foster innovation throughout EPA, there have been additional efforts within EPA's national programs. The national air program has established a Center for Excellence on Air Innovations/Futures to enhance information-sharing among EPA's regional air divisions. And the national solid waste

and emergency response program has realigned staff in a new innovation office that will help drive innovation in its programs and policies.

Together, these moves will ensure that EPA has the innovation leadership it needs to achieve better environmental results.

Human Capital

Protecting human health and the environment requires a diverse, highly skilled, and motivated workforce that seeks creative solutions to environmental problems and is committed to achieving excellence. To develop and retain such a workforce, EPA was among the first agencies to publish a human capital strategy. Issued in 2000, *Investing in Our People, EPA's Strategy for Human Capital, 2001 - 2003* [31] has guided our human capital efforts over the past few years.

We are now updating our human capital strategy to address the President's Management Agenda and to better integrate human capital issues into EPA's strategic planning for the coming 5 years. *Investing in Our People II, EPA's Strategy for Human Capital, 2003 - 2008*[32] (our updated "human capital strategy") will ensure that the Agency's workforce is high-performing, results-oriented, and aligned with our strategic goals and objectives for air, water, land, communities and ecosystems, and compliance and environmental stewardship.

Our updated human capital strategy will help us integrate workforce planning, employee development, and targeted recruitment with our ongoing strategic planning and resource management processes. By promoting strong national leadership and effective planning and implementation of human capital programs across the Agency, the human capital strategy addresses both our current and future workforce needs to accomplish our goals and objectives.

EPA's HUMAN CAPITAL STRATEGY

Vision

EPA has the right people, with the right skills, in the right place, at the right time to protect human health and the environment.

Values

EPA respects and values integrity, the trust and confidence of the public, diversity of cultures and thinking, competence, innovation, continuous learning, and sound science. We treat our people fairly and with respect, and we encourage a spirit of teamwork and the consistent practice of these values.

Human Capital Goals

1. Agency systems and organizational structures are well designed and work together to position and support EPA employees in accomplishing the Agency's strategic goals.

2. EPA attracts and retains a diverse and talented workforce.

3. EPA's employees are highly capable and perform to their highest potential to support the Agency mission.

4. EPA employees at all levels are results-focused, act with integrity, and help to improve environmental programs through innovation, creativity and reasonable risk-taking.

5. Teamwork and collaboration are routinely practiced with internal and external partners.

As part of the President's Management Agenda, the Office of Personnel Management (OPM) is leading the federal government's Strategic Management of Human Capital Initiative. New Human Capital Standards for Success,[33] developed jointly by OPM, the Office of Management and Budget (OMB), and the General Accounting Office (GAO), provide the foundation for this initiative.

Guided by our Human Resources Council (HRC), which is composed of senior leaders representing headquarters and regional offices, EPA is developing its human capital strategy to

address OPM's Human Capital Standards for Success. Our updated human capital strategy will help to ensure that EPA:

- Aligns its workforce to accomplish strategic goals and objectives to protect human health and the environment through effective integration of Agency-wide planning and management processes.

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- Conducts workforce planning and deployment at the regional and program levels and deploys employees or assigns work based on mission-critical needs.

- Maintains continuity of leadership and employee skills and competencies through strong knowledge management, employee development programs, and succession planning.

- Encourages a results-oriented workplace and culture by emphasizing performance management.

- Identifies, hires, and retains a diversity of talented individuals, using innovative and progressive tools for recruitment and retention.

- Evaluates its human capital programs to ensure they are data-driven, cost-effective, and held accountable for results by developing and linking program performance to organizational goals.

Aligning Our Workforce and Mission

Aligning EPA's workforce with our goals for protecting the environment and human health is a critical element of our human capital strategy. The Agency will accomplish this alignment in two ways: (1) by addressing human capital management issues under each of the Agency's five strategic goals and (2) by explicitly linking human capital activities with annual Agency-wide processes for strategic planning and budgeting. EPA will make planning, reporting, and accountability for effective human capital management an essential component of its Annual Performance Plan and Budget. Linking dollars, people, and skills will enable program managers across the Agency to develop a more complete assessment of the resources required to meet annual performance goals and strategic goals and objectives.

The HRC will communicate the Agency's vision for human capital to EPA employees at every level and will continue to provide staff with information on human capital planning activities. Concurrently, EPA's Senior Policy Council—composed of Assistant and Regional Administrators to address cross-cutting Agency issues—is expected to communicate human capital roles and responsibilities and inspire employee commitment to the President's and the Administrator's vision. Senior Policy Council members will also ensure that resources and tools

for sharing knowledge are available to their organizations and across the Agency and foster a culture of continuous learning. Both councils will support Agency efforts to develop performance measures for evaluating the effectiveness of EPA's human capital programs.

As we implement our human capital strategy, we will continue to benchmark other federal agencies' best practices and evaluate whether EPA should implement similar strategies or processes. We also expect to strengthen our human capital strategy as a result of our ongoing work with OPM, OMB, and GAO and to consider lessons learned to improve our strategies.

Planning and Deploying Our Workforce

Strategic workforce planning is integral to addressing many of EPA's human capital issues. We have identified 20 major occupations—each with a unique set of skills and competencies—to help the Agency align mission-critical work with the skills of its workforce. To facilitate this alignment, EPA developed a National Strategic Workforce Planning methodology and online support system and is in the midst of phased implementation.[34] The Agency's workforce planning system will enable line managers to make decisions on deploying employees with mission-critical skills and competencies both programmatically and geographically to fulfill EPA's mission. By 2005, EPA's workforce planning system, in conjunction with established Agency planning and budgeting systems, will support analysis and decision making for effectively managing human capital.

In making sound workforce deployment decisions, EPA recognizes the need to look beyond numbers of employees and their respective skills. We continuously examine environmental objectives, changing priorities, and emerging technologies. Our competitive sourcing efforts complement our human capital strategy by providing an opportunity to analyze the Agency's activities and increase the efficiency and effectiveness of our operations. We are examining those activities with potential for efficiency gains either through internal improvements or competition/direct conversion.

To leverage the skills and talents of our workforce, the Agency will evaluate innovations in human capital management for their potential nationwide. Examples include:

- *Assignments, Not Positions* Program. EPA Region 10 offers voluntary rotations every 3 years to encourage employees to swap jobs and learn about technical programs outside their immediate areas of expertise. Since 1996, approximately 70 employees have participated in each of the three *Assignments, Not Positions* exercises, and more than 100 people have moved to different organizations, bringing insights and fresh points of view to their new assignments.

- *The Senior Executive Service (SES) Mobility Program*: To develop our senior executives

and optimize their talents, EPA moved more than 60 executives into new positions across the Agency in 2002 through the SES Mobility Program. The Mobility Program concept may be extended to other EPA levels of management to strengthen leadership skills and provide exposure to programs across the Agency. Such flexibility supports continued development of EPA managers by challenging them with new learning experiences and broadening their view of the Agency. If implemented, these development opportunities would strengthen EPA's succession planning and management efforts as well.

EPA is using advances in information technology to improve managers' and employees' access to personnel data through its automated human resources information system, PeoplePlus.[35] Improved access to personnel data will help employees manage their careers and help Agency leaders make critical decisions in managing their organizations' human capital resources.

- *Employee Profiles* will provide employees with access to their official personnel records to update personal information, such as emergency contacts, home address/phone, handicap/special needs designations, and other business process-related information.

- *E-Development* provides web-based access for employees and managers to update/review training information, review/approve training enrollment, and document newly acquired skills.

- *The Manager's Desktop* gives supervisors and managers access to workforce information to facilitate organizational decision making. It also provides the connection for managers to initiate and track personnel action change requests electronically.

EPA is also supporting the President's government-wide E-Gov Internal Efficiencies and Effectiveness initiatives[36] to bring commercial best practices to key government operations. The Agency is an active participant in a number of government-wide human resources-related E-Gov activities:

- *E-Payroll* consolidates systems at more than 14 processing centers across government and eliminates duplication in purchasing enterprise resource planning software.

- *Enterprise Human Resources Integration* integrates personnel records across government electronically and reduces delays in processing security clearances.

- *Recruitment One-Stop* modifies *USA Jobs* to create an automated resource for federal government information and career opportunities. It allows for automated resume and assessment tools to route resumes, assess candidates, and streamline the federal hiring process, and it provides an up-to-the-minute status on job applications.[37]

EPA has annually awarded over half of its budget in grants to state, local, and tribal governments, educational institutions, and nonprofit organizations and uses grants as a key means to achieve its strategic goals. Therefore, we need grant specialists and project officers skilled in grants management. They will be responsible for reviewing, negotiating, and administering EPA's grant agreements—from pre-award review of applications, to post-award monitoring and final closeout.

Given our renewed emphasis on grants oversight, EPA must supplement our grant specialists' traditional skill set (i.e., grants processing) with a new competency centered on the business aspects of grants management. We will develop a standardized training program that, when fully implemented, will enable specialists to verify grantee compliance with procurement and other administrative requirements, identify unallowable costs, and ensure that the rare exemptions made to allow noncompetitive awards are appropriately justified.. In addition, we will improve accountability for grants oversight by requiring that grant specialists' and project officers' performance standards adequately address their grant management responsibilities.

Investing in human capital for grants management is linked to and complements EPA's human resources plan and the President's Management Agenda initiative on strategic management of human capital.

Managing Leadership and Knowledge

The loss of institutional knowledge that can result as managers and employees retire clearly highlights the need for effective systems to retain leadership and knowledge. To meet this need, EPA relies on three core strategies: (1) developing leaders throughout the organization, (2) promoting continuous learning, and (3) enabling knowledge transfer.

Through EPA's Workforce Development Strategy, the Agency develops leaders by offering programs centered on EPA's core competencies and the SES Executive Core Qualifications. Using classroom training, mentoring, coaching, and rotational assignments, EPA will continue to build its leadership capacity. As an increasing number of EPA's senior executives become eligible for retirement, our SES Candidate Development Program (CDP) will help to mitigate the loss of leadership, institutional knowledge, and expertise.[38] By 2004, over 50 highly qualified EPA SES candidates will graduate to replace the retiring SES corps. We will continue to strengthen the SES CDP to ensure continuity of leadership.

EPA is establishing a continuous learning culture that enables employees and managers to adapt to the rapidly changing political, social, and economic environment. Feedback systems are key to developing this culture. EPA's performance management system, PERFORMS (Performance Planning, Employee Rating, Feedback, Opportunity, and Recognition Management System), provides regular performance feedback to employees and helps them understand how their work aligns with the Agency's mission. To help Agency managers assess and improve their performance, EPA has implemented a 360-degree feedback program that enables employees and peers to provide feedback on managers' performance.

Evaluating EPA's human capital programs will provide feedback at the organizational level. In 2003, we evaluated our EPA Intern Program to assess its effectiveness in recruiting and preparing a diverse group of future Agency leaders.[39] In 2004, we will begin evaluating other EPA workforce development programs, and we will use the results to improve and refine our leadership development and knowledge management activities.

In addition, the Agency will use its workforce planning system to enhance its knowledge management activities by examining ways to access and link information on EPA expertise in selected skills and competencies. This capability will enable us to align our in-house resources and expertise with mission-critical projects.

Developing a Performance Culture

EPA is implementing three core strategies to build a results-oriented workforce and culture: (1) enhancing performance management, (2) fostering workplace diversity, and (3) improving employee-labor relations management.

In 1998, EPA redesigned PERFORMS to more clearly, simply, and easily communicate performance expectations to managers and employees. PERFORMS reduces administrative burden and minimizes paperwork for managers by providing broader spans of control and promotes more frequent, meaningful, two-way communication between supervisors and employees. An essential aspect of PERFORMS is separating cash awards from ratings of record, so that feedback and rewards occur not just at appraisal time, but throughout the year to highlight and reinforce excellence in a timely manner.

A variety of monetary and non-monetary awards are available to supervisors and managers to motivate or recognize individual employees, teams, or organizations for high performance. Although the Agency has pay and performance systems in place to provide timely feedback and pay for increased contributions, we are reviewing these systems to ascertain that skilled individuals are indeed attracted, encouraged, and rewarded for their high performance. We are also evaluating PERFORMS to confirm that the system improves communication between employees and managers and sets appropriate performance expectations. We will

continue to benchmark other federal and private-sector performance management systems for application in EPA.

EPA's National Diversity Action Plan Initiative[40] represents the Agency's strategy to ensure that all employees are treated equitably. EPA is educating its employees about diversity issues, promoting dialogue within every office to address and work through diversity concerns, recruiting and maintaining a diverse workforce, and developing and implementing concrete solutions to EPA's diversity issues. We are also expanding our targeted recruitment initiatives to identify well-qualified candidates for mission-critical positions.

EPA and its National Partnership Council are working to foster collaborative relationships between Agency managers, unions, and employees to improve working conditions, career development, and employee morale. We have established the Workplace Solutions Staff[41] to provide employees with one-stop service for preventing and resolving workplace conflicts, including informal mediation, conflict resolution, Alternative Dispute Resolution Awareness training, outreach, and consultation. The Workplace Solutions Staff coaches employees in dealing with workplace conflicts more effectively to resolve disputes before filing formal grievances or complaints. To improve labor management accountability, PeoplePlus provides modules to manage labor-employee relations by creating a corporate database for tracking labor-management agreements, decisions, and disputes.

Recruiting and Retaining Talent

In light of changing Agency priorities, the growing number of senior managers and employees eligible for retirement, and the increasingly competitive market for individuals with desirable or unique skills, EPA's human capital strategy emphasizes recruiting and retaining creative and talented people. We are using our workforce planning system to identify gaps in mission-critical skills, knowledge, and competencies, and we are employing a variety of human resource tools to recruit and retain a diverse and highly skilled workforce.

Toward this end, EPA is maximizing its use of special hiring authorities, incentives, and internship and fellowship programs. For example, to recruit and retain talented researchers and scientists, the Agency is examining the use of a pilot program to hire up to five researchers a year. Under the pilot, the Agency will be able to offer the competitive salaries needed to attract and retain world-class scientists and researchers. In addition, we are reviewing innovative pay strategies being used across government, focusing on pay structures; flexibility; and opportunities related to the Agency's workforce needs, program requirements, and job-market conditions.

We are also exploring flexible organization structures, collaborative work arrangements, multi-skilled teams, and options to promote a family-friendly, quality work environment. EPA is interested in reviewing the proposed civil service retirement system computations for part-time service, which would eliminate disincentives for employees nearing the end of their careers who would like to phase into retirement by working part-time schedules. This would allow EPA to retain senior staff in hard-to-fill positions as part of our succession planning/management effort.

In addition, EPA is using and will continue to use various human resource tools (e.g., voluntary separation incentives and early retirement authority) provided by the Homeland Security Act.[42] These tools provide more flexibility than do those offered under current regulations, and they may aid in reshaping the workforce when an organization's skill mix is no longer optimal for carrying out the Agency's mission.

Ensuring Accountability

To manage our human capital efforts effectively, the Agency has established and continues to improve its Human Resources Management (HRM) Accountability Program.[43] The HRM Accountability Program provides a template to ensure that all Agency employees, from the Administrator to EPA's rank and file, understand their human capital roles and responsibilities. EPA's senior political and career leaders are taking an active role in communicating EPA's human capital vision at all levels of the Agency. The HRC advises the Administrator and Deputy Administrator on human resource issues, maintains a sustained commitment to managing human resources within EPA, and oversees implementation of Agency-wide human capital initiatives and policies. The Senior Policy Council advises the Administrator and Deputy Administrator on cross-cutting Agency issues and helps to communicate the impact of human capital issues on the Agency.

EPA's human resource program managers in headquarters and regional offices ensure that employees are recruited and hired to meet Agency needs in accordance with merit-based principles and other civil service personnel requirements. Our new HRM Accountability Program ensures effective merit-based decision making by collecting substantive data that serve as a primary diagnostic tool and provide information on performance measurement indicators. Annual onsite reviews of human resources offices and delegated examining units will:

- Certify knowledge of, and compliance with, Merit System principles
- Identify the contribution that human resource management makes to organizational effectiveness
- Determine whether human resource management is accomplishing its objectives

- Establish a database that can assist managers in making human resource decisions
- Identify strengths and weaknesses of human resource programs and processes.

As a part of EPA's future human capital planning process, we will prepare annual human capital plans in concert with the Agency-wide process for developing Annual Performance Plans. Data-based planning and analysis required for Annual Performance Plans will rely heavily on the completion of EPA's workforce planning and allocation model to help programs identify the competencies needed to meet EPA's strategic and organizational goals. Annual human capital plans will present strategies for deploying the resources and workforce development tools needed to achieve EPA's goals and objectives.

We are also developing results-oriented performance goals and measures and a tracking mechanism to link the effectiveness of the human capital program with the Agency's environmental protection mission. These performance goals and measures will help to guide implementation of our human capital strategy, track our progress toward our human capital objectives, and evaluate our approach for aligning human capital with EPA's *Strategic Plan*.

Science

Today, scientific knowledge and technical information are more important than ever as we seek to understand, and successfully address, the increasingly complex environmental problems facing our Nation.[44] EPA has identified reliance on sound science and credible data among the guiding principles we will follow to fulfill our mission to protect human health and the environment. EPA depends on science, technology, and scientifically defensible data and models to evaluate risk, develop and defend protective standards, anticipate future health and environmental threats, and identify their solutions.

> "Sound science is the foundation of EPA's work. We rely upon science and technology to help us determine which environmental problems pose important risks to our natural environment, human health, and our quality of life."
>
> —Governor Christine Todd Whitman
> Administrator
> EPA Science Forum (May 2002)

To conduct science of the highest quality and relevance, we promote collaborative partnerships and expert peer review. Our approach to addressing science issues is centered on generating and using scientific information based on science priorities ("doing the right science") and sound science practices ("doing the science right"). We do this through partnerships with states, tribes, and other federal and international institutions and by producing scientific information of the highest

quality. The Administrator has named a Science Advisor to work across the Agency to ensure that the highest-quality science is better integrated into the Agency's programs, policies, and decisions.

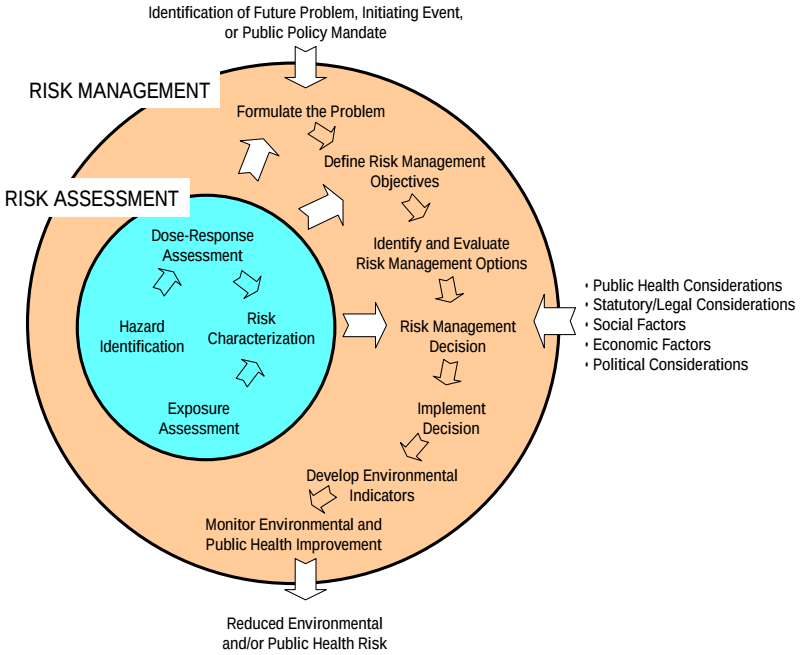

Figure . Risk Assessment Risk Management Paradigm[45]

Generating and Using Scientific Information

EPA's organizing principle for generating and using scientific information is the risk assessment/risk management paradigm (Figure 1). Risk assessment is the process that scientists use to understand and evaluate the relative size (magnitude) and likelihood (probability) of risk posed to human health and ecosystems by environmental stressors, such as air pollution or chemicals in drinking water. Risk assessments play an important role in Agency decisions and, as appropriate, they are integrated with other scientific information, such as economic data and engineering studies, as part of a complete scientific analysis to inform decisions. Risk management involves determining whether and how risks should be reduced. Scientific analysis taken together with nonscientific factors, such as public values, social factors, legal requirements, and statutory mandates, inform Agency management decisions and guide our actions.

The scientific data used in risk assessments are generated in research facilities, collected in the field, and compiled from the body of scientific literature. EPA creates and gathers scientific information through our laboratories, centers, and program and regional offices, and from external partners, such as states, tribes, other federal agencies, and the academic and regulated communities. Making environmental decisions built on sound science includes ensuring that scientific findings are properly described (characterized). To characterize scientific findings properly, the knowledge, assumptions, and uncertainties regarding the science must be clearly stated.

EPA Science Priorities Doing the Right Science

EPA determines its science priorities through coordinated science planning, while also taking into account the particular missions and mandates of individual programs. For example, EPA uses "analytic blueprints" to plan and guide scientific analyses throughout the regulatory decisionmaking process. Analytic blueprints lay out the sequence and nature of the scientific analyses and data needed to inform regulatory decisions. As more complex environmental science is included in the Agency's regulatory and nonregulatory decisionmaking process, EPA scientists are increasingly involved throughout the decisionmaking process and help determine additional research and analyses needed to ensure that EPA's policies are informed by the best possible science. For complex environmental management issues requiring close coordination across multiple programs and regions, EPA may develop Agency-wide science plans to ensure that the relevant science is available to inform its decisions and actions.

EPA's science is strengthened through regional organizations that provide field sampling, analytic and data management support, and quality assurance for Agency programs nationwide. EPA regions have developed special capabilities and expertise (Centers of Applied Science) based on unique geographic and demographic issues. Centers have been designated for ambient monitoring, environmental biology, chemistry, microbiology, and analytic pollution prevention methodologies. EPA's quality assurance programs ensure the integrity of environmental data by overseeing management of monitoring programs, approving data collection activity plans, and evaluating monitoring and laboratory practices. The fast pace of emerging technologies and science requires that Agency programs remain at the forefront of new analytic procedures, and developing and adapting analytic methods and procedures are increasingly important. These capabilities enable us to provide technical advice and assistance to our federal, state, and local government agency partners.

The Agency's research program is designed to conduct leading-edge research and foster the sound use of science and technology. EPA research both addresses specific needs to support Agency decisions and, by increasing our understanding of key processes—biological, physical/chemical, social, and others—that underlie and drive environmental systems, provides the generic scientific basis for responding to a wide variety of environmental problems.[46] Our research direction is described in research strategies and documented as performance measures in multi-year research plans. To ensure the quality of our research program, we use a coordinated, cooperative research planning process; rigorous, independent peer review; and interagency partnerships and extramural grants to academia to complement EPA's own scientific expertise. This approach allows EPA to keep its leading edge in environmental research and focuses our efforts and resources on those areas where we can add the most value toward reducing uncertainty in risk assessments and enhancing environmental management.

EPA is implementing the President's Management Agenda to improve research and development (R D) program management and effectiveness through our application of explicit R D investment criteria.[47] By carefully examining the relevance, quality, and performance of our research program, we are improving R D program management, better informing R D program funding decisions, and increasing public understanding of the possible benefits and effectiveness of the federal investment in R D. Agency R D programs strive to articulate *why* this investment is important, relevant, and appropriate. R D programs have well-conceived plans that identify program goals and priorities and links to Agency program and regional office needs, as well as to national needs.

EPA's specific science priorities, identified in each strategic goal in a separate science/research objective, are summarized below:

- **Goal Clean Air and Climate Change** Science priorities focus on emissions, fate and transport, exposures, mechanisms of injury, and health effects of criteria air pollutants. Activities include routine monitoring, air quality modeling, fuel and fuel additive toxicity testing review, and risk assessments. Air toxics priorities include developing and improving air quality models and source receptor tools; cost-effective pollution prevention and other control options; and scientific information and tools for quantitative assessment of nationwide, urban, and residual air toxic risks. Other significant activities include analyses of the impacts of atmospheric change, the collection and analysis of solar UV monitoring data, community-based assessments, and building surveys.

- **Goal 2 Clean and Safe Water** Science priorities address water quality and drinking water. Water quality priorities focus on approaches and methods to develop and apply criteria to support designated uses and to diagnose impairment of and protect and restore aquatic ecosystems. Drinking water priorities include assessing and managing risks to

human health posed by exposure to regulated and unregulated chemicals and pathogens, and protecting source waters and the quality of water in the distribution system.

- **Goal Land Preservation and Restoration** Science priorities focus on improving characterization, measuring, and monitoring methods; enhancing methods and models for estimating ecological effects; reducing uncertainty in human health and ecological risks; and developing more cost-effective and reliable remediation and treatment technologies.

- **Goal Healthy Communities and Ecosystems** Science priorities are wide ranging and comprise a variety of priorities among multiple program offices. These priorities include risk assessment/management of new and existing chemicals, protection of targeted aquatic ecosystems, refinement and enhancement of human health and ecological risk assessments, characterization of global climate change, development and support of emerging scientific advancements, and homeland security.

- **Goal Compliance and Environmental Stewardship** Science priorities are pollution prevention practices; new technology development; socioeconomics; and decisionmaking related to compliance, enforcement, incentives, monitoring, and innovative approaches to environmental stewardship and sustainable development..

In addition, EPA has identified cross-cutting science priorities that span several programs and help the Agency accomplish multiple science objectives. We have identified aggregate and cumulative risk assessment, genomics, computational toxicology, and susceptible subpopulations as high-priority cross-cutting activities. Advances in these areas will improve EPA's capability to predict and reduce potential human health and ecological risks under all five of the Agency's goals.

Aggregate and Cumulative Risk Assessment

Risk assessment is evolving from evaluating a single stressor in one environmental medium affecting one endpoint to considering aggregate and cumulative risks. Aggregate risk assessments consider exposure to a single stressor, such as a chemical, by multiple pathways and all relevant routes of exposure. Cumulative risk assessments describe and, where possible, quantify a wide variety of health and ecological effects from radiation, biological stressors, and chemicals. An example is the estimation of risks posed from concurrent exposure, through all relevant pathways and routes of exposure, to multiple chemicals that act the same way in the body. Cumulative assessments also consider characteristics of the population potentially at risk. These range from individuals to sensitive subgroups who may be highly susceptible to risks from stressors or groups of stressors due to their age, gender, disease history, size, or developmental stage.

Genomics

Advances in genetic toxicology will have an enormous impact on EPA's ability to assess potential risk. Our initial research is focusing on the use of genomics as a tool to identify and, ultimately, ~~to~~ solve human and environmental problems. Genomics examines the molecular basis of toxicity and develops biomarkers of exposure, effects, and susceptibility to chemicals and other stressors. Before genomics information can be used effectively in Agency risk assessments, such issues as accuracy, reproducibility, and data quality, and understanding whether a genetic change indicates an adverse effect, need to be resolved. An important goal for EPA is to use genomics approaches to provide data for the computational modeling of toxicological pathways for single chemicals or classes of chemicals ("computational toxicology").

Computational Toxicology

The Agency is enhancing the scientific basis and diagnostic/predictive capabilities of existing and proposed chemical testing programs by using *in vitro* or alternative approaches, such as molecular profiling, bioinformatics, and quantitative structure-activity relationships. These techniques will be used in attempting to determine genes that may be responsible for specific mechanisms of toxicity, diagnosing patterns of genes associated with known mechanisms of toxicity, and characterizing and modeling chemical structures associated with known mechanisms of toxicity, respectively. The term "computational toxicology" refers to using these alternative approaches in conjunction with highly sophisticated computer-based models. This approach is expected to greatly reduce the use of animal testing to obtain chemical toxicity information.

Environmental Indicators

EPA is committed to identifying, developing, and applying indicators that can improve our ability to assess environmental progress. While they complement more traditional process indicators, such as measures of emissions or discharges, these new "outcome" measures are intended to more closely reflect the actual impact on ecological or public health from environmental decisions and help clarify—quantitatively and qualitatively—the benefits and costs associated with further incremental improvements. Under ORD's Environmental Indicator Initiative, launched in November 2001, our research will result in a technical report that provides the scientific foundation for future *Reports on the Environment* and will identify additional scientific research and data needed to improve our ability to make sound human and environmental health decisions.

Susceptible Subpopulations

The Agency conducts a continuing research program to protect the general public as well as groups of individuals (for example, older people, children, and tribal peoples) who might be more sensitive/susceptible than the general population to the harmful effects of exposure to environmental agents (e.g., contaminants in drinking water). Studies conducted or supported by EPA to identify and characterize susceptible subpopulations can be described in the context of the various intrinsic (e.g., age, genetic traits) or acquired (e.g., pre-existing disease, exposure) characteristics that can modify the risk of illness or disease. Studies of susceptible subpopulations typically involve multi-disciplinary research and assessments to identify a range of possible adverse health effects, including cancer, reproductive toxicity, and gastrointestinal illness and other adverse health effects. Because of the importance and broad scope of this issue, EPA has established partnerships to leverage resources and capabilities with various federal and state agencies, universities, and other public or private research entities. Examples of activities at EPA include developing supplemental guidance to the cancer guidelines on cancer risk to children and prioritizing and studying environmental health hazards to older people.

EPA Science Practices Doing the Science Right

Equally important to doing the right science is doing it correctly. Sound science, as described by the Society of Environmental Toxicology and Chemistry, is "organized investigations and observations conducted by qualified personnel using documented methods and leading to verifiable results and conclusions."[48] The R D investment criterion of quality, mentioned earlier, refers to the Agency "doing the science right." Sound science or "doing the science right" means supporting, enhancing, and implementing sound science practices and approaches, such as peer review, quality assurance, science coordination, and oversight.

Peer Review

External review of scientific work products by qualified, independent, knowledgeable scientists enhances credibility, uncovers technical problems, identifies additional information needs, and ensures that conclusions follow from data using generally accepted scientific standards. The goal of the Agency's Peer Review Policy[49] is to enhance the quality and credibility of Agency decisions by ensuring that the scientific and technical work products underlying these decisions receive appropriate levels of peer review by independent scientific and technical experts.

External Advisory Groups

External advisory groups play an important role in "doing the right science" and "doing the science right." In particular, the National Academy of Sciences (NAS), EPA's Science

Advisory Board (SAB), and the Board of Scientific Counselors (BOSC) provide scientific and technical advice to the Agency. Each of these advisory groups is composed of a distinguished body of scientists and engineers who are recognized experts in their respective fields.

As chartered by Congress, NAS advises the federal government on scientific and technical matters and conducts studies for a variety of sponsors, including EPA.[50] The recommendations resulting from these studies are an important source of independent advice for Agency decision-makers and scientists.

SAB has a broad mandate to advise the Agency on technical matters.[51] Among its principal missions are reviewing the quality and relevance of scientific and technical information being used or proposed as the basis for Agency regulations; reviewing research programs and the technical basis of applied programs; and advising the Agency on broad scientific matters in science, technology, social, and economic issues.

BOSC's mission is to provide advice, information, and recommendations about ORD research programs.[52] Its specific responsibilities include evaluating ORD's science and engineering research, programs and plans, laboratories, and research management practices and recommending actions to improve their quality and/or strengthen their relevance to EPA's mission. BOSC also evaluates and provides advice on using peer review within ORD to sustain and enhance the quality of EPA's science and reviews ORD's program development and progress, research planning process, and research program balance.

uality Assurance

Quality assurance involves planning, implementing, and reviewing data collection activities to ensure that the data collected by, or on behalf of, the Agency are of the type, quantity, and quality needed. EPA's peer review policy and quality system are described in our Information Quality Guidelines, which outline how we maximize the quality, objectivity, utility, and integrity of our scientific information.[53]

Science Coordination and Oversight

The Science Policy Council (SPC) serves as a mechanism for addressing EPA's many significant science policy issues that go beyond regional and program boundaries[54]. To integrate the policies that guide Agency decision-makers in their use of scientific and technical information, the SPC works to implement and ensure the success of selected initiatives recommended by external advisory bodies, such as NAS and the SAB, as well as the U.S. Congress, industry, environmental groups, and Agency staff. Examples of SPC issues include: revision of the cancer guidelines to provide a current state-of-the-art approach for determining cancer risk, harmonization of cancer and noncancer risk assessment approaches, evaluation of toxicity testing approaches, and validation of laboratory methods.

The Risk Assessment Forum (RAF) is a standing committee of senior EPA scientists.[55] It was established to promote Agency-wide consensus on difficult and controversial risk assessment issues and to ensure that this consensus is incorporated into appropriate Agency risk assessment guidance. The RAF focuses on generic issues fundamental to the risk assessment process and related science policy issues.

Another effort to ensure Agency dialogue and coordination is the Council for Regulatory Environmental Modeling (CREM).[56] CREM was established to promote consistency and consensus between environmental model developers and users.

Meeting the Challenge

EPA intends to meet the challenge of advancing environmental science, and the use of this science in our decisions, by continuing and enhancing collaboration with states, tribes, and federal and international partners, and by measuring our performance through the use of environmental indicators and other measures.

Tribal Partnerships

The Tribal Science Council (TSC)[57] represents a new paradigm for how the Agency works with tribal governments. The mission of the TSC is to provide a forum for interaction between tribal and Agency representatives to work collaboratively on environmental scientific issues, including research, monitoring, modeling, information, technology, and training in Indian country. In conjunction with our tribal partners, the Agency is exploring a new approach, Health and Well-Being, that incorporates the cultural interconnectedness between tribes and the natural world into assessments and uses human and environmental health and well-being as its foundation. The TSC is committed to developing sound cross-media scientific approaches to support tribal cultural values and traditional ways of life and the availability of a healthy environment for present and future generations.

Other Federal Partners

Our emphasis on building partnerships also extends to our relationships with other federal agencies. EPA has ongoing partnerships with many federal agencies engaged in environmental research. We actively participate in the Committee on Environment and Natural Resources (CENR) of the National Science and Technology Council, which was established to foster and implement a coordinated multi-agency and interdisciplinary focus for federal environmental R D. Through partnerships with CENR members—such as the Departments of Energy, Agriculture, and the Interior and the National Institutes of Health—we can stay abreast of emerging technologies, evaluate new approaches, and provide a broad knowledge base to inform EPA decisions.

Achieving Results

EPA's approach to conducting and using science in service to the Agency's mission will ensure that Agency policies, decisions, and other activities reflect high-quality scientific information relevant to current and future environmental issues. We will accomplish this goal by ensuring that we work together, both across the Agency and with our partners, to identify the highest-priority science activities and that our work meets the highest standards of scientific excellence.

Homeland Security

The terrorist attacks of September 11, 2001, followed shortly by the deliberate use of anthrax to contaminate public buildings, brought into sharp focus the important role EPA has to play in helping America meet and defeat the threat of terrorism. EPA's role in environmental monitoring and remediation in lower Manhattan, along with the Agency's efforts to decontaminate the Hart Senate Office Building and other facilities on Capitol Hill, revealed the extent to which we will be on the front lines in the war against terrorism.

EPA's mission is clear: to protect human health and the environment. In pursuing this mission, we have developed certain unique scientific and technical expertise and possess additional capabilities that complement those of other federal agencies, including the new Department of Homeland Security.

The events of September 11 and thereafter led us to reassess our capabilities relating to national security and determine whether they can be enhanced to better protect the American people. Our role in homeland security reflects certain responsibilities given to the Agency under such laws as the Public Health Security and Bioterrorism Preparedness and Response Act of 2002,[58] several Presidential decision directives,[59] and the President's July 2002 National Strategy for Homeland Security.[60]

Organi ing the Work

EPA's homeland security efforts are centered on four main areas of responsibility: (1) critical infrastructure protection; (2) preparedness, response, and recovery; (3) communication and information; and (4) protection of EPA personnel and infrastructure. Each of these areas draws on expertise the Agency already possesses and expands on that experience to meet the challenges we face in protecting the Nation against the threat of terrorism.

Call-out:

EPA's homeland security efforts focus on

- *Protecting critical infrastructure*
- *Preparedness, response, and recovery*
- *Communication and providing information*
- *Protecting EPA personnel and infrastructure.*

Critical Infrastructure Protection

Under the National Strategy for Homeland Security, EPA is named the lead federal agency for protecting two of the Nation's critical infrastructure sectors: the Water Sector and the Chemical Industry and Hazardous Materials Sector.[61] In addition, the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 gives EPA specific responsibilities for promoting the security of the Nation's public drinking-water infrastructure.[62]

These missions draw on EPA's unique programmatic responsibilities and expertise related to the drinking-water and wastewater industries and the use, handling, storage, release, and disposal of chemicals and chemical wastes at industrial facilities. In addition, as a result of EPA's experience with air monitoring and indoor air quality issues, the then-Office of Homeland Security at the White House gave the Agency the lead for the Biowatch system. This system is being implemented in cities across the country to monitor for airborne release of certain biological contaminants.

In these areas, EPA is committed to assessing and reducing vulnerabilities and strengthening detection and response capabilities for critical infrastructures. In addition, EPA will contribute to similar efforts by other federal departments and agencies addressing food, transportation, and energy, and will provide environmental expertise to support federal law-enforcement activities. Among EPA's program offices involved in this area are the Office of Solid Waste and Emergency Response (OSWER), the Office of Water (OW), the Office of Research and Development (ORD), the Office of Air and Radiation (OAR), and the Office of Prevention, Pesticides, and Toxic Substances (OPPTS). EPA's goals for protecting critical infrastructure include:

- Work with the states, tribes, drinking-water and wastewater utilities (water utilities), and other partners to enhance the security of water and wastewater utilities.

- Work with the states, tribes, and other partners to enhance security in the chemical and oil industries.

- Work with other federal agencies, the building industry, and other partners to help reduce the vulnerability of indoor environments in buildings to chemical, biological, and radiological incidents.

- Help ensure that critical environmental threat monitoring information and technologies are available to the private sector, federal counterparts, and state and local governments to assist in detecting threats.

- Actively participate in national security and homeland security efforts pertaining to food, transportation, and energy.

- Manage its federal, civil, and criminal enforcement programs to meet our homeland security, counter-terrorism, and anti-terrorism responsibilities under Presidential Decision Directives 39[63], 62[64], and 63[65] and environmental, civil, and criminal statutes.

Preparedness, Response, and Recovery

Under the National Strategy for Homeland Security and various federal response plans, EPA has specific response and recovery responsibilities. As the Agency's experience since September 11 has made clear, we must expand and enhance our ability to provide response and recovery support to any future terrorist events. EPA will focus on strengthening and broadening its response capabilities, clarifying its roles and responsibilities to ensure an effective response, and promoting improved response capabilities across government and industry in the areas in which the Agency has unique knowledge, experience, and expertise. Among the program offices involved in this effort are OSWER, OPPTS, and ORD. To fulfill our responsibilities for preparedness, response, and recovery, EPA will:

- Be prepared to respond to and recover from a major terrorist incident anywhere in the country by maintaining trained personnel and effective communications, ensuring practiced coordination and decisionmaking, and providing the best technical tools and technologies to address threats.

- Communicate to federal, state, and local agencies its roles, responsibilities, authorities, capabilities, and interdependencies under all applicable emergency plans consistent with the National Strategy for Homeland Security and efforts undertaken by the new Department of Homeland Security. The Agency will also understand the roles, responsibilities, authorities, capabilities, and interdependencies of its partners.

- Support and develop the preparedness of state, local, and tribal governments and of private industry to respond to, recover from, and continue operations after a terrorist attack.

- Advance the state of the knowledge in the areas relevant to homeland security to provide first responders and decision-makers with the tools and scientific and technical understanding they need to manage existing and potential threats to homeland security.

Communication and Information

Comprehensive, accurate, well-organized, and timely information is critical to sound decisionmaking internally and to maintaining public confidence in times of threat. EPA possesses unique capabilities to collect, synthesize, interpret, manage, disseminate, and enhance understanding of complex information about environmental and human-made contaminants and the condition of the environment. Effectively managing and sharing this information within the Agency, among our partners at all levels of government, with the private sector, and with academia will contribute to the Nation's capability to detect, prepare for, prevent, protect against, respond to, and recover from terrorist incidents. Specifically, EPA will:

- Use reliable environmental information from internal and external sources to ensure informed decisionmaking and appropriate response.

- Effectively disseminate timely, quality environmental information to all levels of government, industry, and the public, allowing them to make informed decisions about human health and the environment.

- Exchange information with the national security community to prevent, detect, and respond to terrorist threats or attacks.

- Continuously and reliably communicate with employees and managers.

Protection of EPA Personnel and Infrastructure

The security and protection of EPA's personnel and infrastructure are critical to ensuring our ability to respond to terrorist incidents as well as continue to fulfill our mission. To further safeguard our staff, ensure the continuity of our operations, and protect the operational capability of our vital infrastructure assets, EPA is taking steps to:

- Safeguard its employees.
- Ensure the continuation of the Agency's essential functions and operations.
- Maintain a secure technology infrastructure capable of supporting lab data transport and analysis functions, continual telecommunications to all EPA locations, and management of critical data and information.
- Ensure that the Agency's physical structures and assets are secure and operational.

Coordinating the Effort

EPA's homeland security efforts are very much an extension of its traditional mission and involve a number of its program offices. To coordinate these efforts, the Agency has established the EPA Office of Homeland Security within the Office of the Administrator. This new office will serve as the central coordinating body in the Agency for homeland security and as a single point of entry for homeland security matters with other federal departments and agencies.

Working with the Department of Homeland Security and Other Partners

The new Department of Homeland Security is responsible for coordinating the various efforts of federal departments and agencies involved with homeland security. As an important partner of the Department of Homeland Security, EPA—through its program and regional offices—will work with the department on a host of homeland security issues, including critical infrastructure protection, research, and response and recovery. EPA's Office of Homeland Security will be responsible for ensuring that the Agency's various external efforts are properly coordinated and receive clear direction from the Office of the Administrator and other senior leadership.

Achieving Results

EPA is capable of meeting our homeland security mission without compromising our ability to fulfill our traditional mission. By keeping the operational aspects of homeland security in existing programs (as opposed to creating a new homeland security program office), EPA should realize numerous cross-cutting benefits from its homeland security work.

For example, our work in enhancing technologies for detecting chemical or biological contaminants that could be deliberately introduced into a public water supply might prove useful in detecting naturally occurring contaminants. Similarly, efforts to enhance our response capacity to meet the challenges of several simultaneous terrorist acts could help the Agency

respond more effectively, for example, to an accidental release at a chemical facility. As we continue to build our capacity to meet our homeland security responsibilities, we will bring our expertise and experience to bear in our efforts to protect human health and the environment under all of our strategic goals.

Economic and Policy Analysis

EPA's regulations and policies define the technical, operational, and legal details of many of the Nation's environmental programs. Each year, we issue hundreds of rules and policies—some routine and non-controversial, others dealing with complex, cutting-edge scientific issues or generating major economic benefits and costs. The quality of the analyses on which we base our decisions and the clarity of policies and regulations we develop determine how well environmental programs actually work and achieve health and environmental goals. Sound economic and policy analysis builds the foundation for EPA to meet its goals and use its resources wisely to do so.

To ensure that EPA uses sound analysis in developing priority regulations and guidance, we have adopted procedures to leverage cross-Agency expertise, emphasize early analytic planning, promote option development, and encourage timely management involvement. A recent review of our process for developing regulations found our current system to be well designed, but recommended several improvements, including strengthening economic and science analysis, considering a broader range of options, and increasing management attention.

To address these recommendations, we have developed a strategy for improving our internal processes. In particular, we will emphasize sound economic and policy analysis by continually investigating emerging analytic approaches and adopting them as appropriate, fostering consistent techniques across Agency programs, and ensuring that appropriate environmental results are achieved cost-efficiently. In addition, we have named an Economics Advisor who will work across the Agency to ensure that EPA uses the best economic science to support Agency regulations, policies, procedures, and decisions.

Achieving Environmental Results

Sound economic and policy analysis supports EPA's continuing efforts to quantify the benefits of its air, land, and water regulations, policies, and programs. For example, determining the value of ecological systems and the benefits of preserving these systems will be critical in our work toward healthy communities and ecosystems. Sound economic and policy analysis will also support EPA's goals for promoting stewardship and improved compliance by fostering consideration of such nonregulatory approaches as voluntary programs, innovative compliance

tools, and flexible, market-based solutions. Sound analyses help gain support for Agency decisions, allowing us to implement regulations, policies, and programs effectively and efficiently. In addition, our analysis of issues and priorities established under statute or by executive order that cut across Agency programs—such as small business and unfunded mandates—help us better understand the economic effects of various approaches and ensure that we use the Nation's resources wisely. Carefully allocating resources is particularly important today, as many states face severe budget constraints.

What We Intend to Accomplish

Our strategy for improving EPA's regulatory and economic analysis addresses several objectives: (1) to enhance the quality of Agency decisions; (2) to refine our analytic tools and capabilities and factor new analytic information into Agency rules and policies more effectively; and (3) to address priorities. To accomplish these objectives, our strategy emphasizes analytic planning, management involvement, cross-office participation, and public input.

Enhancing the uality of Agency Decisions

As suggested by our recent review of our regulatory development process, EPA is strongly committed to strengthening the quality and consistency of economic science and policy analysis supporting Agency decisions. Typically, EPA forms workgroups of technical experts to develop regulations and policies. We will strive to bolster workgroup expertise by engaging economists, policy analysts, scientists, and legal staff from offices across the Agency throughout the regulation and policy development process.

In addition, we will work to apply sound economic science and promote consistency. In FY 2001, following extensive peer review by the Economics Subcommittee of EPA's Science Advisory Board (SAB), the Agency released its *Guidelines for Preparing Economic Analyses*. In its final review report, SAB concluded that the guidelines "succeed in reflecting methods and practices that enjoy widespread acceptance in the environmental economics profession." EPA will work to ensure that staff across the Agency understand these guidelines and apply them consistently, and we will conduct internal peer reviews to ensure the quality of economic analyses prepared for economically significant regulatory actions.

Finally, we will identify and investigate key cross-cutting environmental policy issues. Historically, EPA has addressed environmental problems by medium—air, water, or land. However, many problems might be addressed more efficiently using holistic or multimedia approaches. We will continue to use economic and policy analysis to identify emerging environmental concerns, such as children's health, and assess cross-media, cross-program issues, such as Agency policy on mercury.

Improving Analytic Tools and Capabilities

EPA must use the most up-to-date, sound information and economic analysis methods in developing regulations and policies. We are working to advance the tools and techniques we can use to assess the effects of Agency actions, communicate with our partners and the public, and strengthen our regulations and policies.

In the coming months, the Agency will issue an *Ecological Benefits Strategic Plan* to provide a framework for using ecology and economics to evaluate the impact of policies and regulations. We will also establish a research agenda to better account for ecological impacts in benefit-cost analyses.

We are finalizing an Agency *Environmental Economic Research Strategy* that will draw together EPA research and establish our economic research priorities. Future research will focus on such topics as resolving issues associated with determining the value of reducing health risks; improving our cost estimation; and treating uncertainty in benefit-cost analysis.

Through our SAB affiliation, EPA will work closely with preeminent economic scientists. We will continue to consult with the SAB Environmental Economics Advisory Committee to ensure that our *Economic Guidelines* comport with current economic science in mortality risk valuation, uncertainty analysis, and ecological benefits valuation. Finally, to improve our staff's capability to provide sound economic and policy analysis, our internal Economics Forum will continue to address economic issues. We will train staff in such key areas as economic analysis guidance, children's health valuation, quantitative uncertainty analysis, and incorporating analysis in regulation and policy development effectively.

Addressing Policy Priorities

EPA actions are bounded by many policy priorities and initiatives, including Congressional priorities provided in environmental or other statutes, Executive Office priorities presented in executive orders, and Agency initiatives. We will use appropriate economic and policy analysis to further the Agency's policy priorities.

One such priority is reducing burden on small entities. Consistent with the Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act, EPA will consider the impact of its actions on small entities. When appropriate, we will continue to convene a Small Business Advocacy Panel with the Office of Management and Budget and

Small Business Administration. To date, EPA has convened 26 panels and continues to assess the need for additional panels.

In addressing our policy priorities, we will continue to promote innovative analytic approaches, work with our federal, state, tribal, and local government partners, and encourage public participation to ensure that Agency decision-makers consider a broad range of approaches and perspectives.

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Appendix 1
Social Costs and Benefits

Introduction

The Office of Management and Budget (OMB) requires that EPA include both social costs and budget costs of attaining each goal in its revised *Strategic Plan* under the Budget and Performance Integration initiative of the President's Management Agenda.[1] The Agency would like to have provided estimates of the social costs and benefits of attaining our strategic goals. However, such an analysis is infeasible, largely because EPA's economic models and tools have not been developed to estimate the aggregate costs or benefits of achieving the kind of ambitious, broad, long-term goals adopted in this *Strategic Plan*.

As part of its ongoing assessment of EPA's progress toward Budget and Performance Integration, OMB has recognized the methodological difficulties of estimating the future social costs of achieving our strategic goals. This appendix, therefore, describes the current social costs and benefits of EPA's programs and policies under each of our strategic goal areas for the year 2002. It is important to note that although the results are presented here by strategic goal area, they do not reflect the costs and benefits of achieving the specific strategic goals in this plan.

Scope and Methodology

The methods used here are generally based on those used in EPA's 1990 report, *Environmental Investments: The Cost of a Clean Environment*.[2] In that report, EPA presented a comprehensive assessment of the costs of environmental programs based on readily available data, including those from the U.S. Census Pollution Abatement Costs and Expenditures (PACE) survey.[3] Many parts of the analysis in this appendix draw upon the most recent version of this survey. The analysis in this report is also guided by EPA's *Guidelines for Preparing Economic Analyses*.[4]

The quantitative and qualitative analysis of current social cost and benefits includes regulations, programs, and activities that were substantially in place by 2002 and have achieved substantial compliance with standards or attainment of goals.

For the purposes of this report, we have defined *social costs* as nonfederal expenditures due to EPA policies, regulations, and programs. This includes compliance costs by the private sector as well as costs borne by state and local governments. It does not include the costs of "basic services," such as trash removal or sewer lines, under the assumption that these activities would occur regardless of EPA activities. Also, our definition of *social costs* is narrower than

that typically used by economists. Economists usually define *social costs* as all opportunity costs associated with resource use, which would include all relevant indirect effects throughout the economy. Additionally, we include in this report some expenditures that are better classified as transfers than as social costs.

This appendix is based on readily available information assembled in ways that are methodologically convenient. It draws upon existing data, reports, summaries, and studies of the costs and benefits of environmental regulation. While there are many studies that address these economic effects in part (e.g., regulatory impact analyses), studies that fully support the analysis of social costs and benefits for strategic goal purposes are not generally available. Even the most complete existing analyses, such as those estimating the benefits and costs of the Clean Air Act mandated under Section 812 of the 1990 Clean Air Act Amendments,[5] are substantially limited by current economic data and models.[6]

The benefits of environmental protection are particularly difficult to quantify and monetize for most EPA programs. Social benefits from EPA programs are diverse, ranging from reduced health risks to improvements in ecological services. Many of these benefits are quantified and monetized in this appendix, but many more are not. To offer a more complete picture of benefits, we have included indicators and qualitative descriptions when limitations in data and methods prohibited quantification and monetization.

Key Limitations of the Analysis

While this appendix presents an assessment of benefits and costs of EPA activities in the year 2002, it is not a benefit-cost analysis. A benefit-cost analysis would evaluate EPA activities over time and calculate the present value of future costs and benefits. Efficiency could then be gauged by comparing the present value of benefits with the present value of costs. An analysis of current costs and benefits, like this report, only presents information for a single year. The distinction between assessing *current* (single-year) costs and benefits and assessing the *present value of all* costs and benefits is important because even a program that is net beneficial may have costs exceeding benefits in any particular year. For example, a regulation promulgated in 2001 may result in compliance costs during 2002, but may not produce benefits until future years. This could be the case for a regulation that reduces exposure to carcinogens and leads to cancers avoided after a period of latency.

The cost and benefits estimates in this appendix cannot be aggregated across goal areas without some double-counting, due to the overlapping of many EPA activities. For example, the costs and benefits of enforcement activities are subsumed in the estimates under other goals because of compliance assumptions in analyses of specific programs in those goals.

Another complicating factor for aggregation is that our analysis draws on studies conducted at different times under differing analytic circumstances. While the methods and data used in the original studies are sound, given the resources available at the time each study was conducted, there are significant differences in their baselines, analytic methods, discount rates, and other critical analytic elements. As a consequence, aggregated results even within narrowly defined programs should generally be regarded as suggestive rather than conclusive.

This analysis was completed in a relatively brief period of time in order to be included with the *Strategic Plan*. The timeframe was much shorter than that provided for analyses that are narrower in scope and did not allow for a more thorough and rigorous assessment of all benefits and costs. However, this appendix has been subject to limited external peer review by four experts in economic analysis of environmental programs. Additionally, the appendix was subject to an internal Information Quality Guidelines pre-dissemination review. The appendix was subsequently revised. More information on peer review comments and supporting documents may be found on the website for the National Center for Environmental Economics (www.epa.gov/economics) following publication of this document.

Specific limitations and uncertainties associated with estimates of individual programs and Agency activities are detailed below. In many cases the appendix reports several separate estimates for individual programs under a goal area. Generally we have not added these separate estimates to produce an overall estimate for the goal area because of concerns about double-counting costs and/or benefits described earlier.

Appendix Overview

This appendix presents costs and benefits individually by strategic goal area. Under each goal we begin by discussing the scope of the analysis, describe the methodology and limitations, and then detail estimates of the goal's social costs and benefits.

Goal 1: Clean Air and Global Climate Change

The analysis of social costs and benefits includes EPA actions under the Clean Air Act Amendments of 1990, Titles I through VI. Analyses are provided for three source categories—point sources, mobile sources, and area source compliance—as well as for the compliance costs and benefits associated with the stratospheric ozone program.

Goal 2: Clean and Safe Water

This appendix reports the benefits and costs of programs under the Safe Drinking Water Act and the Clean Water Act. All actions evaluated under the Safe Drinking Water Act are regulations that improve the quality of drinking water in the United States. Clean

Water Act programs assessed in this report include industrial and municipal pollution control performance standards for point sources of pollutants.

Goal 3: Land Preservation and Restoration

Most of the activities associated with the Office of Solid Waste and Emergency Response, including Superfund, the Oil Spill Program, and activities under the Resource Conservation and Recovery Act and Underground Storage Tank program, fall under this goal. Quantitative and qualitative descriptions of benefits and costs are reported for each of these activities.

Goal 4: Healthy Communities and Ecosystems

The analysis includes EPA's pesticide programs, such as registration and re-registration, worker protection and certification, and ecological resource protection. The Toxics Release Inventory Program also falls under this goal, and the section provides an assessment of its costs and benefits.

Goal 5: Compliance and Environmental Stewardship

The analysis covers Office of Enforcement and Compliance Assurance activities, such as fines and penalties. As noted earlier, economists generally consider fines and penalties to be a transfer of resources rather than a social cost. However, for consistency and clarity, we have included these in the appendix as "nonfederal expenditures." Also included are pollution prevention programs under Office of Prevention, Pesticides, and Toxic Substances and the Office of Solid Waste and Emergency Response.

Goal 1: Clean Air and Global Climate Change

Discussion

Although the Office of Air and Radiation (OAR) administers several programs in addition to the Clean Air Act (CAA)[7] regulations, the estimates presented in this section are based upon assessments of CAA and the Clean Air Act Amendments of 1990 (CAAA).[8] Of OAR's programs and regulations, CAA- and CAAA-related activities generate the most significant costs and benefits. In addition, several programs, such as the radiation program, are voluntary and require no expenditures from private firms.

Methodology

To estimate the costs and benefits in 2002 of CAA and its Amendments, we rely upon the comprehensive economic assessments of the legislation that Congress requires the Agency to conduct under Section 812 of CAAA. To date, EPA has completed two reports to Congress in this series:

1. *The Benefits and Costs of the Clean Air Act: 1970 to 1990*[9] (hereafter "the Retrospective") was delivered to Congress in 1997

2. *The Benefits and Costs of the Clean Air Act: 1990 to 2010*[10] (hereafter "the Prospective"), which examines the benefits and costs of CAAA for the target years 2000 and 2010, was delivered to Congress in 1999.

Both of these reports address the full range of regulatory programs implemented pursuant to CAA, including measures to achieve compliance with all National Ambient Air Quality Standards (Title I of the Act); measures to control air pollutant emissions from mobile sources, primarily cars and trucks (Title II); measures to control the release of hazardous air Pollutants (Title III); measures to control acid rain, including the sulfur emissions trading program that primarily affects electric utilities (Title IV); permitting requirements (Title V); and measures to control pollutants that contribute to the depletion of stratospheric ozone (Title VI).

We generate separate cost and benefit estimates for CAA and CAAA and, for reasons noted in the appendix, we present only estimates based on the Prospective. While estimate-specific discussions appear in the appendix, for the most part estimates related to this appendix have been calculated by linearly interpolating estimates provided in the Prospective. We present estimates for three source categories—point sources, mobile sources, and area source compliance—as well compliance costs associated with Title VI of the Amendments.

Limitations

A variety of uncertainties and limitations are associated with the estimates discussed in the appendix. As previously noted, these estimates are not reflective of all of OAR's program.

Because of the comprehensive nature of the Retrospective and Prospective, an ideal measure of the social costs and benefits would reflect the combined effect of CAA and CAAA. The combined effect, however, is not necessarily represented by adding the estimates from the Retrospective to those from the Prospective. There are many reasons to expect that the cost estimates from the last target year in the Retrospective, 1990, overstate the costs that were incurred in 2002 for compliance with those regulations. The reasons include the cumulative effects of CAA and CAAA regulations that lead to co-control efficiencies, the cost-reducing

effects of 12 years of learning-by-doing, major advancements in technologies for extracting and using low-sulfur coal that reduces costs of all compliance, and a significant shift in U.S. economic activity away from higher-polluting manufacturing industries. As a result, attempting to extrapolate the cost and benefit estimates from the Retrospective to 2002 is too problematic to undertake. We therefore report only estimates from the Prospective. The likely effect on the cost estimates we report is that they are underestimated somewhat. The recent PACE survey suggests that the degree of underestimation in costs may be small. The likely effect on benefit estimates is a substantial underestimation, as the Prospective measures benefits relative to a baseline of CAA compliance.

The PACE survey suggest that the total point source costs of complying with CAA and CAAA are much less than the sum of the Retrospective and Prospective cost estimates and are close to those estimated for the Prospective alone. According to PACE results, point source expenditures in 1999 were $10 billion in 2002 dollars. Adjusting for inflation and increased abatement and prevention activity between 1999 and 2002, these costs would be $11.5 billion in 2002, which is significantly lower than the $44.4 billion sum of point source compliance costs as estimated in the Retrospective and Prospective analyses.

With regard to the benefit estimates, monetized social benefits include only improvements in human health, enhanced worker productivity, and increased recreational services and are not a complete picture of even these benefit categories. Further, OAR programs also generate ecological benefits that have not been quantified. It is also important to note that our estimates of annual benefits exclude the potentially substantial benefits of CAA regulations promulgated before 1990. The Retrospective estimates that annual benefits of CAA in 1990 were approximately $1.2 trillion in 1990 dollars, which translates to over $1.8 trillion in 2002 dollars. While we cannot reliably estimate the effects of a shift in economic activity away from more polluting activities, some of which may actually have been hastened by CAA, it is reasonable to expect that some substantial portion of this very large benefit estimate still applies in 2002. As a result, we expect that our estimates are a substantial understatement.

Summary of Results

A summary of the estimated costs and benefits appears in Table 1. Using a 5 percent discount rate, the estimated 2002 monetized benefits associated with OAR regulations and programs are $118.9 billion, while the estimated costs are $30.9 billion.

Table 1
Summary of 2002 Monetized Costs and Benefits of OAR Regulations and Programs
(billions of 2002 dollars)

Regulation or Program	Costs	Benefits
CAAA, Titles I through V	$29.1	$118
CAAA, Title VI	$1.8	$0.90
TOTAL, CAAA	$30.9	$118.9

Note: The above estimates were generated using a 5 percent discount rate, consistent with advice received by EPA from the Science Advisory Board panel that oversaw development of the section 812 reports. A discount rate sensitivity analysis performed in the Prospective found that annual costs in 2010 are 0.746 percent lower when the discount rate is 3 percent, but the analysis could only be completed for a subset of the relevant regulations. Because of the effect of a modeled cessation lag, the use of a lower discount rate would increase benefits.

Social Costs

We present CAA and CAAA cost estimates for three source categories—point sources, mobile sources, and area source compliance—as well compliance costs associated with Title VI of CAAA.

Point Sources

To estimate 2002 CAAA compliance costs, we linearly interpolated cost estimates from the 2000 and 2010 target years of the Prospective analysis. Table 2 shows the inflation-adjusted point source costs of CAAA for the two target years. Using the 2000 and 2010 data from the Prospective analysis, we estimated the annual change in costs for different types of point sources. Based on this per year average change, we estimate 2002 point source CAAA compliance costs of approximately $10.0 billion in 2002.

Table 2
Point Source Annual Costs of Clean Air Act Amendments of 1990
(millions of 2002 dollars)

Source Category	2000 Costs	2010 Costs	Estimated Annual Change	Estimated 2002 Costs
Non-utility Point Sources	$4,313	$5,056	$74	$4,461
Utility Point Sources	$4,610	$6,841	$223	$5,056
Permits	$446	$446	$0	$446
Total	**$9,369**	**$12,343**	**$297**	**$9,963**

Mobile and Area Sources

The Prospective presents 2000 and 2010 compliance cost estimates for both on-road and off-road mobile sources. We use these estimates to linearly interpolate 2002 compliance costs for motor vehicles and non-road engines. Mobile source costs for CAAA are approximately $19.2 billion in 2002. As was the case with point sources, cost estimates derived from the sum of Retrospective and Prospective analysis estimates may substantially overestimate total 2002 mobile source costs because of the reasons previously discussed.

We performed a separate calculation for area source compliance costs with CAAA. Our method for calculating area source costs related to CAAA was identical to our method for calculating mobile source costs.

Stratospheric Ozone

In calculating the costs of Title VI of CAAA in 2002, we used data that formed the basis of EPA's present-value stratospheric ozone cost estimate in the Prospective analysis. We present only the costs associated with compliance with Sections 604 and 606, as most of CAAA stratospheric ozone costs are associated with these sections. Adjusting the Prospective estimates for inflation, we estimate the 2002 cost of the stratospheric ozone provisions is approximately $1,752 million. However, the costs of the stratospheric ozone program are highest during its earlier years. By 2008, the last year covered in this *Strategic Plan*, annual costs of the program will have fallen by 36 percent.

Social Benefits

Monetized social benefits include improvements in human health, enhanced worker productivity, and increased recreational services. OAR programs also generate ecological benefits that have not been quantified. Benefit estimates are based upon the Prospective analyses of the legislation, which provides monetized benefits estimates for the human health and welfare improvements resulting from CAAA.

The Prospective analysis provides annual benefits estimates for the target years 2000 and 2010. To estimate the 2002 benefits of CAAA, we linearly interpolated the inflation-adjusted annual change in benefits between the years 2000 and 2010. Based on this average rate of change, we estimate 2002 health and welfare benefits of $118 billion (Table 3).

Table 3
Annual Benefits of Titles I through IV of the CAAA of 1990
(millions of 2002 dollars)

Source Category	2000 Benefits	2010 Benefits	Estimated Annual Change	2002 Benefits
Mortality	$93,686	$148,708	$5,502	$104,690
Chronic Illness	$5,562	$8,595	$303	$6,168
Hospitalization	$414	$775	$36	$486
Minor Illness	$1,538	$2,443	$91	$1,719
Welfare	$4,327	$6,186	$186	$4,699
Total	**$105,527**	**$166,707**	**$6,118**	**$117,763**

Notes: Mortality benefits include only the deaths of people who are least 30 years of age. Chronic illness includes chronic bronchitis and chronic asthma. Hospitalization benefits include all hospital visits due to respiratory and cardiovascular conditions, as well as asthma-related emergency room visits. Minor illnesses include acute bronchitis, upper respiratory symptoms, lower respiratory symptoms, asthma attacks, work-loss days, and several other conditions. Welfare benefits include enhanced worker productivity, increased recreational activity, and improved agricultural productivity. For a complete list of these minor illnesses, refer to Table H-5 of US EPA (1999).

Stratospheric Ozone

We estimated the annual benefits of the stratospheric ozone provisions of Title VI of CAAA with annual benefits data used to calculate the present value of benefits estimated in the Prospective. According to these data and adjusting for inflation, benefits are $893 million in 2002. Although the 2002 annual benefits are less than 2002 costs, most of the benefits of the

program will not be realized until after 2015. Estimates of annual benefits climb rapidly after 2015, to well over $1 billion annually through the end of the 21st century.

Goal 2: Clean and Safe Water

Discussion

EPA's programs related to this goal are primarily administered under the Safe Drinking Water Act (SDWA)[11] and Clean Water Act (CWA).[12]

In 2002, 14 federal regulations aimed at improving the quality of drinking water in the United States were in effect (see Table 4). These regulations require public drinking water systems to monitor for contaminants, provide finished water in compliance with maximum contaminant levels, install required drinking water treatment technologies, and inform their customers when water quality is compromised. In addition, these regulations impose primacy requirements on the states to implement and enforce these regulations. The public health issues addressed by these rules are far-reaching. They include, among other effects, avoided cancer cases, reduced incidences of acute gastrointestinal illnesses associated with microbial infections, and reduced incidence of brain damage associated with lead exposure in children.

With regard to surface water, EPA establishes industrial and municipal pollution control performance standards for point sources of conventional, nonconventional, and toxic pollutants. It charges states and tribes with setting specific water quality criteria appropriate for their waters and with developing pollution control programs, including controls on nonpoint sources, to meet them. The Agency also provides funding to states and communities to help them meet their clean water infrastructure needs. EPA's efforts to implement the CWA provide benefits to businesses that use water as an input and to households, which value water for a variety of services including recreation, aesthetics, existence, and fish consumption.

Methodology

<u>Safe Drinking Water Act</u>

To estimate the costs and benefits associated with SDWA, we relied on *Environmental Investments: The Cost of a Clean Environment* [13] (hereafter "*Cost of Clean*") as well as regulatory impact analyses, economic analyses, and *Federal Register* preambles associated with SDWA regulations. Specifically, the cost of compliance with the two earliest drinking water standards (the National Interim Primary Drinking Water Regulations[14] and the Total Trihalomethane Rule[15]) estimate is based on information from *Cost of Clean*, while the incremental cost of the remaining 12 regulations rely upon the other types of documents. For

each of these 12 federal regulations, the annualized capital cost was added to the annual operation and maintenance costs to derive an estimate of 2002 social costs.

An estimate of the benefits associated with the two earliest regulations is not readily available. For the purpose of this analysis, it is assumed that the annual benefits of these two rules are equal to the annual costs.[16] For each of the 12 regulations, the annualized benefits were applied to derive an estimate of 2002 benefits. In some cases, we were not able to monetize or quantify the estimated benefits of a regulation.

Clean Water Act

Cost estimates related to CWA are based on partial estimates through the mid-1990s from EPA's retrospective study of the costs of CWA[17] and are supplemented by data on water pollution abatement expenditures from PACE surveys, the Census of Governments through 2000/2001 for state/local spending, and EPA 2002 budget for information on federal spending.[18] Data through 1994 (industrial) and 2000/2001 (state/local) are extrapolated to 2002 using the methods described in the retrospective cost study. The retrospective study was also used for methodology and data to apportion total spending into the amount that would occur without CWA and the increment attributable to CWA. Data on capital expenditures are converted to annual capital costs by annualizing over the expected life of the capital equipment.

Spending is considered pursuant to an EPA program if the program prompting the spending is carried out by EPA or can be enforced by EPA. The estimate does not include most nonpoint source costs, the bulk of which are voluntarily initiated in response to incentive-based voluntary programs; however, these programs are also often heavily cost-shared. Likewise, it does not include clean water programs implemented by other federal agencies. We also assume that there would be some spending on water pollution abatement even in the absence of EPA programs.[19]

Limitations

Safe Drinking Water Act

To estimate the costs and benefits of SDWA programs, we used the economic analyses developed in support of 14 regulatory actions. While aggregating the values is comparatively straightforward, it is important to note that the approach taken in these analyses typically involves comparing the state of the world before the regulation to the state of the world after the regulation. This before-and-after approach ignores the potential for the future state of the world to be different than it is today even without the regulation. It is, however, analytically more tractable, since a sophisticated baseline forecast is not necessary.

Clean Water Act

To estimate CWA benefits and costs, we used a "with-and-without" approach that improves the quality of the baseline estimate by forecasting post-1972 spending in the absence of CWA by using exogenous macroeconomic variables as correlates and predictors of pollution control activities.[20] To estimate federal contributions that are not included in this social cost estimate, we subtracted the amounts provided for state, local, and private spending in EPA's 2002 enacted water program budget. There are certain clean water grant programs, subsidies, or tax expenditures administered by federal agencies other than EPA which may provide federal contributions toward state/local clean water activities. However, we are uncertain how much of this spending may simply fund basic services or further CWA activities. Furthermore, we did not separate some funds in EPA's water budget that are provided to state and local governments because state/local spending on these items was not considered to be pursuant to an EPA mandate in the first place. Finally, our process for extrapolating to 2002 from data series that end in 1994 (PACE) and 2000/2001 (Census of Governments) omits any increments of spending due to EPA programs or requirements that have ramped up sharply over this period.

There are also uncertainties and omissions associated with the CWA social benefit estimate. The partial estimate of benefits through the mid-1990s does not include improvements to the Great Lakes, ocean shorelines, bays and estuaries, and lakes and reservoirs; benefits from reductions in nonconventional and toxic pollutants and controls on nonpoint sources; or withdrawal benefits. These omissions likely result in a substantial underestimate of benefits. No benefits are counted for the National Toxics Rule (NTR),[21] state water quality standards for toxics not included in the NTR, or the Combined Sewer Overflow policy.[22] Only partial estimates were possible for other regulations implemented since the 1990s. Although EPA policies may be reflected in National Pollutant Discharge Elimination System permits by 2002, factors such as compliance schedules and historical contamination may result in a lag in realizing water quality benefits; compliance schedules may also mean that neither are costs fully realized by 2002.

Summary of Estimates[23]

The monetized portion of the benefits of SDWA programs are estimated to be between $4.8 billion and $13.5 billion in 2002, while the costs are estimated to be between $3.1 billion and $3.8 billion. The monetized portion of the benefits of CWA programs are estimated to be $12.8 billion, while the costs are estimated to be $11.2 billion. Potentially significant effects were not valued in monetary terms, in large part as a result of missing or incomplete data and/or methods. For example, the data, information, and/or methodologies required to reasonably estimate and monetize the benefits associated with CWA programs are often entirely unavailable, particularly with regard to ecological benefits.

Social Costs

Safe Drinking Water Act

The estimated social costs of SDWA programs are presented in Table 4.

Clean Water Act

Annual 2002 monetized social costs for the public and private sectors pursuant to EPA clean surface water programs implemented under CWA are presented in Table 5.

Social Benefits

Safe Drinking Water Act

The estimated monetized social benefits of SDWA programs are presented in Table 4.

Clean Water Act

Table 5 provides benefit estimates prepared in economic analyses or regulatory impact analyses for specific rules implemented since the 1990s. The retrospective study estimated partial annual benefits of $12.4 billion annually in the mid-1990s. These benefits are partial because they reflect only controls on point sources, controls on conventional pollutants, improvements to rivers and streams, and in place and existence benefit values. EPA has estimated the benefits of some of these missing elements, listed in Table 6:

- the Great Lakes Water Quality Guidance[24]
- the California Toxics Rule[25]
- effluent limitation guidelines for 7 industries.[26]

Adding in these benefits results in annual benefits of $12.7 billion to $12.9 billion. Moreover, EPA's benefit estimates reflect the fact that the technology-based effluent limitation guidelines program and the national pretreatment program has reduced the discharge of almost 700 billion pounds of pollutants each year.[27]

Table 4
Estimated 2002 Social Costs and Social Benefits of Drinking Water Regulations

Regulation	Year	Social Costs (millions of 2002 $)	Social Benefits (millions of 2002 $)	Other Benefits
National Interim Primary Drinking Water Regulations (47 *Federal Register* 9350, December 24, 1975)	1976-1979	$293.3	$293.3	*Estimates combined in 1990 Cost of Clean Report*
National Primary Drinking Water Regulation; Thihalomethane (44 *Federal Register* 68624, November 29, 1979)				
National Primary Drinking Water Regulations; Flouride (51 *Federal Register* 11396, April 2, 1986)	1986	$4.4	No estimate	Reduction in incidences of osteosclerosis and flourosis.
National Primary Drinking Water Regulations; Synthetic Organic Chemicals (Phase I) (52 *Federal Register* 25690, July 8, 1987)	1987	$63.4	No estimate	27 - 32 cancer cases avoided.
National Primary Drinking Water Regulations; Total Coliform Rule (54 *Federal Register* 27544, June 29, 1989)	1989	$86.3 - $102.4	No estimate	Identification of public water systems that are contaminated or vulnerable to contamination.
National Primary Drinking Water Regulations; Surface Water Treatment Rule (54 *Federal Register* 27486, June 29, 1989)	1989	$672.5 - $955.6	No estimate	Reduction in 83,194 cases of waterborne microbiological disease.
National Primary Drinking Water Regulations; Synthetic Organic Chemicals; Inorganic Chemicals; (Phase II) (56 *Federal Register* 3526, January 30, 1991)	1991	$147.3	$39.0 - $778.3	
National Primary Drinking Water Regulations; Lead and Copper (56 *Federal Register* 26460, June 7, 1991)	1991	$699.8 - $1,105.7	$4,016.8 - $6,215.1	Corrosion control extends the life of distribution system.
National Primary Drinking Water Regulations; Volatile Organic Chemicals (Phase IIB) (56 *Federal Register* 30266, July 1, 1991)	1991	No estimate	No estimate	280,000 reduced exposures to aldicarb, aldicarb sulfoxide, and aldicarb sulfone. 960,000 people will have reduced exposure to pentachlorophenol.
National Primary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals (Phase V) (57 *Federal Register* 31776, July 17, 1992)	1992	$59.7	No estimate	0.01 cases of cancer avoided per year.
National Primary Drinking Water Regulation; Consumer Confidence Reports (63 *Federal Register* 44512, August 19, 1998)	1998	$25.5	No estimate	Increased consumer awareness concerning source water protection. Encourages consumers to be more aware of decisions that affect their health.
National Primary Drinking Water Regulations; Disinfectants and Disinfection By-products (Stage 1) (63 *Federal Register* 69389, December 16, 1998)	1998	$676.7	0 - $4,324.2	Possibly reduces mutagenicity, kidney disorders, developmental effects, immunotoxicity, liver disorders, kidney disorders, and spleen disorders.

National Primary Drinking Water Regulations; Interim Enhanced Surface Water Treatment Rule (63 *Federal Register* 69478, December 16, 1998)	1998	$310.3	$376.2 - $1,732.9	Reduces the risk of outbreaks and exposure to other pathogens such as giardia.
National Primary Drinking Water Regulations; Radionuclides (65 *Federal Register* 76707, December 7, 2000)	2000	$86.4	$5.0	Avoidance of kidney toxicity due to reductions in exposure to uranium. Treatments may also reduce exposure to other contaminants.
TOTAL		$3,125.6 to $3,830.7	$4,730.3 to $13,348.8	

[1] All prices were adjusted to Year 2002 dollars using the estimated GDP price index as found in Historical Table 10.1 of the FY2003 Federal Budget.

Table 5 - Estimated 2002 Social Costs of CWA Programs (millions of 2002 dollars)

Item	Total CWA Prompted Public & Private Spending (Net of non-CWA Spending)	Federal Contribution	Social Costs Net of Federal Contribution ("nonfederal expenditures")
Industry:			
Capital	$3,156.3	$0.0	$3,156.3
O&M (net of cost savings)	$2,608.2	$0.0	$2,608.2
Public sewerage and wastewater treatment:			
Capital	$2,340.7	$1,599.5	$741.2
O&M	$4,401.8	$0.0	$4,401.8
Regulation and monitoring and other	$766.4	$604.8	$161.6
Research and development	$133.0	$55.5	$77.5
Public electric utilities	$93.9	$0.0	$93.9
Total	**$13,500.3**	**$2,259.8**	**$11,240.5**

Table 6 - Estimated 2002 Social Benefits of Surface Water Protection Regulations Implemented Since the Mid-1990s

State (rule)	Number of Facilities Affected	Annual Pollutant Loading Reductions	Annual Benefits (Millions 2002 $)
Water Quality Standards			
Great Lakes Water Quality Guidance (40 CFR 132) (OH, IN, PA, MI, MN, NY, WI) (GLI, final, 1995; assumed fully implemented by 2002)	Major municipal: 316 Major industrial: 272	5.8 million to 7.6 million toxic pounds-equivalent	Evaluated (human health-carcinogenic risks): $0.9 to $8.2 Not evaluated: human health-systemic risks, recreational fishing, commercial fishing, recreational swimming, recreational boating, nonconsumptive recreation, hunting, nonuse
Ohio (GLI, final, 1995; assumed fully implemented 2002) - case study	Major municipal: 3 Major industrials: 2	11,000 toxic pounds-equivalent	Evaluated (recreational fishing, recreational boating, waterskiing, sailboarding, and swimming, nonuse): $1.1* Not evaluated: human health
Michigan (GLI, final, 1995; assumed fully implemented by 2002) - case study	Major municipal: 18 Major industrial: 10	135,000 toxic pounds-equivalent	Evaluated (recreational fishing, wildlife viewing, waterfowl and other hunting, commercial fishing, human health-carcinogenic risks, nonuse): $4.9* Not evaluated: human health-systemic risks
Wisconsin (GLI, final, 1995; assumed fully implemented by 2002) - case study	Major municipal: 6 Major industrial: 13	824,000 toxic pounds-equivalent	Evaluated (recreational fishing, wildlife viewing, commercial fishing, human health-carcinogenic risks, nonuse): $5.5* Not evaluated: human health-systemic risks
Idaho (ID WQS, final, 1997; assumed fully implemented by 2002) (40 CFR 131.33)	Major municipals: 1 Major industrials: 5	14,772 to 70,000 toxic pounds-equivalent	Not evaluated
Alabama (AL WQS Phase 1, final, 1999; assumed fully implemented by 2002) (40 CFR 131.34)	Major municipals: 6 Major industrials: 5	29,000 toxic pounds-equivalent (does not include BOD reductions)	Not evaluated
California (CTR; 40 CFR 131.38) final, 1999; assumed fully implemented by 2002)	Major municipals: 128 Major industrials: 56	1.1 million to 2.7 million toxic pounds-equivalent	Evaluated (human health-carcinogenic risks, recreational angling-San Francisco Bay and freshwater, nonuse): $7.7 to $83.0 Not evaluated: human health-systemic risks, recreational angling-other estuarine resources, recreational boating, swimming, and related in-stream and stream-side activities, wildlife viewing, hunting Qualitative Evaluated: Nonuse (ecologic)
Effluent Limitation Guidelines			
Centralized Waste Treatment Effluent Limitation Guidelines (40 CFR Parts 136 and 437) (Final rule published December 22, 2000)	223 facilities	9.7 million pounds of conventional pollutant 9.3 million pounds of toxic and nonconventional pollutants	Reduced cancer risk: $0.08 - $0.45 Reduced Lead Health Risk: $0.54 - $1.75 Reduced Non-Carcinogen Hazard: Unquantified Improved Recreation Value: $1.35 - $3.84 Improved Intrinsic Value (including ecological conditions): Unquantified Reduced Biosolid Contamination at POTW Operation (Inhabition): Unquantified

State (rule)	Number of Facilities Affected	Annual Pollutant Loading Reductions	Annual Benefits (Millions 2002 $)
Commercial Hazardous Waste Combustor Subcategory (40 CFR Part 444) (Final rule published January 27, 2000)	8 facilities	170,000 pounds of pollutants	Recreational fishing $0.10 - $0.18 Nonuse (intrinsic) $0.05 - $0.18 Avoided cancer cases $0.02 - $0.10 POTW Operation (Sludge) Unquantified
Landfills Point Source Category (40 CFR Parts 136 and 445) (Final rule published January 19, 2000)	143 facilities	323,150 pounds of toxics pollutants 600, 000 pounds of conventional pollutants	Reduced cancer risk $0.002 - $0.01 Recreational fishing 0
Transportation Equipment Cleaning Point Source Category (40 CFR Part 442) (Final rule published August 14, 2000)	692 facilities	20,979,069 pounds of toxic pollutants 60,875 pounds of conventional pollutants 25,574,670 pounds of nonconventional pollutants	Cancer benefits $0.06 - $0.32 Recreational benefits $1.08 - $3.78 Nonuse benefits $0.54 - $1.84
Pesticide Formulating, Packaging, and Repackaging Point Source Category (40 CFR Part 455) (Final rule published November 6, 1996)	2,600 facilities	7,600,000 toxic pounds	Benefits not monetized: annualized costs are less than $100 million
Pulp, Paper, and Paperboard Point Source Category (40 CFR Part 430) (Published April 15, 1998 as part of the "Cluster Rule")	96 mills	AOX: 28,210 kkg Chloroform: 45kkg Dioxin and Furan: 125gm	Human health: $2.3 - $25.3 Recreation angling: $2.3- $21.85 Reduced sludge disposal cost: $9.2 - $18.4
Oil and Gas Extraction (Synthetic-Based Drilling Fluids) (40 CFR Part 435) (Final rule published January 22, 2001)	Gulf of Mexico: 1,047 shallow wells, 138 deep wells Offshore California: 7 shallow wells, 0 deep wells, Alaska: 6 shallow wells, 0 deep wells	118 million pounds of cuttings per year	*Cost savings: $52.8 million*

NA = not applicable.
1. Benefit estimates updated to 2002 dollars using the Consumer Price Index.
* Represents midpoint of the estimated range.

Goal 3: Land Preservation and Restoration

Discussion

In general, most of the activities associated with Office of Solid Waste and Emergency Response (OSWER) programs support EPA's Goal 3. Programs included in the analysis are: Superfund Emergency Response and Site Remediation under the Office of Emergency and Remedial Response (OERR); Resource Conservation and Recovery Act (RCRA) Prevention, Technical Standards, and Corrective Action; Oil Spill Response; Cleanup Program and Technical Standards under the Office of Underground Storage Tanks (OUST); Federal Facilities Restoration and Reuse; activities of the Technology and Innovations Office; 2002 Oil Pollution Prevention Revisions;[28] and Hazardous Waste Combustion maximum achievable control technology (MACT) standards.[29]

Three OSWER activities that support other goals are activities implemented by the Office of Brownfields Cleanup and Redevelopment to restore brownfields; chemical facility planning and preparedness under the Emergency Planning and Community Right-to-Know Act,[30] which is implemented by the Chemical Emergency Preparedness and Prevention Office; and waste reduction and resource efficiency efforts managed by the Office of Solid Waste (OSW). The brownfields and chemical facility activities support EPA's Goal 4, which entails the development and protection of healthy communities and ecosystems. OSWER's waste reduction initiatives assist in achieving EPA's Goal 5: Compliance and Environmental Stewardship. It is important to note that OSWER programs also contribute to the protection of water and air (i.e., by ensuring the proper management and rapid cleanup of volatile wastes and by encouraging pollution prevention). The limitations of available data, however, prevent the accurate assignment of benefits among multiple goals. Ideally, a broad benefits analysis would start with a discussion of what the benefits are and then associate (multiple) program activities with those benefits.

Methodology

These estimates reflect the compilation and interpretation of existing published data sources that estimate regulatory costs and benefits, adjusted to constant 2002 dollar estimates using the Bureau of Economic Analysis' (BEA) gross domestic product (GDP) deflator.[31] Consistent with the request by OMB, OSWER uses a simplified definition of annual social costs that includes all private and nonfederal public (i.e., state, tribal, and municipal) expenditures to implement OSWER regulations and programs.[32] Benefits include estimates of human health and ecological impacts that have been avoided as a result of OSWER programs, estimates of the costs avoided as a result of regulations preventing releases (e.g., emergency cleanup and response costs), and estimates of economic welfare improvements resulting from reduced waste-related pollution (e.g., quality of life).

To estimate private sector social costs, OSWER relied primarily on data from the 1999 PACE survey, adjusted to remove categories and costs that are not in response to OSWER programs. Where PACE data do not address specific costs (e.g., non-manufacturing industry hazardous waste management and underground storage tank cleanup costs) OSWER used available EPA data to estimate costs.

To estimate state and local government costs, OSWER relied on the Environmental Council of States' report, *States Put Their Money Where Their Environment Is (State Environmental Spending)*,[33] to estimate costs associated with hazardous waste management under RCRA; the *Regulatory Impact Analysis for the Final Criteria for Municipal Solid Waste Landfills* (Municipal Solid Waste Landfill RIA)[34] to estimate state and local costs associated with nonhazardous waste management; the Association of State and Territorial Solid Waste Management Officials' *Report Card on the Federal UST/LUST Program* (Report Card)[35] and OUST *FY 2001 and 2002 End-of-Year Activity Reports* (Activity Reports)[36] to estimate state administrative costs associated with the underground storage tank (UST) programs; and the *Economic Analysis in Support of Final Rule on Risk Management Program Regulations for Chemical Accident Release Prevention, as Required by Section 112(r) of the Clean Air Act* (EA of RMP Regulations)[37] to estimate state and local costs associated with chemical emergency preparedness and prevention. OSWER then adjusted these estimates to net out federal distributions through grants and cooperative agreements. To the extent possible, costs are allocated among specific OSWER programs using available reports on office activity and existing regulatory impact analyses (RIAs).

To estimate annual benefits, OSWER compiled benefits estimates from a number of existing published reports and adjusted them to constant 2002 dollars using BEA's GDP deflator.[38 and 39] Where possible, OSWER used comprehensive program-level assessments of benefits (e.g., the Oil Spill Program).[40] The analysis in this appendix estimates the total benefits of program regulations against a "without regulation" baseline. For programs that have not been able to perform a comprehensive assessment of benefits, OSWER used partial estimates of benefits based on assessments of specific regulations. RIAs provided a significant amount of information; our estimates draw from RIAs related to nine major OSWER regulations: the municipal solid waste landfill design criteria, RCRA Corrective Action, the five land disposal restriction regulations, and the technical standards for USTs.[41 and 42] However, RIAs do not address benefits related to voluntary OSWER programs and initiatives, and, in many cases (e.g., RCRA) RIAs provide only a partial estimate of benefits because RIAs do not address voluntary or pre-compliance efforts that change the baseline.[43] Several other available publications assess the effectiveness of various programs, and, in some cases, individual program Web sites provide additional information.

We use monetary estimates of benefits when available; however, for several types of benefits, available data are not monetized. In these cases, we identify or describe benefits

qualitatively. Due to limitations in environmental modeling and economic methodologies at the time that some of the available studies were developed, a significant portion of the benefits presented below are not quantified. As a result, the monetized and quantified benefits outlined below represent a lower bound estimate of the benefits associated with OSWER programs under Goal 3.

Limitations

Estimates of costs reflect a number of uncertainties. Several of these are associated with the 1999 PACE data, including that the 1999 PACE survey covers only a small number of non-manufacturing industries (i.e., mining and electric-power generation) in its estimate of total costs. To address this issue, OSWER used data on waste generation by small quantity generators along with other data to estimate cost for industries not covered in the 1999 PACE survey. Several assumptions regarding the calculation of private costs were also made, and these are detailed in the supporting documents to this appendix.

A number of general and important assumptions are reflected in the development of the cost and benefit estimates:

- **Representative Annual Costs:** In general, these estimates assume that the most recent reports of public and private sector environmental expenditures are indicative of expenditures today and in the near future. For private sector costs, the most recent comprehensive data source is the 1999 PACE data; use of this data source assumes that 1999 is "typical year" for private sector costs. Similarly, the use of 2002 state budget estimates assumes that 2002 is "typical year" for these costs.[44]

- **Baseline Practices:** This report addresses social costs and benefits that would not have occurred in the absence of OSWER programs. Therefore, total social costs are adjusted to exclude "baseline" expenditures (e.g., trash removal) that would have occurred absent regulation. In the case of benefits, estimates generally assume a "without regulation baseline" and do not require adjustment. However, estimates based on RIAs address only the benefits of incremental improvements at facilities in response to specific rules and do not address any additional benefits associated with facilities that complied prior to rule publication.

- **Voluntary Expenditures:** A portion of certain types of costs (e.g., brownfields redevelopment, pollution prevention, and recycling) likely represent voluntary business investments and do not necessarily result from OSWER programs. OSWER does not generally attempt to remove voluntary expenses from cost estimates, but does apply adjustments (i.e., offsets) to reflect cost savings and income associated with recycling and pollution prevention. In addition, social cost estimates do not include brownfields

restoration costs incurred by real estate developers, both because these costs are difficult to identify accurately and because some portion of these costs represent business investments. Finally, we do not include costs incurred by the waste management industry because a significant portion of these costs is likely reflected in waste disposal costs reported in the PACE survey.

- **Non-monetized Benefits:** Benefits estimates are in some cases several years old and do not capture recent advances in health and ecological science and economics that allow more comprehensive measures of the economic value of environmental changes. By not incorporating these advances, the available estimates likely understate known benefits that could be measured and valued today. Where known benefits cannot be monetized, they are described in quantitative or qualitative terms.

- **Non-characterized Ecological Benefits:** We are unable to provide a comprehensive quantitative analysis of ecosystem services (e.g., a description of the bio-physical functions preserved by OSWER programs, a discussion of the socially valuable services dependent on those functions, and an analysis of factors that contribute to the value of those services). Methodological limitations to a thorough assessment of ecological benefits include lack of quantitative information on ecological impacts and lack of "market" data on ecosystem services.[45] Ecosystem services are typically not traded in markets and have no revealed monetary value. Even when monetary estimates can be obtained, they require a great deal of data and tend to focus on only a subset of services. Available data did not support an effort of this scope.

Summary of Estimates

As summarized in Table 7, total estimated costs of programs under Goal 3 are approximately $7.7 billion. The largest contributors to estimated social costs are the RCRA Subtitle-C Prevention program ($1.9 billion) and RCRA Subtitle-D Technical Standards ($2.3 billion). Superfund Site Remediation costs are estimated at about $1.2 billion. While most of these costs are allocated to the specific sets of programs listed in this section, approximately $1.5 billion are included in the total, but cannot be so allocated. These are listed as "OSW: Other" in the summary table.

Benefits of programs supporting Goal 3 that can be monetized total almost $6 billion and are also summarized in Table 7. These benefits include lower incidence of cancer and other ailments, avoided cleanup costs and product losses, increased recreational opportunities, and ecological improvements. The Technical Standards Program from OUST accounts for almost all of the monetized benefits in Goal 3; uncertainty in estimating the benefits of this rule results in the range reported. However, many of the benefits of programs under this goal are not monetized in this report due to the limitations described in the previous section. These nonmonetized

benefits are diverse and range from large numbers of reduced cancers and other health effects to the preservation of animal habitat and ground water. Nonmonetized benefits are detailed below for specific sets of programs.

Social Costs

Superfund Emergency Response and Oil Spill Response

The quantitative cost estimates of these programs are included in the analysis of RCRA Prevention and Technical Standards and OUST Technical Standards, as indicated in Table 7. These costs are not estimated separately.

RCRA Subtitle-C Prevention and Corrective Action, and Subtitle-D Technical Standards

Current annualized costs of these programs total approximately $4.3 billion $2.3 billion of this total is associated with Subtitle-D Technical Standards, while Subtitle-C Prevention contributes about $1.9 billion of the total. The remaining $136 million is associated with Subtitle-C Corrective Action. State and local costs associated with the Corrective Action Program are not estimated separately, but are included in the other RCRA estimates.

OUST Technical Standards and Cleanup Program

The costs of these OUST programs is estimated at $917 million. The OUST Cleanup Program accounts for $874 million of this total, most of which are costs to state and local governments. OUST Technical Standards account for $42 million in estimated costs. Private cost estimates for the OUST Technical Standards Program are not estimated separately.

Superfund Site Remediation and Federal Facilities Restoration and Reuse

The total quantified social costs for this set of programs is around $1.2 billion, all of which are from Superfund Site Remediation. Most of this cost, about $870 million, is to the private sector. Costs associated with Federal Facilities Restoration and Reuse fall on state and local governments and are believed to be minimal.

Technology and Innovations

Social costs for programs under OSWER's Technology and Innovations Office are believed to be minimal and are not included quantitatively in the total.

Social Benefits

Superfund Emergency Response and Oil Spill Response

Monetized benefits for Oil Spill Response are estimated at $51 to $199 million, while benefits from Superfund Emergency Response are not estimated quantitatively. Non-monetized benefits from these programs include lower maintenance costs for drinking water systems, reduced third-party damages, diminished cancer risk, improved ability to deter terrorism and mitigate its consequences, and the avoidance of uncertain or unanticipated risks. Non-monetized benefits from Superfund Emergency Response arise from the relocation of 1,800 people away from pathways of exposure and the provision of safe drinking water to 9,100 people.

RCRA, Subtitle-C Prevention and Corrective Action, and Subtitle-D Technical Standards

Benefits for RCRA Prevention, Corrective Action and Technical Standards Programs are diverse and substantial, but are not monetized. In total, the non-monetized benefits of these programs include 10 to 11 fewer cases of cancer each year and approximately 150 fewer cases of other illnesses. These may be conservative estimates of benefits. RCRA Corrective Actions may also lead to 102 fewer cancer cases per year and over 98,000 reduced non-cancer illnesses. Additional benefits arise from long term protection of ground water and land for future use, reduced ecological impacts from location of facilities, restoration of ecosystems, reduced releases of waste near sensitive systems, and avoided costs of replacing contaminated drinking water.

OUST Technical Standards and Cleanup Program

Monetized benefits are estimated only for the OUST Technical Standards Program. These benefits total approximately $5.9 billion, which accounts for most of the monetized benefits of Goal 3 programs. Other benefits include reduced cases of cancer and non-cancer health effects, as well as long-term protection of ground water. Benefits also arise from approximately 13,600 fewer tanks per year releasing pollutants into streams, particularly into small, vulnerable streams. Benefits from UST Cleanup are not monetized, but include avoided fires and explosions, reduced health risks from drinking water contamination, and long-term protection of ground water for future use.

Superfund Site Remediation and Federal Facilities Restoration and Reuse

Benefits from these programs are not monetized but include reduced cancer incidences and mortality, fewer birth defects, and reduced lead exposure and associated health effects. These programs also increase agricultural productivity and restore ecosystems, leading to improved water filtration, erosion control, and enhanced recreational services. These programs

also improve regional land-use patterns leading to preservation of open spaces that would otherwise be developed and to local revitalization.

Technology and Innovations

Benefits from programs under the Technology and Innovations Office of OSWER are reflected in reduced remediation costs. Non-monetized benefits from these programs include information from 120,000 documents per year distributed to stakeholders and information to 14,000 individuals reached monthly via *Tech Direct*. Additional benefits result from training 6,100 federal and state cleanup professionals per year and the development and adoption of several technologies that quicken the pace and lower the cost of site analysis and remediation.

Table 7
SUMMARY OF MONETIZED COSTS AND BENEFITS OF OSWER GOAL 3 PROGRAMS
(millions of 2002 dollars)

Office and Program	State and Local Cost Estimate	Private Cost Estimate	Total Cost Estimate	Monetized Benefits [a]
OERR: Superfund Emergency Response	*Included elsewhere in table*			*Not monetized*
OERR: Oil Spill Response	*Included elsewhere in table*			$51.2 - $119.5
OSW: RCRA Subtitle-C Prevention	$179.8	$1,693.8	$1,873.6	*Not monetized*
OSW: RCRA Subtitle-C Corrective Action	*Included with RCRA Subtitle-C Prevention*	$136.0	$136.0	*Not monetized*
OSW: RCRA Subtitle-D Technical Standards	$1,138	$1,116.8	$2,254.8	*Not monetized*
OSW: Other (recycling, pollution prevention, other expenditures and payments)	*None*	$1,467.0	$1,467.0	*Not monetized*
OUST: Technical Standards	$42.6	*Included in Total*	$42.6	$5,868.1
OUST: Cleanup Program	$826.8	$47.9	$874.6	*Not monetized*
OERR: Superfund Site Remediation	$319.7-$366.1	$872.9	$1,192.6 - $1,239.0	*Not monetized*
Federal Facilities Restoration and Reuse	*Minimal*	*None*	*Minimal*	$12

Table 7
SUMMARY OF MONETIZED COSTS AND BENEFITS OF OSWER GOAL 3 PROGRAMS
(millions of 2002 dollars)

Office and Program	State and Local Cost Estimate	Private Cost Estimate	Total Cost Estimate	Monetized Benefits [a]
Technology and Innovations Office	*None*	*Minimal*	*Minimal*	*Not monetized, or reflected in reduced costs*
Total Monetized Costs & Benefits	**$2,351.7 - $2,388.1[b]**	**$5,334.4**	**$7,686.1 - $7,722.5**	**$5,931.3 - $5,999.6**

[a] Does not include non-monetized benefits of OSWER programs.
[b] This total estimate includes an adjustment of $165.2 million to account for federal grants to support state and local waste programs.

Goal 4: Healthy Communities and Ecosystems

Discussion

This goal is supported by a wide variety of EPA programs. As is the case for the other goals, the estimates and discussion of social costs and benefits we provide here cover only a portion of the objectives included in Goal 4. The EPA programs under Goal 4 for which we have some information on social costs and/or benefits include:

- *OSWER, Chemical Emergency Preparedness and Prevention Office (CEPPO) Risk Management Plan Program*. CEPPO implements provisions of the Emergency Planning and Community Right-to-Know Act,[46] designed to prevent or ensure effective emergency response to chemical spills, including any caused by acts of terrorism.

- *The Office of Prevention, Pesticides and Toxic Substances (OPPTS), Office of Pesticide Programs (OPP)*. OPP, with assistance from its regional offices and state and tribal partners, protects human health and the environment from unreasonable risks associated with pesticide use, while ensuring that human health and economic welfare are protected from damages caused by insects, weeds, and other pathogens. OPP regulates pesticides under two statutes. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[47] requires that pesticides be registered (licensed) by EPA before they may be sold or distributed for use in the United States and that they not cause unreasonable adverse effects to people or the environment when used according to EPA-approved label

directions. Under the Federal Food, Drug, and Cosmetics Act (FFDCA),[48] as amended by the Food Quality Protection Act (FQPA),[49] EPA sets tolerances for pesticide residues in food and must ensure that there is a reasonable certainty of no harm to human health as a result of pesticide residues in food.

- *OPPTS, Office of Pollution Prevention and Toxics, Lead Safe Housing Program*. Lead-based paint in houses built prior to 1978 is the largest remaining source of lead exposure to Americans. Individuals, especially children, can be exposed to high levels of lead from deteriorating lead-based paint or during remodeling of older housing. The Residential Lead-Based Paint Hazard Reduction Act of 1992[50] added a significant new section to the Toxic Substances Control Act (TSCA),[51] requiring EPA to develop a series of regulations concerning lead paint abatement, including hazard identification, laboratory procedures, training requirements, and information programs. No EPA program requires that any lead paint abatement be undertaken, but the TSCA program does ensure that all abatements that occur are done correctly and safely.

- *OPPTS, Office of Pollution Prevention and Toxics, Asbestos Regulations*. Long-term exposure to asbestos can lead to fatal lung disease (asbestosis) and cancer, among other respiratory diseases. EPA's asbestos program for schools,[52] which also includes guidance for owners of other buildings,[53] regulates the inspection of in-place asbestos insulation, as well as the proper removal and disposal of asbestos if necessary or during remodeling.

- *OPPTS, Office of Pollution Prevention and Toxics, New Chemicals Program*. EPA's New Chemicals Program functions as a "gatekeeper" to ensure that new chemicals being introduced into commercial use in the United States pose low risk or manage risk properly. Entities considering manufacturing or importing a new chemical must notify EPA of their intent by filing a Pre-Manufacture Notice (PMN), through which they provide EPA with information about the chemical's use, potential volume, possible health risks, disposal practices, and human exposures. EPA reviews the information in the PMN and determines what procedures manufacturers must follow if they begin to manufacture or import the chemical commercially.

- *OPPTS, Office of Pollution Prevention and Toxics, Existing Chemicals Program*. The Existing Chemicals Program collects data on the toxicity, health risk, safety, and exposure characteristics of chemicals and mixtures used in the United States. The Inventory Update Rule (IUR)[54] requires manufacturers and importers of certain chemical substances included on the TSCA Inventory to report current data (in 4-year cycles) on the production volume, plant site, and site-limited status of these substances. Data not considered to be confidential business information (CBI) are made accessible to the public. All the data, CBI and non-CBI, are intended to provide input for efforts to

evaluate and manage risk from exposures to these chemicals. Elements of the Existing Chemicals Program addressed here are the TSCA Inventory,[55] which contains data on the more than 75,000 chemicals in U.S. commerce, and the Testing Program,[56] which collects human health and environmental data on chemicals for which this information is lacking. The Testing Program has a particular focus on high production volume chemicals (greater than 1 million pounds/year) and the Voluntary Children's Chemical Exposure Program (VCCEP),[57] both voluntary programs.

- *OSWER, Office of Brownfields Cleanup and Redevelopment, Brownfields Economic Redevelopment Program*. EPA's Brownfields Program is designed to empower states, cities, tribes, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. The program identifies and addresses barriers to cleanup and redevelopment and provides financial and technical assistance for brownfields revitalization, including grants for environmental assessment, cleanup, and job training. Four broad activities serve as the program's cornerstones; these include protecting the environment, promoting partnerships, sustaining reuse, and strengthening the marketplace.

- *Office of Environmental Information, Toxics Release Inventory (TRI) Program*. The TRI Program collects annual reporting on toxic chemical releases and other waste management from facilities in manufacturing and other industry sectors, as well as from federal facilities. Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986[58] requires owners and operators of facilities that manufacture, process, or otherwise use any of the approximately 650 listed toxic chemicals and chemical categories in excess of applicable threshold quantities to report annually to EPA.[59] In addition, Section 6607 of the Pollution Prevention Act of 1990[60] requires that facilities provide information on the quantities of the toxic chemicals in waste streams and the efforts they have made to reduce or eliminate those quantities. Data gathered under these authorities are available through a public database maintained by EPA.[61]

Methodology

The estimates of social costs and benefits provided for this goal are derived mainly from existing economic and other analyses. Many of the estimates are not monetized and are limited to a qualitative description of social costs and benefits supplemented by quantitative information. The specific analyses used are described in the following sections and more fully in the supporting documents for this appendix.

Limitations

Due to a lack of data, many of the social costs and benefits for Goal 4 are not monetized. A variety of uncertainties and limitations that are associated with the estimates that do exist are

described in the following sections. As previously noted, an overwhelming limitation is that the estimates we do have do not represent the full scope of EPA programs that strive to achieve Goal 4.

Social Costs

Risk Management Plans

The *Economic Analysis in Support of the Final Rule on Risk Management Program Regulations for Chemical Accident Release Prevention, as Required by Section 112 (r) of the Clean Air Act*[62] provides an estimate of $113.1 million for private compliance costs and $34.2 million for state and local government compliance costs.[63] Total social costs for the Risk Management Plan Program are $147.3 million.

Pesticide Programs

Nonfederal costs of pesticide regulation may be imposed upon registrants (pesticide manufacturers or formulators), state agencies, pesticide users (most significantly, agricultural and residential users), laborers, and consumers. To estimate these costs, we generally relied upon average expenditures inferred from a small number of case studies or estimated in internal reports, multiplied by the number of expected annual actions. Because of the limited samples, estimates are subject to a high degree of uncertainty. In some cases, costs may be overestimated due to sample selection while the number of regulatory actions is likely to be underestimated because of the difficulty in distinguishing "voluntary" industry actions due to regulations from actions due to market forces and in determining how many uses may be effected by a general regulation. OPP makes a large number of decisions annually, although the impact of a particular decision may be quite narrow. In 2002, OPP registered 26 new active ingredients (a.i.), including antimicrobial substances, biopesticides, and conventional and reduced risk pesticides; registered 720 new uses for registered a.i.; and received and evaluated 503 requests for emergency exemptions to existing regulations. OPP also reviewed 23 registered chemicals in light of new health, safety, and environmental standards, each of which could have registrations for over 50 specified uses.[64]

Because of the number and relatively narrow scope of individual actions that OPP takes each year and the limited resources available for impact assessments, OPP has not previously estimated the total yearly burden of regulatory activities of the pesticide programs. Available external studies have largely evaluated the impacts of actions OPP has never even considered, such as the total ban on all organophosphate pesticides or all herbicides.[65] Therefore, estimates presented here were derived especially for this appendix using available studies within OPP, including estimates of burden for specific data requests, impact assessments for specific regulations and unpublished analyses for proposed rule-making. Details are available in the OPP report on costs and benefits, from which this summary is derived.[66]

OPP estimates that the total net yearly burden of pesticide programs is $378.4 million, as summarized in Table 8. This total consists of $306.5 million in costs to registrants, $81.6 million to agricultural users, and around $3.3 million in annual costs to state agencies. Other users, laborers, and consumers face only nominal costs. Partly offsetting these costs are allocations by Congress of about $13 million annually for the support of research and testing for products used on minor crops. Each of these subsets of costs is detailed below.

TABLE 8 - Summary of 2002 Costs	
Entity	***Total Cost (millions)***
Registrant (manufacturer)	*$306.5*
State agency	*$3.3*
User, agricultural	*$81.6*
Total cost	*$391.4*
Government subsidies *• registration support, minor crops*	*$13.0*
Net cost	***$378.4***

Pesticide Programs Costs to Registrants ($306.5 million)

Costs to registrants consist of re-registrations and new registrations. The total cost to registrants of OPP regulatory requirements is estimated at $306.5 million annually. (For details on the data and methodologies used in the OPP estimates, see Wyatt and Widawsky, 2003.) This is only 2.7 percent of U.S. expenditures on pesticides, which in 1999 were $11.2 billion.[67]

- *Re-Registration* costs to the pesticide industry may be around $70.2 million annually. This includes test costs of about $23 million per year ($1 million per chemical with 23 chemicals re-registered per year between 2000 and 2002) and other re-registration costs (e.g., meetings with OPP officials, legal counsel, and other administrative costs) at just under $900,000 per chemical. Recent re-registration decisions have involved special testing in 12 situations, with costs averaging around $200,000; and monitoring in 8 situations, with costs as much as $900,000 per chemical. Finally, OPP levies maintenance fees on existing registrations that collected $17.0 million in 2002.

- *New Registrations* cost registrants an estimated $236.3 million annually. These costs are estimated separately for conventional and reduced-risk pesticides, biopesticides, and antimicrobials.

- Conventional chemicals cost the industry almost $100 million per year for testing to meet OPP's data requirements. Roughly half that amount is for the registration of about six new conventional active ingredients each year, with testing costs of about $10.3 million for a food-use chemical and averaging about $4.3 million for a non-food use chemical. These costs are probably overstated, since some tests or equivalent tests would likely be conducted in the course of research and development even without regulation. OPP can identify only three chemicals in the past 10 years that were denied registration, although chemicals may not be registered on every use site (e.g., crop) for which registration was sought. Some chemicals are no doubt eliminated during research and development when tests show they fail to pass the health and safety criteria. However, it is not clear that these costs should be included in the social costs of regulation precisely because they do not meet health standards; certainly we have no way of measuring the comparative benefits of keeping such a chemical off the market. The rest of the costs are for registrations of new products or new uses, which requires significantly less data, but for which there are many more requests.

- Reduced risk pesticides cost registrants about $67.7 million for testing. Reduced risk chemicals have fewer data requirements and are eligible for an expedited review. About five new ingredients are registered each year, with average test costs of about $6.5 million. Other registration costs, mainly the paperwork burden, total approximately $15.5 million.

- About 12 new biopesticides are registered each year, with relatively low test costs of around $200,000 each. One or two plant-incorporated protectants are registered as well, at significantly higher cost. In total, registrants incur costs of about $4.4 million annually. The equivalent cost for antimicrobials is about $37.3 million, about a third of which is for new active ingredients. Cost per ingredient is around $5.5 million for food uses and $2.5 million for non-food uses. Finally, OPP also collects $11.6 million dollars in fees to pay for the establishment of tolerances, the maximum allowable residues that can be found on food products.

Pesticide Programs Costs to State Agencies ($3.3 million)

State agencies face a relatively small annual burden from OPP regulations of around $3.3 million. Costs are mainly associated with supporting special local registrations under Section 24© of FIFRA and emergency exemptions from restrictions under Section 18. The estimate is based on an annual average of 350 local registration requests that cost agencies about $800 each, and an annual average of 600 emergency exemptions that cost about $5,000 each to prepare.

Pesticide Programs Costs to Agricultural Users ($81.6 million)

Agricultural users may face costs of around $81.6 million annually. This represents only 0.2 percent of net farm income (gross value of production less operating expenses) in 2000, estimated by U.S. Department of Agriculture to be $46.4 billion.[68] This total includes regulations for dietary reasons of approximately $19.0 million, regulations to address occupational concerns of approximately $17.1 million, and regulations for environmental concerns of around $45.5 million. These figures are based on average *ex-ante* estimates of impacts from a small number of crop-chemical combinations. Estimates of these anticipated impacts are subject to a high degree of uncertainty due to the limited available information and widely varying conditions under which pesticides are regulated.

Other, Unquantified Costs from Pesticide Programs

Other users, principally residential users, could face higher pest control costs as a result of pesticide regulations, which may restrict their choices. Consumers and labor may also face higher food costs and fewer employment opportunities due to changes in production systems resulting from pesticide regulations. However, these impacts are likely to be small. Active ingredients make up only a small proportion of the cost of household pest control products, changes in pesticide use have little impact on retail prices of agricultural commodities compared to the influence of international prices, and labor may well benefit from restrictions on labor-saving chemical inputs to production.

Lead Safe Housing

TSCA regulations set standards for lead paint abatement-related activities, including the proper identification of a lead-based paint risk, training requirements for abatement workers, abatement work practices, and the disposal of removed hazardous materials. In 2002, approximately 30,000 housing units underwent at least a screening for lead paint hazards, and 11,000 units underwent some sort of abatement. The total cost of these abatements was $111.4 million, including $92.4 million in direct abatement work practice costs, $11.4 million for inspections and risk assessments, and $7.6 million for worker training.[69]

Asbestos

The current social costs of EPA's asbestos program for schools include periodic re-inspections, taking appropriate action to repair any deterioration, and the proper removal and disposal of asbestos products during renovation and remodeling. States must also maintain contractor and laboratory accreditation programs.

New Chemicals

The private costs of the PMN program come from the firms' costs of preparing a notification, addressing any EPA concerns, and any costs associated with chemicals that are rejected as a result of the PMN process (0 in 2002) that would otherwise have been commercially viable. There are no costs to nonfederal government organizations. In 2001 (the last year with complete data) firms submitted a total of 1,365 notices (including PMNs and low volume, test market, and polymer exemption notices). The average cost of a pre-manufacturing notice to a firm was $27,000, while low volume and test market exemption notices averaged $15,900 and $6,600 respectively. The total cost to industry of the pre-manufacturing and exemption notices was $31 million.[70]

Firms may also submit administrative notices (including commencement notices, withdrawals, etc.) that are in addition to the aforementioned pre-manufacturing and exemption notices. A total of 463 notices beyond the basic PMN were filed in 2001. Unit cost information is not available for these additional notices.

If EPA requested additional information or imposed restrictions, firms that decide to begin commercial production or use of a chemical that has received restrictions bear the cost of meeting the restrictions as well. EPA does not have data available to estimate the cost of restrictions on these chemicals.

Existing Chemicals

Chemical manufacturers and importers that are required to report for the TSCA IUR incur costs as part of their reporting on the production volume, plant site, and status of TSCA inventory chemicals. In 1998, industry filed reports from 2,666 facilities, with a total of over 26,000 separate chemical reports. The estimated total cost to industry of meeting the IUR reporting requirements that year was $17.7 to $27.9 million, including the cost of compliance determination, rule familiarization, report preparation and record keeping. Because the IUR requires facilities to submit the inventory information only every 4 years, the cost in a typical year are less. The annualized social costs are $4.6 to $7.3 million using a 3 percent discount rate, or $4.9 to $7.7 million using a 7 percent discount rate.[71]

In addition to reporting, chemical suppliers incur costs for laboratory tests and administrative activities. They are responsible for conducting laboratory tests on the toxicity, risk, and exposure characteristics of the chemicals. The majority of the test results received by the Agency in 2002 were submitted as part of the High Production Volume Voluntary Challenge Program. The costs of this program are borne by the companies that manufacture and use these chemicals, with no costs to state or local governments. Using data from the 2000 ICR,[72] the total estimated cost of the program is $37.2 million in 2002, but this is believed to be overstated. This estimate assumes each chemical underwent full testing, while few of the test plans submitted in 2002 contained complete data sets.

The total cost to industry was previously estimated at $12.5 million in each of the 3 years (2002-2004) of the VCCEP program.[73] The volume of test result submissions in 2002 was significantly lower than assumed in the proposed ICR. Only Tier 1 test results were submitted for a single chemical in 2002. The industry cost for this single submission, per the proposed ICR, is estimated at $70,747. Additional Tier 1 submissions were received by EPA in spring 2003, indicating that some effort and expense by other industry sponsors occurred in 2002. Current data do not allow the separation of cost components, so these costs will be associated with the 2003 submissions.

Brownfields Redevelopment

Based on the limited data available regarding brownfields costs, we assume that at a minimum state brownfields budgets total $214.2 million, which is equal to the amount of grants ($170.5 million) and cooperative agreement funding ($43.6 million) provided by EPA in 2003. We believe that state spending on brownfields is higher in reality (e.g., because federal grants may not be used for certain activities, and some grants require matching funds from state, tribal, or local entities). However, we assume that the remaining state and local costs of brownfields redevelopment are included in the estimate for Superfund site remediation (Goal 3). Note that some state spending on site remediation is likely associated with state-designated sites that are not related to OSWER programs.

TRI

For the 2002 reporting year, EPA expects that 24,308 facilities will file 88,117 Form R reports and 5,451 facilities will file Form A certification statements on 13,209 chemicals.[74] Using the 2002 burden-hour estimates from supporting statements for the TRI Information Collection Request (ICR) and loaded hourly wage rates derived from data in the Employer Costs for Employee Compensation report from the Bureau of Labor Statistics as described in the TRI ICRs, the 2002 social costs of TRI are estimated to be $115 million.[75]

Social Benefits

Risk Management Plans

In the 1996 *Economic Analysis in Support of the Final Rule on Risk Management Program Regulations for Chemical Accident Release Prevention*, EPA used data from the Accidental Release Information Program database to monetize damages prevented by the Risk Management Program. The *Economic Analysis* estimated $202.3 million in annual human health,
property, and ecological benefits. To estimate the effectiveness of an additional dollar spent on risk management activities, EPA assumed that doubling spending reduces damages by 50 percent. In addition, the *Economic Analysis* assesses the probability of a catastrophic accident similar to the 1984 incident in Bhopal, India, using two different methods to calculate the probability and recognizing that the lack of data on serious accidents is a source of uncertainty. The *Economic Analysis* does not address ecological benefits or the value that people place on decreased risk of accidents and terrorist-related incidents.

Pesticide Programs

The social benefits of pesticide regulations primarily accrue through reductions in risk to human health and the environment. The goal of OPP is to balance benefits of reducing pest damage to agricultural production, human health, and the quality of life with risks of inappropriate use of toxic materials. Testing pesticides for their impact on human health and the environment addresses a market information failure, whereby users and consumers would otherwise not know the true extent of risks. As scientific knowledge improves and social values change, re-evaluating previously registered pesticides offers a mechanism for OPP to continue to identify unacceptable levels of risk.

For dietary risk, including drinking water, benefits accrue to more than 220 million consumers of agricultural products and, in particular, to the Nation's children. Children's lower body weight and specialized diet leads OPP to consider them explicitly when determining tolerable levels of residues.

The benefits of worker protection requirements and certification and training, accrue to the more than 1.5 million farm workers, including family labor as well as permanent hired, seasonal, and migrant labor, who might otherwise be exposed to excessive levels of toxic chemicals. The primary benefits include reductions in illness of those exposed individuals, which impose health costs and losses in wages and productivity. Unfortunately, measuring these reductions is complicated by difficulties in monitoring changes over time and statistically relating the changes to regulations. Incidents of worker sickness are documented, and many more effects go unreported, particularly among migrant workers.

The benefits of ecological resource protection accrue to commercial enterprises that depend on the natural environment either directly or indirectly (e.g., commercial fisheries, tourism industry, agriculture) and to individuals through recreational value (e.g., sport fishermen, tourists) or existence value. There may also be an option value, in that future goods or services may result from preserving the environment in the present. As with dietary and occupational concerns, linking regulations with data on reductions in mortality and morbidity of wildlife is nearly impossible, although incidents are documented, as in the cases of fish kills and bird deaths.

Pesticides are toxic chemicals, but the benefits of their use accrue to agriculture and other commercial enterprises from reducing production costs, improving working conditions, protecting plants and structures from damage, and increasing productivity. Pest control products are used throughout industry to maintain sanitary conditions and by governments to ensure the public health. Consumers benefit from a cheaper, plentiful, and safe food supply. Benefits also accrue to society in general with the availability of pesticides and antimicrobials that protect health and homes. However, the realization of these benefits depends on smoothly functioning markets, which depends in turn on the availability of trustworthy information as to the appropriate uses and safety of the end products. In the absence of federal regulations, state governments would likely establish their own regulations, which could well prove more costly to the regulated community. Without the approval process granted by EPA, pesticide and agricultural producers could find their markets subject to the risks and uncertainties of unfounded concerns. Products may, in fact, face higher standards and require more exhaustive testing simply to protect manufacturers from litigation. The value of official assurances of a safe food supply to a well functioning market may well exceed the costs of pesticide regulation.

Lead-Safe Housing

For the purposes of this exercise, only one portion of the social benefits of lead abatements has been monetized: the avoided loss of IQ in young children. The quantified benefit of avoiding lowered IQ includes both extra educational costs and lower lifetime earnings and is estimated using a value of a one point avoided IQ loss of $8,675 (with 3 percent discounting). The present value of the avoided IQ damages in the 11,000 housing units abated in 2002 is $171 million. The average benefit per abatement is $15,352. The estimate includes IQ benefits to children living in the housing units at the time of abatement as well as subsequent children living in that unit in the future. The benefit estimates also assume only 1 percent of the housing units have children living in them at the time of abatement.[76] Additional health benefits that are unquantified include other neurological-related benefits to children and all benefits to adults living in the abated housing or who conduct the abatements.

Asbestos

The asbestos regulations reduce not only the exposure and health risk during the normal use of the asbestos-containing products, but also reduce the much higher exposures and health risks associated with the eventual removal and disposal of the asbestos materials. Estimates are not currently available for the amount or value of avoided health effects of EPA's asbestos actions.

New Chemicals Program

While the costs of the PMN program arise from a direct regulatory program, the benefits arise through both direct regulatory effects, as well as pollution prevention-like effects. The immediate public benefits of the PMN program are realized as human health risks and environmental damages that are avoided from the restrictions or bans placed on new chemicals. These restrictions may consist of labeling requirements, specified workplace practices, disposal restrictions, etc., which are established through the PMN program before commercial production of the new chemical begins. For the very few (0 in 2002) chemicals that are found to pose an unreasonable risk, the restriction may be a ban. In many cases, manufacturers who submitted the notices decide not to actually begin use of the chemical once they receive the feedback of the PMN review, often selecting more environmentally benign products instead. Additional benefits may arise if PMN chemicals start to displace existing chemicals in the marketplace, if the new chemical is less risky than the older chemical. We are currently analyzing annual risk reduction data and believe that the program has resulted in reduced risks to the public in the 20 years since its inception.

Existing Chemicals Program

The Existing Chemicals Program serves to improve the quality and quantity of publicly available toxic chemical information so as to minimize information market failures. Prior to these programs, the information on toxic chemicals that was available to citizens, firms, or government organizations dealing with toxic chemical issues was inconsistent. The benefits of these information collection programs flow through their contribution in risk assessment and risk management to reductions in risk to human health and the environment. Having available current and accurate information on these chemicals enables government decision-makers and the public to assess the risks from chemicals in their communities, thus helping to support rapid and informed decisionmaking at all levels.

Brownfields Redevelopment

Using data from 142 sample brownfields sites, the report *Public Policies and Private Decisions Affecting the Redevelopment of Brownfields: An Analysis of Critical Factors, Relative Weights and Areal Differentials* estimates that every acre of brownfields development preserves 4.5 acres of greenfield space.[77] However, OSWER was unable to estimate the level of annual

greenfield preservation attributable to brownfields, since no data are available on the amount of land redeveloped through brownfields programs on an annual basis. Additional benefits not estimated by the report include increased economic activity, human health improvements, restoration of ecosystems, improved regional land-use patterns, the preservation of open spaces that would otherwise be developed, and the avoided cost of infrastructure associated with greenfield development.

TRI

The industries that have reported to TRI since its inception have reduced their on- and offsite releases of TRI chemicals by a total of 48 percent, or 1.55 billion pounds.[78] The information reported to TRI increases knowledge of the levels of toxic chemicals released to the environment and the potential pathways of exposure, improving scientific understanding of the health and environmental risks of toxic chemicals; allows the public to make informed decisions on where to work and live; enhances the ability of corporate leaders and purchasers to more accurately gauge a facility's potential environmental liabilities; provides reporting facilities with information that can be used to save money as well as to reduce emissions; and assists federal, state, and local authorities in making better decisions on acceptable levels of toxic chemicals in the environment.[79]

Goal 5: Compliance and Environmental Stewardship

Discussion

Social costs and benefits related to Goal 5 result primarily from two types of EPA activities. First, EPA's Office of Enforcement and Compliance Assurance (OECA) uses a mix of compliance assistance, compliance incentives, monitoring, and enforcement to address environmental risks and patterns of noncompliance. These activities produce direct environmental benefits that result in better protection of human health and the environment, and they provide a general deterrent to noncompliance that is the foundation of the Agenc's regulatory and voluntary programs. In fact, the activities of OECA allow the programs under Goals 1 through 4 to often make the simplifying assumption of full compliance and, therefore, state the benefits associated with full compliance. This would be a far from realistic assumption without the activities of both the media programs and the national compliance and enforcement program working in concert. In addition to general monitoring and enforcement activities, specific examples of OECA activities include:

> *Supplemental Environmental Projects (SEPs)* are those projects that are negotiated with a defendant at the end of a legal case; these projects can run the gamut from local community projects (such as planting trees or implementing water quality improvement programs in concert with a local environmental group) to more general projects such as

voluntarily reducing emissions of certain pollutants or working cooperatively with a state to use certain technologies to help improve state-wide environmental performance.

Compliance Assistance Centers are Internet-based centers which make extensive compliance information available to the regulated community in order to help facilities come into environmental compliance without incurring the cost of a violation and subsequent legal action.

The Audit and Self-Policing Policy provides an incentive for regulated facilities to detect, disclose, and correct environmental violations in exchange for a waiver or significant reduction in penalties, thereby encouraging facilities to come into compliance more quickly and with the use of fewer government resources and ultimately reducing emissions.

The second major type of EPA activity related to Goal 5 is the various pollution prevention programs within the Office of Pollution Prevention and Toxics (OPPT) and OSW. The Pollution Prevention Act of 1990[80] recognized that one of the most effective ways of reducing public health risks from exposure to toxic chemicals, as well as lowering environmental risks, is to prevent pollution from being created in the first place. Rather than relying on traditional regulatory approaches, EPA's pollution prevention programs use a broad array of cooperative approaches, working closely with industry, state and local governments, and citizens who volunteer to work with EPA to find better, smarter, and cleaner ways of doing business. Examples of EPA's pollution prevention programs include:

OPPT's Design for the Environment Program is a voluntary partnership program that works with individual industry sectors to develop and integrate cleaner, cheaper, and smarter environmental solutions into everyday business practices.

OPPT's Green Chemistry Program promotes the research, development, and implementation of innovative chemical technologies that prevent pollution in both a scientifically sound and a cost-effective manner.

OPPT's Green Engineering Program promotes consideration of exposure, fate, and toxicity—in addition to the more traditional waste minimization concerns—in the design, commercialization, and use of chemical products and the development of feasible, economical processes that minimize generation of pollution at the source.

OPPT's Healthy Hospitals for the Environment Program is a voluntary program centered on reducing the amount of mercury used in hospitals and improving the efficiency of handling hospital wastes in general.

OPPT's Environmentally Preferable Purchasing Program is a federal government-wide program that encourages and assists Executive agencies to prevent waste and pollution by considering environmental impacts along with price, performance, and other traditional factors when deciding what products and services to buy.

OPPT's Pollution Prevention Grants comprises two programs: the Pollution Prevention Grant Program, which provides $5 million annually to states to help administer pollution prevention programs, and the Pollution Prevention Resource Exchange, which partially sponsors a consortium of eight regional pollution prevention information centers that provide pollution prevention information, networking opportunities, and other services to states and local governments and technical assistance to providers in their region.

OSW's Voluntary Waste Reduction Programs include efforts focused on both hazardous waste and municipal solid wastes. OSW's RCRA Hazardous Waste Minimization Program seeks to reduce the generation of hazardous waste in the United States. The program targets a list of 30 "priority chemicals" that—because of their persistent bioaccumulation potential and toxicity—are of significant concern when released to the environment.[81] Reductions of wastes that contain one or more of these chemicals are the focus of this program. EPA accomplishes waste reduction goals through a combination of regulatory actions, voluntary waste reduction partnerships, and technical support initiatives. EPA's Hazardous Waste Minimization Program tracks the progress toward national reduction goals via the TRI database. Municipal solid wastes are similarly targeted through voluntary programs for reductions in waste rates and increases in recycling. Results are measured in terms of reduction in waste generation rates as compared to growth in the economy.

Methodology

Enforcement and Compliance Activities

The national enforcement and compliance assurance program imposes three main categories of costs: administrative and judicial penalties, injunctive relief, and SEPs. Not all of these costs qualify as social costs. Though penalties do impose a monetary burden on those required to pay them, they are a transfer payment and do not incur a social cost. Regulated entities involved in enforcement activities are required to pay injunctive relief to bring a facility back into compliance and redress environmental harm caused. Since injunctive relief is offsetting environmental harm, or represents a cost that would have been incurred if the facility had been in compliance, it does not represent a social cost attributable to the enforcement and compliance program. Also, these costs are included in the analyses of costs of programs in Goals 1 through 4 to the extent those analyses assumed 100 percent compliance.

SEPs are voluntary projects undertaken by violators as part of the settlement of an enforcement action. Examples of past SEPs include upgrading equipment or processes to reduce

the amount of pollution produced, restoring habitats degraded by past noncompliance, and agreeing to assist other facilities to help them reduce the amount of pollution they are producing. Though not legally required to perform a SEP, EPA may reduce the magnitude of a penalty if the violator agrees to undertake an acceptable SEP. The cost of SEPs amounted to approximately $56 million in 2002.

Pollution Prevention Activities

As pollution prevention activities are voluntary programs, private industries will only participate if they expect to find ways to reduce their costs and/or improve their profitability. Therefore, one can expect there are no net social costs of these programs, as social costs are defined in this report. Monetized estimates of social benefits attributable to these programs are not available. A description of the social benefits of pollution prevention programs along with quantitative indicators of their success are summarized in Goal 5's Social Benefits section.

Limitations

Enforcement and Compliance Activities

As noted above, the simplifying compliance assumptions made in analyses for Goals 1 through 4 make it impossible to aggregate the estimates of social costs and benefits attributable to OECA's activities with those of the program offices. The assistance and incentive programs and the monitoring and enforcement activities carried out by OECA serve not only to bring facilities back into compliance, but to deter and prevent facilities from operating outside the law. A social cost for which we currently have no data is the costs to states of state inspectors monitoring for compliance with federal environmental regulations, although part of this cost is funded by EPA.[82] We also are unable to provide estimates of litigation fees/transaction costs related to noncompliance. This involves costs of attorney and other fees when a facility is involved in litigation over a violation of environmental law. No general estimates are available concerning the overall value of national expenditures on these fees; however a study done by RAND in 1991 reported that transaction costs accounted for 19 percent of outlays for five very large industrial firms involved in Superfund cleanups at 49 sites nationwide.[83] A subsequent RAND study found that transaction cost percentages were much higher when including both large firms and smaller firms in the study sample. Transaction cost share estimates ranged from 60 percent for firms with annual revenues less than $15 million to 15 percent for firms with annual revenues between $100 million and $1 billion.[84]

Pollution Prevention Activities

Data to assess either the costs or benefits of pollution prevention activities are scarce. Consequently, most of the information presented about these activities is qualitative. Quantitative information is presented whenever it is available.

Social Costs

Enforcement and Compliance Activities

The annualized cost arising from SEPs was approximately $56 million in 2002.

Pollution prevention activities

Voluntary pollution prevention programs are often thought of as win-win programs. Private industry and/or municipalities will only participate if they believe it is in their own best interest. Industry and government organizations are motivated to participate because of the opportunity of finding ways to increase profits or lower costs by creating more output with fewer inputs, reducing disposal of hazardous materials, increasing worker protection and productivity, reducing liability, improving public relations, or lowering environmental compliance expenses.

Social Benefits

Enforcement and Compliance Activities

The direct human health and environmental benefits of the federal air, water, and hazardous waste laws are addressed in the social benefits section for Goals 1 through 4. However, the public benefits of clean air, water, and land are only achieved through regulated entities' compliance with environmental laws. And compliance is achieved through a system that depends on the activities of media (e.g., air, water, solid waste) programs and the national compliance and enforcement program working in concert. The compliance assistance, compliance incentive, monitoring, and enforcement activities carried out by OECA serve not only to bring facilities back into compliance, but to deter and prevent facilities from operating outside the law. Thus, a percentage of the social benefits outlined in Goals 1 through 4 is attributable to the activities of the national enforcement and compliance assurance program.

Although enforcement activities clearly have a positive effect on compliance,[85] it is virtually impossible to estimate the percentage of benefits estimated by the media offices (in Goals 1 through 4) that may be attributable to OECA activities. The effect of OECA activities is likely to vary across industry, media, and pollutant, which increases the difficulty of attributing the benefits of environmental improvements to those activities. For example, data from Gray and Deily[86] suggest~~s~~ that EPA enforcement of air pollution regulations accounts for about one-third to one-half of compliance in the U.S. steel industry between 1980 and 1989, while results from Gray and Shadbegian[87] suggest that compliance rates in the paper industry would be about 13 percent lower without EPA enforcement activity.

More generally, some of the reasons firms comply with environmental regulations is outside the realm of EPA control. For instance, firms may comply with environmental statutes to improve or simply maintain goodwill within the community in which they operate and with the

consumers of their products or services. Private citizen or environmental interest group legal actions against "dirty" firms are also a motivating factor for firms to comply. It is difficult to disentangle the effect of enforcement activities from these other considerations on firms' compliance behavior.

Social benefits also accrue to the public solely as the result of OECA activities. The environmental outcomes resulting from the conclusion of enforcement cases (e.g., pounds of pollutants reduced, ground water treated, and contaminated soil to be cleaned) are a direct result of enforcement activity and would not have been achieved in the absence of enforcement actions. During FY 2002, the compliance and enforcement program secured 261 million pounds of pollutants to be reduced through settled enforcement cases. In addition, enforcement cases resulted in 2.8 billion gallons of polluted ground water to be treated, 503 million pounds of contaminated soils to be cleaned up, 40,000 acres of wetlands to be protected, and 3.15 million individuals served by drinking water systems brought back into compliance.[88]

OECA's Internet-based Compliance Assistance Centers provide information to help facilities achieve, maintain, and exceed compliance requirements. Seventy-four percent of the users of the Compliance Assistance Centers report having made one or more environmental improvements as a result of that use.[89] EPA's Audit and Self-Policing Policy[90] provides incentives for regulated facilities to detect, disclose, and correct environmental violations in exchange for a waiver of or significant reduction in penalties. In FY 2002, more than 252 companies used the policy to resolve violations at 1467 facilities.[91] The social benefit of this policy and the Compliance Assistance Centers is that they help bring many facilities into compliance that would otherwise be involved in a lengthy litigation process. Therefore, facilities achieve environmental benefits sooner and with the use of fewer government resources.

One other note is relevant concerning enforcement cases. Although SEPs do impose some social cost, they also produce significant offsetting social benefits, which accrue only in the presence of an enforcement action. Regulated entities agree to undertake SEPs because of pending enforcement activity. Consequently, those offsetting social benefits are a direct result of enforcement as well.

Regarding enforcement and monitoring, while there are costs associated with fines and penalties, the benefit to society is the resulting deterrent effect that this action has upon negative corporate behavior. Chester Bowles, head of the U.S. Office of Price Administration during World War II, observed that 20 percent of the population would likely comply with any regulation, 5 percent would not comply, and the remaining 75 percent would go along with the regulation as long as there was certainty that the 5 percent would be caught and punished. While Bowles' assertion may or may not be true in terms of percentages, research on the effects of enforcement seems to indicate that some percentage of the regulated community is motivated to stay in compliance as a result of monitoring and enforcement activity. It is, however, difficult to determine the degree of this beneficial effect, and even more difficult to determine what might be the effect of marginal increases in enforcement levels. In general, the research appears to show

that increased monitoring and enforcement deters violations and improves environmental performance.

Pollution Prevention Activities

Social benefits arising from pollution prevention programs include both private and public components. The private components include the net cost savings that motivate industry, municipalities, or federal agencies to participate in these voluntary programs. The public components flow from the lowering of exposure and risks from toxic chemicals. By helping develop and adopt pollution prevention approaches throughout the economy, EPA is permanently lowering the risks from toxic chemicals. We believe there are growing benefits from the pollution prevention program and are working to develop approaches to measure impacts to human health and environment. Examples of EPA's pollution prevention programs, along with indicators of their benefits, are listed below.

OPPT's Design for the Environment Program. Based on OPPT estimates, program partnerships have reached over 2 million workers at over 170,000 facilities; evaluated over 500 chemical substances; reduced diisocyanate exposure, formaldehyde use, lead and mercury use and exposure, perchloroethylene use, volatile organic compounds, hazardous air pollutants, and toxic chemical releases; and conserved millions of gallons of water and BTUs of energy every year.

OPPT's Green Chemistry Program. Twenty-eight firms have won Green Chemistry awards[92] since the program began in 1996. Those who win a Green Chemistry Award anticipate added market power and improved public relations that such an award conveys. OPPT records show that award winners eliminated 114,103,260 pounds of hazardous substances, 2,131,000 gallons of hazardous substances, and 57,000,000 pounds of carbon dioxide and saved 55,000,000 gallons of water. Additional reductions occurred in 2002 from the many other firms that actively participated in the Green Chemistry Program that year and in prior years.

OPPT's Green Engineering Program. Like other pollution prevention programs, the Green Engineering Program produces both private and public benefits. In particular, the program has produced a textbook and other instructional material to incorporate environmental considerations into engineering curricula. Human health and environmental risk reduction will become mainstreamed as students who are trained in the principles of Green Engineering move into the workforce and change the way firms design chemical processes.

OPPT's Healthy Hospitals for the Environment Program. The benefits of this program include reduced private costs (associated with toxic materials) to health care facilities, as well as public benefits arising from the decrease in human health and environmental risks from exposure to mercury and other toxic chemicals that may have been otherwise

incinerated and dispersed into the atmosphere. Private facilities could also be motivated by the possibility of improved public relations. Less frequent and less intensive operation of incinerators to dispose of regulated wastes, including mercury, presents less risk to the public and reduces the amount of energy needed to operate the incinerators.[93]

OPPT's Environmentally Preferable Purchasing (EPP) Program. This program's social benefits are the reduced health and environmental risks from decreased use and release of toxic chemicals. In addition, once these preferable products are available for the federal market, it becomes possible for manufacturers to also offer the EPP products to other purchasers of these goods and services, including consumers, industry, and other levels of government. The increased manufacturing and purchase of "greener" products will lead to a more sustainable standard of living and economy that preserves scarce natural resources like oil and clean water, uses fewer toxic chemicals, and generates less pollution within the federal government.

OPPT's Pollution Prevention Grants. Benefits include the aforementioned private and public benefits that arise from the adoption of pollution prevention approaches. The pollution prevention grants support states in their outreach and technical assistance efforts. A recent study of only 13 of the programs funded by the Pollution Prevention Resource Exchange found the program produced significant benefits. Quantified private benefits of the 13 programs include total cost savings of $32.8 million. In addition, public benefits through pollution prevention actions included reductions of 39.8 million pounds in air, 155 million pounds in water, and 1.5 billion pounds of waste generated. In addition, resource conservation benefits were 8.8 million kWh of energy and 368.4 million gallons of water.[94]

OSW's Voluntary Waste Reduction Programs . These programs provide social benefits in terms of reductions in waste generation rates for both hazardous waste and municipal solid waste streams. Municipal waste generation is increasing at only half the rate of GDP growth.[95] Additionally, there has been a 44 percent reduction in disposal of Waste Minimization Priority Chemicals between 1991 and 1998.[96] Voluntary waste reduction programs have also helped to increase municipal waste recycling on a per capita basis.[97] Waste generation reduction and waste recycling have helped to bring about long-term protection of ground water and both scarce resources and land for future use.

Notes

1. U.S. Office of Management and Budget. 2002. *The President's Management Agenda.* Washington, DC: Government Printing Office. Available online at: http://www.whitehouse.gov/omb/budget/fy2002/mgmt.pdf.

2.U.S. Environmental Protection Agency, Office of Planning and Evaluation. November 1990. *Environmental Investments: The Cost of a Clean Environment*. EPA 230-11-90-083. Washington, DC: Government Printing Office.

3.U.S. Census Bureau. November 2002. *Pollution Abatement Costs and Expenditures: 1999*. MA200(99). Washington, DC: U.S. Government Printing Office. Available online at http://www.census.gov/prod/2002pubs/ma200-99.pdf. Date of access: September 10, 2003.

4.U.S. Environmental Protection Agency, Office of the Administrator. November 2000. *Guidelines for Preparing Economic Analyses*. EPA 240-R-00-003. Washington, DC: Government Printing Office.

5. 42 *U.S. Code* § 7401 et seq. [Nov. 15, 1990]

6. U.S. Environmental Protection Agency, Office of Air and Radiation, and Office of Policy, Planning, and Evaluation. October 1997. *The Benefits and Costs of the Clean Air Act, 1970 to 1990: EPA Report to Congress*. EPA 410-R-97-002. Washington, DC: Government Printing Office.

   U.S. Environmental Protection Agency. Office of Air and Radiation, and Office of Policy. November 1999. *The Benefits and Costs of the Clean Air Act, 1990 to 2010: EPA Report to Congress*. EPA 410-R-99-001. Washington, DC: Government Printing Office.

7.42 *U.S. Code* § 7401 et seq. [Dec. 31, 1970]

8.42 *U.S. Code* § 7401 et seq. [Nov. 15, 1990]

9.U.S. Environmental Protection Agency. Office of Air and Radiation, and Office of Policy, Planning, and Evaluation. October 1997. *The Benefits and Costs of the Clean Air Act, 1970 to 1990: EPA Report to Congress*. EPA 410-R-97-002. Washington, DC: Government Printing Office.

10.U.S. Environmental Protection Agency, Office of Air and Radiation, and Office of Policy. November 1999. *The Benefits and Costs of the Clean Air Act, 1990 to 2010: EPA Report to Congress*. EPA 410-R-99-001. Washington, DC: Government Printing Office.

11.*Public Law* No. 104-182, 110 Stat. 1613 (Aug. 6, 1996)

12.33 *U.S. Code* §§ 1251-1387

13.U.S. Environmental Protection Agency, Office of Planning and Evaluation. November 1990. *Environmental Investments: The Cost of a Clean Environment*. EPA 230-11-90-083. Washington, DC: Government Printing Office.

14.47 *Federal Register* 9350 (December 24, 1975)

15.44 *Federal Register* 68624, November 29, 1979)

16.This is likely an underestimate of benefits, as these early rules were aimed at correcting gross public health concerns.

17.U.S. Environmental Protection Agency. 2000. *A Retrospective Assessment of the Costs of the Clean Water Act: 1972 to 1997*. Washington, DC: Government Printing Office. Available online at: http://www.epa.gov/ost/economics.

18.A Census of Governments is taken at 5-year intervals and covers three major subject fields—government organization, public employment, and government finance (U.S. Census Bureau, Governments Division, May 22 2003; http://www.census.gov/govs/www/index.html).

19.Our approach in estimating the federal contributions, which are not included in social cost estimates, was to subtract the amounts provided toward state, local, and private spending in EPA's 2002 enacted water program budget. There are certain clean water grant programs, subsidies, or tax expenditures administered by federal agencies other than EPA (e.g., USDA conservation assistance, HUD, Rural Utilities Service and Economic Development Administration grants, or the tax deductibility of bond interest for pollution control investments) that may provide federal contributions toward state/local CWA activities. However, we are uncertain how much of this spending may simply fund basic services or further CWA activities. Furthermore, we did not net out some funds in EPA's water budget that are provided to state and local governments because state/local spending on these items was not considered to be pursuant to an EPA mandate in the first place (i.e., since we do not count state, local, or private spending on nonpoint source water pollution abatement as pursuant to an EPA program, we do not need to net out the CWA Section 319 grants provided to assist states on nonpoint source activities).

20.U.S. Environmental Protection Agency. January 2000. *A Benefits Assessment of Water Pollution Control Programs Since 1972: Part 1, The Benefits of Point Source Controls for Conventional Pollutants in Rivers and Streams*. Washington, DC: Government Printing Office. Available online at: http://www.epa.gov/ost/economics/assessment.pdf.

21.40 *Code of Federal Regulations* 131.36

22.40 *Code of Federal Regulations* Part 122

23.Generally speaking, our benefit estimates represent the expected beneficial effects to the full national population ("society"), making it reasonable to refer to the estimates as societal, or "social," benefit estimates. This is not the case with the cost estimates. Instead, these estimates generally reflect an "impact analysis" heritage that emphasizes the adverse effect on a subpopulation of society, typically the regulated community and its most directly affected groups (e.g., state and local governments). Hence, a comparison of the benefit estimates to the cost estimates presented here is questionable since one estimate reflects an impact on the full population, while the other estimate reflects an impact only on a subpopulation.

Another methodological concern relates to establishing the baselines for estimating the effects of SDWA and CWA programs. To estimate the costs and benefits of SDWA programs, we used the economic analyses developed in support of 14 regulatory actions. To estimate the costs and benefits of CWA programs, we used as a foundation two retrospective analyses conducted by EPA aimed at estimating the cumulative effects of the programs and added supplemental data and other information from other sources to provide a more complete and up-to-date impression of the effects of CWA programs.

24.To obtain basin-wide benefits for the Great Lakes Water Quality Guidance (40 *Code of Federal Regulations* 132), the average monetary benefit per toxic pound-equivalent reduced ($48) was computed across the three case studies (Ohio, Michigan, Wisconsin), then multiplied by the estimated reduction in toxic pound-equivalents for the basin as a whole (5.8 million to 7.6 million toxic pounds-equivalent). The estimate is only a partial estimate of anticipated benefits because benefits from noncancer human health risk reductions could not be monetized for the case studies.

25.40 *Code of Federal Regulations* 131.38

26.Centralized Waste Treatment Point Source Category (40 *Code of Federal Regulations* Parts 136 and 437); Commercial Hazardous Waste Combustor Subcategory (40 *Code of Federal Regulations* Part 444); Landfills Point Source Category (40 *Code of Federal Regulations* Parts 136 and 445); Transportation Equipment Cleaning Point Source Category (40 *Code of Federal Regulations* Part 442); Pesticide Formulating, Packaging, and Repackaging (40 *Code of Federal Regulations* Part 455); Pulp, Paper, and Paperboard Point Source Category (40 *Code of Federal Regulations* Part 430); Final Water Rule, and Oil and Gas Extraction (Synthetic Based Drilling Fluids) (40 *Code of Federal Regulations* Part 435).

27.U.S. Environmental Protection Agency. November 2002. *A Strategy for National Clean Water Industrial Regulations: Effluent Limitations Guidelines, Pretreatment Standards, and New Sources Performance Standards*. Washington, DC: Government Printing Office. Available online at: http://epa.gov/guide/strategy/304mstrategy.pdf.

28.U.S. Environmental Protection Agency. 2002. *Economic Analysis for the Final Revisions to the Oil Pollution Prevention Regulation.* Washington, DC: Government Printing Office.

29.U.S. Environmental Protection Agency, Office of Solid Waste, Division of Economics, Methods, and Risk Analysis Division. July 23, 1999. *Addendum to the Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*.

30.42 *U.S. Code* 11001 et seq. (1986)

31.U.S. Department of Commerce. 2003. *Bureau of Economic Analysis National Income and Product Accounts Table 7.1. Quantity and Price Indexes for Gross Domestic Product*. Available online at: http://www.bea.gov/bea/dn/nipaweb/SelectTable.asp?Selected=Y. Date of access: September 10, 2003.

32.Welfare economics typically defines total social cost as the sum of the opportunity costs incurred by society as a result of regulations. These costs include direct costs to both private sector and government (net of any gains such as improved efficiency or sale of recycled products), as well as any additional social welfare losses, transitional costs, and indirect costs such as changes in product quality. Note that costs in each of these categories can be negative or can be offset by gains (e.g., transitional costs may be offset by increased demand for resources for pollution control).

33.Brown, Stephen. 2001. *States Put Their Money Where Their Environment Is (State Environmental Spending)*. Environmental Council of the States. Available online at: http://www.sso.org/ecos/ECOStatesArticles/rsbrown.pdf. Date of access: September 10, 2003.

34.U.S. Environmental Protection Agency, Office of Solid Waste. 1990. *Regulatory Impact Analysis for the Final Criteria for Municipal Solid Waste Landfills.* Washington, DC: Government Printing Office.

35.Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Tanks Subcommittee.1998. *Report Card on the Federal UST/LUST Program*.

36.U.S. Environmental Protection Agency, Office of Underground Storage Tanks. December 23, 2002. *Memorandum: FY 2002 End-of-Year Activity Report.*

37.U.S. Environmental Protection Agency. May 1996. *Economic Analysis in Support of the Final Rule on Risk Management Program Regulations for Chemical Accident Release Prevention, as Required by Section 112 (r) of the Clean Air Act*. Washington, DC: Government Printing Office. Available online at: http://yosemite.epa.gov/EE/epa/ria.nsf/vwRef/S.96.4+A?OpenDocument. Date of access: September 3, 2003.

38.U.S. Department of Commerce. 2003. *Bureau of Economic Analysis National Income and Product Accounts Table 7.1. Quantity and Price Indexes for Gross Domestic Product*. Available online at: http://www.bea.gov/bea/dn/nipaweb/SelectTable.asp?Selected=Y. Date of access: September 10, 2003.

39.Ideally, a comprehensive analysis would rely on current and future projections rather than past analyses. However, we are limited by the availability of such analyses. Some current and future projections are available and were consulted for this report (for example: Probst, et al. 2003. *Superfund's Future: What Will It Cost?* Resources for the Future, Washington, DC.) However, the bulk of available data are retrospective or older projections of costs and benefits.

40.EPA is in the process of preparing an analysis of Superfund program benefits. This report is not yet ready for publication, but monetized estimates of Superfund benefits may be available in the near future.

41.P. Balserak, "Analysis of the Efficiency of the Environmental Protection Agency's Land Disposal Restrictions Program" (M.S. thesis, George Mason University, 1996).

42.Although certain RIAs provide monetized estimates of human health benefits, EPA does not present these estimates here because those quantified represent a very small portion of the total health benefits provided by OSWER and would, therefore, provide a misleading estimate. RIAs assess only incremental benefits of specific rules and, in many cases, are limited to outdated understanding of health effects. To monetize the public health benefits accurately, one would have to revisit the approach used in the RIAs to update their estimates and address the benefits that are not reflected.

43.There are also a number of voluntary OSWER programs and initiatives not addressed (e.g. WasteWise, Resource Conservation Challenge, and Product Stewardship Partnerships). While the costs associated with activities under these programs are likely reflected in the PACE data, benefits associated with these efforts have not been calculated.

44.There are three exceptions to this assumption. First, 1999 PACE data likely reflect one-time charges for UST replacements to meet the 1998 deadline for compliance with technical standards. These replacement cost estimates have, therefore, been replaced with general estimates of recent UST activities. Second, the 1999 Hazardous Waste Combustion MACT standards are not reflected in 1999 PACE estimates. Although implementation of these standards has been delayed through legal review, OSWER adjusts the PACE-based social cost estimates to include the costs and benefits of the rule since some facilities are already taking action in anticipation of the finalized rule. Finally, cost savings associated with the 2002 Oil Pollution Prevention and Response revisions are not included in 1999 PACE data. OSWER includes these savings of $11 million in our estimate.

45.EPA is currently working to improve the methods for valuing the protecting ecological systems and services and is convening a Science Advisory Panel as part of "a comprehensive effort that will improve the methods used to value the benefits of protecting ecological systems and services to facilitate Agency decisions concerning the protection and restoration of ecosystems." (*Federal Register*: March 7, 2003 (Volume 68, Number 45), 11082-11084, 11083).

46.42 *U.S.Code* 11001 et seq. (1986)

47.Federal Insecticide, Fungicide, and Rodenticide Act, 7 *U.S.Code* s/s 136 et seq. (1996), *Public Law* 92-516 (1972). Available online at: http://www4.law.cornell.edu/uscode/7/ch6.html.

48.Federal Food, Drug, and Cosmetics Act (FFDCA), 21 *U.S. Code* 301, *Public Law* 106–540, (December 8, 2000). Available online at: http://www.fda.gov/opacom/laws/fdcact/fdctoc.htm.

49.Food Quality Protection Act (FQPA), *Public Law* 104-170, (August 3, 1996). Available online at: http://www.epa.gov/oppfead1/fqpa/gpogate.pdf.

50.Residential Lead-Based Paint Hazard Reduction Act of 1992, *Public Law* 102-550. Available online at: http://www.hud.gov/offices/lead/regs/leatilex.pdf.

51.Toxic Substances Control Act (TSCA), *Public Law* 94-469. Available online at: http://www4.law.cornell.edu/uscode/15/ch53.html.

52.Asbestos School Hazard Abatement Reauthorization Act of 1990, *Public Law* 101-637. Available online at: http://www.epa.gov/opptintr/asbestos/200240CFR763.pdf.

53.Asbestos Hazard Emergency Response Act of 1986, *Public Law* 99-519. Available online at: http://www4.law.cornell.edu/uscode/15/ch53schII.html.

54.Inventory Update Rule (IUR), *Federal Register*: January 7, 2003 (Volume 68, Number 4); 40 *Code of Federal Regulations* Parts 9, 710, and 723, TSCA Inventory Update Rule Amendments. Available online at: http://www.epa.gov/fedrgstr/EPA-TOX/2003/January/Day-07/t32909.htm.

55.U.S. Environmental Protection Agency, New Chemicals Program, TSCA Chemical Substance Inventory Web Site: http://www.epa.gov/opptintr/newchems/invntory.htm. Date of access: September 4, 2003.

56.U.S. Environmental Protection Agency, Chemical Information Collection and Data Development (Testing) Web Site, http://www.epa.gov/opptintr/chemtest/index.htm. Date of access: September 4, 2003.

57.U.S. Environmental Protection Agency, Voluntary Children's Chemical Evaluation Program (VCCEP) Web Site: http://www.epa.gov/chemrtk/vccep. Date of access: September 4, 2003.

58.*Public Law* 99-499

59.40 *Code of Federal Regulations* 372

60.*Public Law* 101-508

61.U.S. Environmental Protection Agency, Office of Environmental Information. August 2002. *2000 Toxics Release Inventory (TRI). Public Data Release.* EPA 260-R-02-003. Washington, DC: Government Printing Office.

62.U.S. Environmental Protection Agency. May 1996. *Economic Analysis in Support of the Final Rule on Risk Management Program Regulations for Chemical Accident Release Prevention, as Required by Section 112 (r) of the Clean Air Act*. Washington, DC. Available online at: http://yosemite.epa.gov/EE/epa/ria.nsf/vwRef/S.96.4+A?OpenDocument: EPA National Center for Environmental Economics Web Site. Date of access: September 3, 2003.

63.Costs are reported in 1996 dollars. An inflation factor of 1.1046 is used to arrive at the 2002 estimate.

64.U.S. Environmental Protection Agency. April 2003. *Promoting Safety for America's Future, Office of Pesticide Programs FY 2002 Annual Report.* EPA735-R-03-001. Washington, DC: Government Printing Office.

65. Gianessi, L., and S. Sankula. April 2003. *The Value of Herbicides in U.S. Crop Production.* Washington, DC: National Center for Food and Agricultural Policy.

Knutson, R., and D. Smith. April 1999. *Impacts of Eliminating Organophosphates and Carbamates from Crop Production: Agricultural and Food Policy Center Working Paper 99-2*. Department of Agricultural Economics, Texas A&M University.

66. Wyatt, T., and D. Widawsky. July 24, 2003. *Social Cost Report for OPP's 2003 Strategic Plan.* Washington, DC: U.S. Environmental Protection Agency, Office of Pesticide Programs (Unpublished draft).

67.Donaldson, D., T. Kiely and A. Grube. August 2002. *Pesticide Industry Sales and Usage: 1998 and 1999 Market Estimates.* Washington, DC: U.S. Environmental Protection Agency, Biological and Economic Analysis Division, Office of Pesticide Programs, Office of Prevention, Pesticides and Toxic Substances.

68.U.S. Department of Agriculture. 2002. *Agricultural Statistics, 2002.* Washington, DC: National Agricultural Statistics Service.

69.Number of abatements in 2002 from current OPPT estimates; abatement costs from US EPA, *TSCA §403 Lead Based Paint Standards Economic Analysis*, adjusted to 2002 dollars using the GDP price index.

70.EPA ICR No. 574.11 (OMB Control No. 2070-0012): Premanufacture Review Reporting and Exemption Requirements for New Chemical Substances and Significant New Use Reporting and Recordkeeping Requirements for Chemical Substances; Supporting Statement (May 5, 2000), and EPA data on PMN submissions filed in 2001, adjusted to 2002 dollars using the GDP price index.

71.U.S. Environmental Protection Agency. August 2002. *Economic Analysis for the Amended Inventory Update Final Rule*. Washington, DC: Government Printing Office. Available online at: http://cascade.epa.gov/RightSite/dk_public_collection_item_detail.htm?ObjectType=dk_docket_item&cid=OPPT-2002-0054-0260&ShowList=xreferences&Action=view.

72.TSCA Existing Chemical Test Rules, Consent Orders, Test Rule Exemptions, and Voluntary Test Data Submissions, EPA ICR #1139.06; OMB Control #2070-0033 (2000).

73.Proposed ICR Supporting Statement for Data Submissions for the Voluntary Children's Chemical Evaluation Program (VCCEP). Available online at:

http://cascade.epa.gov/RightSite/getcontent/Tempfile.pdf?DMW_OBJECTID=090007d480098bd9&DMW_FORMAT=pdf.

74. U.S. Environmental Protection Agency, Office of Environmental Information. December. Supporting Statement for Information Collection Request for TRI Reporting Form R. EPA #1363.12 and OMB #2070-0093.

U.S. Environmental Protection Agency, Office of Environmental Information. December. Supporting Statement for Information Collection Request for TRI Reporting Form A.. EPA #1704.06 and OMB #2070-0143.

75. U.S. Environmental Protection Agency, Office of Environmental Information. December. Supporting Statement for Information Collection Request for TRI Reporting Form R. . EPA #1363.12 and OMB #2070-0093.

U.S. Environmental Protection Agency, Office of Environmental Information. December. Supporting Statement for Information Collection Request for TRI Reporting Form A.. EPA #1704.06 and OMB #2070-0143.

76. Average benefits/abatement from TSCA §402/404 Training & Certification Program for Lead-Based Paint Activities Economic Analysis (1996) adjusted to 2002 dollars using the GDP price index.

77. Deason, Jonathan P., George W. Sherk, and Gary Carroll, 2001. *Public Policies and Private Decisions Affecting the Redevelopment of Brownfields: An Analysis of Critical Factors, Relative Weights and Areal Differentials.* Washington, DC: George Washington University and U.S. Environmental Protection Agency. Available online at: http://www.gwu.edu/%7Eeem/Brownfields/index.htm.

78. U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance. November 2000. *Case Conclusion Data Sheet: Training Booklet*. Washington, DC: Government Printing Office. Available online at: http://www.epa.gov/compliance/resources/publications/planning/caseconc.pdf. Date of access: September 10, 2003.

79. U.S. Environmental Protection Agency, Office of Environmental Information. December 2002. Supporting Statement for Information Collection Request for TRI Reporting Form R. EPA #1363.12 and OMB #2070-0093.

80. Pollution Prevention Act of 1990, 42 *U.S. Code* 13101-13109, *Public Law* 101-508, 1990. Available online at: http://www.epa.gov/opptintr/p2home/p2policy/act1990.htm.

81. U.S. Environmental Protection Agency, Office of Solid Waste. June 2002. *Municipal Solid Waste in the United States: 2000 Facts and Figures.* Washington, DC: Government Printing Office.

82. About 23 percent of total state environmental spending was funded by EPA in 2000 and so would not count as a social cost as defined in this appendix (Brown, R. Steven and Michael J. Keifer. 2003. "ECOS budget survey: budgets are bruised, but still strong." *ECOStates: The Journal of the Environmental Council of the States*. Summer: 10-15).

83. Dixon, Lloyd, Deborah Dresner, and James Hammitt. 1993. *Private-Sector Cleanup Expenditures and Transaction Costs at 18 Superfund Sites.* RAND.

84.Dixon, Lloyd, Deborah Dresner, and James Hammitt. 1993. *Private-Sector Cleanup Expenditures and Transaction Costs at 18 Superfund Sites.* RAND.

85. Nadeau, L. 1997. EPA effectiveness at reducing the duration of plant-level noncompliance. *Journal of Environmental Economics and Management* 34: 54-78.

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87.Gray, W. and R. Shadbegian. 2003. When and why do plants comply? Paper mills in the 1980s. Unpublished manuscript.

88.Data are derived from EPA's Integrated Compliance Information System (ICIS) database, which tracks information from the Case Conclusion Data Sheets (CCDS). Available online at: http://www.epa.gov/Compliance/planning/data/index.html.

89.Data collected from exit surveys completed by users of the National Compliance Assistance Centers. Available online at: http://www.assistancecenters.net.

90.For more information on EPA's Audit Policy, visit EPA's Compliance Incentives and Auditing/Audit Policy Web Site, http://www.epa.gov/compliance/incentives/auditing/auditpolicy.html.

91.U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance. November 2000. *Case Conclusion Data Sheet: Training Booklet*. Washington, DC: Government Printing Office. Available online at: http://www.epa.gov/compliance/resources/publications/planning/caseconc.pdf. Date of access: September 10, 2003.

92.U.S. Environmental Protection Agency. 2002. *Presidential Green Chemistry Challenge Award Recipients*. EPA 744-K-02-002. Washington, DC: Government Printing Office. Available online at: http://www.epa.gov/greenchemistry/docs/award_recipients_1996_2002.pdf. Date of access: September 3, 2003.

93.*Hospitals for a Healthy Environment* (H2E) Web Site, http://www.h2e-online.org/index.cfm.

94.National Pollution Prevention Roundtable. January 2003. *An Ounce of Prevention Is Worth Over 159 Billion Pounds of Cure: A Decade of Pollution Prevention Results 1990-2000.* Available online at: http://www.p2.org/p2results/2418_historyfinal.pdf. Date of access: September 10, 2003.

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Appendix 2
Program Evaluations

EPA's program evaluations are internal assessments of our programs' success in meeting their goals and objectives. Program evaluation goes beyond strict performance measurement by also answering the questions "why" and "how" a program achieved what it did, helping us to determine what is working well and what is not. EPA program managers and staff use program evaluations to identify areas needing improvement, more effective strategies for achieving established goals, and ways to improve data collection or better measure program results.

COMPLETED EVALUATIONS THAT INFLUENCED DEVELOPMENT OF THIS STRATEGIC PLAN

- *An Assessment of Water Quality Standards Review and Development Process* (EPA's Office of Science and Technology, 2000).[1] The Office of Water assessed a select number of states' processes for developing water quality standards and EPA regional offices' efforts to review them. The results of the assessment contributed to this *Strategic Plan* by helping establish new draft Program Activity Measures for developing clear, consistent national guidance on water quality criteria and standards; formulating a multi-year Strategy for Water Quality Standards and Criteria; and improving coordination among EPA, states, and federal agencies.

- *Assessing the TMDL Approach to Water Quality Management* (National Academy of Sciences, National Research Council, 2001). The U.S. Congress directed EPA to contract with the National Academy of Sciences' National Research Council to review the quality of the science used to develop total maximum daily loads (TMDLs). The study found that programs should make changes to better account for scientific uncertainties, improve water quality standards and monitoring programs, and base management decisions on new information as it become available. Most important, this study (along with our own understandings of current state programs) helped support our strategic thrust to place more emphasis on working with states in upgrading their ambient water quality monitoring and assessment.

- 2002 National Estuary Program (NEP) Implementation Review (EPA's Office of Wetlands, Oceans, and Watersheds, 2002). This review assessed the progress made by 19 of 28 NEPs in implementing their Comprehensive Conservation Management Plans developed under Section 320 of the Clean Water Act. The findings are used to determine whether an estuary program is eligible for continued funding under Section 320. The review provided a comprehensive evaluation of progress in meeting programmatic

objectives as well as environmental improvement in the estuaries. In particular, it assessed the ability of the NEPs to restore and protect habitat, which resulted in a measure for habitat protection. Key elements in the review were an assessment of how priority action plans are implemented and who is going to pay, which resulted in our including finance plans and leveraging goals in this *Strategic Plan*.

- *A Review of Statewide Watershed Management Approaches* (EPA's Office of Wetlands, Oceans, and Watersheds, 2002). EPA's Office of Water evaluated eight states' experiences with different models of the statewide watershed management approach. The study focused on the impact of the watershed approach on federal and state program management and coordination, public involvement, and the implementation of six core programs under the Clean Water Act and Safe Drinking Water Act. Specific influences of this program evaluation on this *Strategic Plan* include: development of strategic goals that must be attained through contributions from programs that, historically, have been managed separately; development of integrated measures reflecting linkages between water protection activities and water quality monitoring and TMDL programs; and establishment of a new ecosystem-based goal within the *Strategic Plan* hierarchy.

- *Regulation and Innovation in the Chemical Industry*. The Joint Research Center of the European Commission concluded that risk-based testing regulations, such as those employed in the United States, appear to provide more incentives to innovate than do other approaches, such as those used in the European Union. EPA was encouraged by this study to continue its strategy of emphasizing risk-based screening of new and existing chemicals. This approach is reflected throughout the Agency's strategic architecture for measuring and assessing program effectiveness.

- *Great Lakes Program Evaluations*. The Great Lakes Strategy and its updated Lakewide Management Plans include contributions from the State of the Lakes Ecosystem conferences and reports by EPA's Inspector General, the General Accounting Office (GAO), and the International Joint Commission. Together, the Strategy and the Lakewide Management Plans set forth the goals, objectives, and targets for environmental progress at the Great Lakes—basin-wide and at individual Great Lake basins. They also involve substantial public participation. Select indicators from the State of the Lakes Ecosystem conferences (e.g., coastal wetlands, phosphorus concentrations, sediment contamination, benthic health, fish tissue contamination, beach closures, drinking-water quality, and air toxics deposition) served as the basis for Great Lakes sub-objective targets.

- *Environmental Protection: EPA Should Strengthen Its Efforts to Measure and Encourage Pollution Prevention* (GAO-01-283). This February 2001GAO report examined how extensively companies have adopted pollution prevention strategies and the major factors

that either encourage or discourage private-sector decisions to employ such strategies. GAO concluded that improved data collection and measurement are critical needs, stating: "EPA officials note that the limitations of available data inhibit both their ability to ascertain the extent to which companies use pollution prevention practices, and their attempt to target efforts to further encourage these practices." GAO's recommendations focused on the need for EPA to clarify source-reduction reporting requirements and to obtain accurate data on the quantity of emissions reduced. In response to this study, EPA has taken steps to improve its ability to measure emission reductions from sources of pollution. As a result of these actions, performance goals in this *Strategic Plan* for the first time are composed of specific measurable targets for pollution prevention, expressed in terms of the quantity of waste reduced (for example, "By 2008, reduce waste minimization priority list chemicals in hazardous waste streams reported by businesses to the Toxic Release Inventory by 50 percent from 1991 levels").

- *NPDES Performance Analysis.* Focused on the National Pollutant Discharge Elimination System (NPDES) "majors" universe—a component of the national enforcement and compliance assurance program—this study determined rates of significant noncompliance at major NPDES facilities and assessed the timeliness and appropriateness of enforcement actions taken to address significant noncompliance. The evaluation measured the program's success in meeting four key objectives: (1) protecting human health and the environment, (2) achieving appropriate levels of compliance, (3) achieving appropriate levels of enforcement activity, and (4) changing regulated community's behavior. The evaluation also discussed such factors potentially influencing results as data gaps, state requirements for data collection, levels of enforcement activity, existing policies on NPDES majors, and guidance issued on permit limits. The information provided by this performance analysis helped senior managers make program adjustments to achieve results that will contribute to the compliance objective under Goal 5. EPA will structure future analyses on this pilot performance analysis.

PROPOSED FUTURE PROGRAM EVALUATIONS IN SUPPORT OF EPA'S FIVE GOALS

GOAL 1: CLEAN AIR

Program Evaluations Planned

- *New Source Review and Prevention of Significant Deterioration.* EPA's Office of Air and Radiation (OAR) is working with the National Academy of Sciences (NAS) to investigate: (1) changes in emission of pollutants regulated under the new source review

program; (2) impacts on human health; (3) pollution control and prevention technologies installed in facilities covered under the rule after its effective date; (4) changes in operational efficiencies, including energy efficiency, at affected facilities; and (5) other relevant data. This study and the April 2003 NAS report, *Breath of Fresh Air: Reviving the New Source Review Program*,[2] will be used to improve the new source review and prevention of significant deterioration programs. (FY 2003-2004)

- *Carbon Monoxide and Cold Weather Inversions*. At Congress's request,[3] NAS conducted an independent study of carbon monoxide (CO) episodes in meteorological and topographical problem areas to address potential approaches for predicting, assessing, and managing high concentrations of CO. In its 2002 interim report,[4] which focused on the CO problem in Fairbanks, Alaska, NAS found that Fairbanks has made great progress in reducing violations of the CO National Ambient Air Quality Standards (NAAQS) and has worked effectively to reduce CO emissions. NAS provided recommendations that, if implemented, will help Fairbanks further reduce CO NAAQS violations. The final report, *Managing Carbon Monoxide Pollution*,[5] more broadly addresses CO problems in other areas and will be used to help areas in nonattainment with the health-based CO standard identify and evaluate strategies for achieving clean air. (FY 2003-2004)

- *Health Benefits of Air Pollution Regulations*. Section 812 of the Clean Air Act requires EPA to report to Congress on the incremental human health and environmental benefits and costs of new control strategies and technologies.[6] Our report to Congress will analyze the actual emission reductions beyond existing practice and effects on human health, quality-of-life, and the environment, and it will incorporate the results of a recent NAS evaluation of the economic methods EPA uses to estimate the health benefits of its air pollution regulations.[7] (In that report, NAS concluded that EPA's benefits analyses do provide valuable information to policymakers and the public, and that, generally, the Agency has used a reasonable approach to estimate health benefits.) OAR expects to submit the analytic blueprint for its study to the Science Advisory Board for review by the end of 2003. (FY 2003 and beyond)

- *Community-Based Projects*. Pilot projects are underway in such cities as Charlotte, North Carolina to assess the effectiveness and usefulness of air pollution regulatory requirements. Communities will use the evaluation results to set priorities for risks not addressed by the regulatory programs. (FY 2003-2007)

- *Permit Issuance*. Pursuant to the March 2002 Office of Inspector General (OIG) report on permit issuance[8] and OAR's action plan for addressing each of OIG's recommendations,[9] OAR will evaluate the Title V permit program and how well state permitting authorities are implementing their permitting regulations. The results of the evaluations will be used to improve state permitting programs. (Summer 2003-FY 2006)

- *2007 Highway Progress Review.* As part of rule promulgation, OAR will comprehensively review progress made by the heavy-duty (HD) diesel engine industry (e.g., engine manufacturers and emission-control technology vendors) in developing technologies to meet the HD 2007 emission standards.[10] OAR representatives will visit technical research centers and meet with engineers from all of the major manufacturers for briefings on technical progress and business plans to comply with the 2007 emission standards. These visits will enable OAR to evaluate industry's progress and factor results into next steps for implementing these rules. (FY 2003-2007)

- *Diesel Desulfurization Progress Review.* To assist in implementing the rules, OAR will review the HD diesel engine industry's progress in employing existing desulfurization technologies and developing new technologies to produce 15 ppm sulfur diesel fuel. OAR reviewers will visit companies, participate in conference calls, and study information submitted to meet the HD 2007 program's registration and reporting requirements.[11] (FY 2003-2007)

- *Impact Evaluation of* ENERGY STAR® *for the Commercial Sector.* OAR is studying the extent to which EPA's ENERGY STAR® program has reduced energy use or intensity in the commercial sector.[12] The evaluation will use information from the Energy Information Agency (EIA) on state-level electric-utility energy consumption/intensity as well as data from the Commercial Building Energy Consumption Survey on energy consumption by commercial buildings. Market-driven effects will be distinguished from ENERGY STAR® program effects using cross-sectional and/or time-series econometric models. (FY 2003-2004)

- *Impact Evaluation of* ENERGY STAR® *for the Industrial Sector*. OAR is also studying the extent to which EPA's ENERGY STAR® program has reduced energy use or intensity in the industrial sector. The evaluation, which will distinguish market effects from program effects, will involve processing and analyzing many publicly available time-series and cross-sectional databases, such as those that EIA and the U.S. Census Bureau maintain. Commercially available databases may also be required for analyzing industry- or firm-specific trends. (FY 2004-2005)

GOAL 2: CLEAN AND SAFE WATER

- *A Study of Public Awareness of Required Consumer Confidence Reports (CCRs) by Public Water Suppliess of Varying Sizes.* This study would involve national survey research, or focus group research, to examine how CCRs have impacted awareness of drinking-water quality. (FY 2003)

- *Evaluation of Effectiveness of State/Regional Water Monitoring Councils*. The purpose of this project is to determine the factors that contribute to an effective water monitoring council. The project will assess nine monitoring councils through a combinations of literature reviews and interviews. (FY 2003)

- *An Assessment of State NPDES Program Integrity and Regional Oversight.* This evaluation will assess the factors that contribute to the weaknesses and vulnerabilities, as well as strengths, of state NPDES programs. It will also analyze to what extent EPA regional offices have adequate tools to effectively oversee and assess the integrity of state programs. The project approach will include reviewing information on state legal authorities and regional evaluations as well as site visits to selected state and regional offices. (FY 2003-2004)

- *An Evaluation of the Water Quality Analytical Methods Program*. Project includes support for development and promulgation of analytical methods under the Clean Water Act (CWA)[13] and review of the alternate test procedure approval process. Evaluation will address concerns related to technical issues, resources, and coordination among EPA's Office of Research and Development, Office of Groundwater and Drinking Water, and regional offices. (FY 2003-2004)

- *An Evaluation of the Non-Point Source Pollution Control Program.* Evaluation will assess whether CWA section 319 funds are being spent in a way that (a) will result in protection and restoration of watersheds from non-point source pollution and (b) effectively leverage other available federal, state, and local funds for protection and restoration of watersheds. The study will specifically address how well the states are implementing EPA's FY 2002 and 2003 319 guidelines regarding the use of incremental section 319 funds to develop watershed-based plans and implement them to restore 303(d) - listed waters. Evaluation methods will include a review of program documents and interviews with selected regions, states, and local project managers. (FY 2004)

- *A Review of State 303(d) Lists and Methodologies*. This project will review the 2002 lists of impaired waters approved by the regions and compare them with the 1998/2000 list to (a) evaluate whether more or fewer waters were listed, (b) categorize the reasons for listing fewer waters, and (c) evaluate whether methodologies provided with the lists were more or less detailed. Methodology will include review of documents and discussions with regions. (FY 2004)

- An *Evaluation of State Implementation of Water Quality Standards.* As a follow-up to the assessment of the water quality standards development and review process conducted by the Office of Water (OW) in FY 2001, OW plans to evaluate whether water quality

standards are being implemented effectively in assessments, permits, TMDLs, and drinking-water source protection. (FY 2005-2006)

- *An Assessment of the Effectiveness of the On-Site/Decentralized Treatment Guidelines and other program activities in Achieving Public Health and Environmental Results.* This project will look at the On-Site/Decentralized Treatment Guidelines and other program activities to determine their effectiveness in achieving public health and environmental benefits. (FY 2005-2006)

- *A Regional Evaluation of State Drinking Water Programs*. The proposed project is designed to be a process/implementation evaluation on the effectiveness of state programs as they implement the Safe Drinking Water Act. The project will involve site visits in selected states and would be integrated with existing annual Data Verifications and Drinking Water State Revolving Fund evaluations. (FY 2006)

GOAL 3: LAND PRESERVATION AND RESTORATION

- *Evaluation of the RCRA Waste Generator Program*. This impact evaluation will assess the effectiveness of the Resource Conservation and Recovery Act (RCRA) regulatory program for hazardous waste generators. EPA's Offices of Solid Waste and Emergency Response and Office of Enforcement and Compliance Assistance will work with the Association of State and Territorial Solid Waste Management Officials and EPA Region 1 on this project. (FY 2004-2006)

- *Evaluation of the Impacts and Effectiveness of Waste Recycling Incentives.* EPA will study cases of regulatory relief initiatives to evaluate their success in increasing recycling of hazardous waste. The results of this impact evaluation will help to direct the Resource Conservation Challenge, one of EPA's priority programs. (FY 2004-2006)

- *Evaluation of the Effectiveness of the Interagency Open Dump Cleanup Program for Tribes.* This impact evaluation will assess the effectiveness of developing solid and hazardous waste management programs in Indian country by reviewing program results, changes in waste management, and the effectiveness of interagency relationships and implementation mechanisms. (FY 2004-2006)

- *Evaluation of the Impacts/Benefits of Community Involvement in Superfund Risk Assessment Process*. This evaluation will assess the extent to which public involvement in risk assessment at Superfund sites has improved and how Office of Emergency and Remedial Response initiatives have contributed to community involvement. (FY 2004-2006)

- *Evaluation of Superfund Allocation of Human Capital Resources and the Need for Redistribution/Reallocation*. This process evaluation will examine the human capital resource requirements for implementing the Superfund program and will assess the need for redistributing, reallocating, or making other changes to manage the program's human capital nationwide. (FY 2004-2006)

- *Evaluation of Factors Influencing Performance in Underground Storage Tank Program*. Information provided by this process evaluation will help explain why we have missed or exceeded performance goals such as cleanups completed, backlogs reduced, or reductions in releases. (FY 2004-2006)

- *Evaluation of Multi-Statute Preparedness, Prevention, and Response Planning Requirements*. To prevent and prepare for releases of oil and hazardous materials, facilities might be asked to meet multiple requirements for spill prevention and emergency response plans.[14] This evaluation will identify potential redundancies, inconsistencies, and/or inefficiencies among the multiple requirements and opportunities to ameliorate those problems. (FY 2004-2006)

GOAL 4: HEALTHY COMMUNITIES AND ECOSYSTEMS

- *Pre-Manufacture Notice Review Program*. EPA will assess the performance of the Pre-Manufacture Notice Review Program, one of our largest and most visible chemicals programs, in meeting its zero-tolerance risk-based performance goal, given an increasing demand for adopting additional review criteria, an aging work force, and declining contract funding. (FY 2003-2004)

- *An Assessment of the Effectiveness of Participatory Processes in Achieving Environmental Results*. EPA will determine the effectiveness of the National Estuary Program, the Fisheries Management Council, and other relevant models in achieving and maintaining ecological protection. (FY 2005)

- *An Evaluation of State Wetland Protection Programs*. The Agency will evaluate factors that lead states and tribes to develop and implement no-net-loss programs for all wetlands/waters (including wetlands and waters that are not regulated by the CWA), barriers to those programs, and ways to overcome barriers. (FY 2006)

- *Great Lakes Programs.* The International Joint Commission will evaluate the progress of Great Lakes programs every 2 years (FY 2004, 2006, and 2008). Progress will also be assessed through State of the Lakes Ecosystem Conferences (FY 2003, 2005, and 2007).

- *Reduced-Risk Initiative for Conventional Pesticides*. EPA will conduct this program evaluation to determine the market share that each approved reduced-risk pesticide has gained in its respective crop/site, to identify the extent to which reduced-risk pesticides have displaced other pesticides in the market, and to suggest factors contributing to the success or failure of these pesticides in the marketplace. (FY 2004)

GOAL 5: COMPLIANCE AND ENVIRONMENTAL STEWARDSHIP

- *Wet Weather Performance Analysis.* To complement its 2003 NPDES Performance Analysis (described in the Goal 2 section of this appendix), EPA's Office of Enforcement and Compliance Assistance will evaluate the Agency's wet weather program areas (which encompass combined animal feeding operations, combined sewer and sanitary sewer overflows, and stormwater). Because both wet weather areas and NPDES majors are regulated under CWA, resource constraints can necessitate trade-offs between NPDES and wet weather inspections. Analyzing the performance of the wet weather program will help determine whether these trade-offs are appropriate. (FY 2003-2004)

- *RCRA Permit Evaders*. RCRA permit evaders, one of the Agency's national enforcement priorities, may (1) fail to make proper hazardous waste determinations, (2) operate hazardous waste treatment units without appropriate permits, and (3) dispose of hazardous wastes illegally and unsafely. EPA's Office of Enforcement and Compliance Assistance will examine enforcement and compliance assurance efforts directed toward RCRA permit evaders and determine the extent to which these efforts are improving compliance and affecting environmental and human health conditions. (FY 2004)

CROSS-AGENCY AND SUPPORT-PROGRAM EVALUATIONS

- *Research*. EPA is exploring options for periodic evaluations of Agency research programs. Beginning in FY 2005 (with possible pilot evaluations in FY 2004), independent and external panels will regularly review research programs' relevance, quality, and performance to date, in accordance with the Office of Management and Budget's (OMB) Investment Criteria for Research and Development.[15] Evaluators will determine whether EPA research programs have complete plans with clear goals and priorities; articulate potential public benefits; relate to national, scientific, and customer needs; award funds competitively or otherwise demonstrate justifiable funding mechanisms; and identify appropriate output and outcome measures, schedules, and decision points. Evaluators will also examine program designs to determine the appropriateness of the program's short-, intermediate-, and long-term goals and its

strategy for attaining them. Recommendations resulting from these reviews will help EPA improve the design and management of its research programs and measure progress, as required under the Government Performance and Results Act.[16]

- *Assessment of Implementation of the Agency's Quality System*. Every EPA organization that maintains environmental data must implement a quality system to plan and document its quality assurance activities. EPA's quality systems include preparation of a Quality Management Plan (QMP), which must be approved by the Agency's Office of Environmental Information (OEI). On a 5-year schedule, OEI assesses QMPs for conformance to our quality systems and to ensure that the Agency is collecting and using appropriate, high-quality data for decisionmaking. (Several assessments are planned through 2006.)

- *Assessing EPA databases*. The Agency will continue to assess and map several of its databases to ensure that the data are transparent and sufficient (suitable) to answer specific questions or inform decisions. Suitability assessments will describe characteristics of databases for both primary and secondary uses and may include information on coverage, spatial and temporal characteristics, consistency within data systems, ability to link to other systems, accuracy, limitations, access, and documentation. (FY 2004)

- *OIG Evaluations*. EPA's OIG provides independent audit, evaluation, and investigative products and advisory services to promote economy, efficiency, and effectiveness and to prevent and detect fraud, waste, and abuse in EPA programs and operations. OIG has developed a multi-year plan that translates EPA's five strategic goals into component media areas or "tracks"(Air, Water, Land, Cross-Media, and Good Government).[17] OIG will conduct studies within each track to answer key questions and provide information on the extent to which the Agency is achieving desired results and benefits of environmental programs, as envisioned by the Administration and Congress. Planned OIG program evaluations include: Under Goal 1, Particulate Matter, Ozone, and Air Toxics; under Goal 2, Drinking Water, Watershed Protection, and Pollutant Loadings; Under Goal 3, Superfund, Brownfields, and Resource Conservation and Recovery Act; under Goal 4, Environmental Justice and Homeland Security; under Goal 5, Compliance Assistance and Enforcement and Environmental Stewardship; and, as part of cross-goal efforts, Financial Management, Information Resources Management, Program Management, Assistance Agreements, Contracts, and Energy Conservation/Green Power.

SCHEDULE OF OMB PART ASSESSMENTS FOR EPA PROGRAMS

As part of the fiscal year 2004 budget process, OMB introduced a new instrument—the Program Assessment Rating Tool (PART)—for assessing government programs' purpose, design, strategic planning, management, results, and accountability to determine overall effectiveness. PART is an accountability tool that OMB and federal agencies use to determine the strengths and weaknesses of federal programs, with a particular focus on results that individual programs produce. At the conclusion of the assessment, OMB prepares summaries and recommendations for setting priorities and making funding decisions.[18]

Approximately, 27 percent of EPA's programs (by budget amount) were assessed during the FY 2004 budget formulation process. Once a program is assessed using the PART, it is reassessed annually thereafter. Thus an additional 24 percent of EPA's programs are being assessed during the FY 2005 process. An additional 20 percent will be added in fiscal years 2006, 2007, and 2008, until 100 percent of EPA's programs are assessed in FY 2008 and every year thereafter.

FY 2004

Leaking Underground Storage Tanks
Air Toxics
Nonpoint Source
Superfund Removal
Drinking Water SRF
Pesticides Registration
Pesticides Reregistration
New Chemicals
Existing Chemicals
Tribal GAP
Civil Enforcement

FY 2005

RCRA Corrective Action
RCRA State Grants
Ecosystem Research
Clean Water State Revolving Fund (CWSRF)
Criminal Enforcement
PM Research

Notes

1.U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance. February 20, 2003. *NPDES Majors Performance Analysis.* Internal document.

2.National Academy of Public Administration. April, 2003. *A Breath of Fresh Air: Reviving the New Source Review Program*.

3.Senate Report, 106-410, p. 81, Conference Report, 106-988, p. 121.

4.National Academy of Sciences. 2002. *The Ongoing Challenge of Managing Carbon Monoxide Pollution in Fairbanks, Alaska*.

5.National Academy of Sciences. 2003. *Managing Carbon Monoxide Pollution in Meteorological and Topographical Problem Areas*.

6. Clean Air Act, Title I, Section 112. Available online at http://www.epa.gov/air/caa/caa112.txt: EPA Clean Air Act Web Site. Date of Access: September 8, 2003.

   Clean Air Act Amendments, Title I (42 U.S.C. 7401-7514a), Clean Air Act Amendments, Title II (42 U.S.C. 7521-7590), Clean Air Act Amendments, Title IV(42 U.S.C. 7651-7661f), Clean Air Act Amendments, Title IX (42 U.S.C. 7403-7404).

7.National Academy of Sciences. 2002. *Estimating the Public Health Benefits of Proposed Air Pollution Regulations*.

8.Environmental Protection Agency, Office of Inspector General. March 29, 2002. *Air: EPA and State Progress in Issuing Title V Permits* (Report No. 2002-P-0008).

9.Available through the Internet: http://www.epa.gov/oar/oaqps/permits/oig-actionplan .

10. See EPA's Tier 2 / Gasoline Sulfur Final Rulemaking. (February 10, 2000) Regulatory Impact Analysis. Chapter VII: Benefit-Cost Analysis. (EPA 420-R-99-023, December 22, 1999) Available through the internet: http://www.epa.gov/otaq/regs/ld-hwy/tier-2/frm/ria/chvii.pdf .

    See also EPA's Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements .(December 21, 2000). Chapter VII: Benefit-Cost Analysis. Regulatory Impact Analysis (EPA420-R-00-026, December 2000) Available through the internet: http://www.epa.gov/otaq/regs/hd2007/frm/ria-vii.pdf

11. See EPA's Tier 2 / Gasoline Sulfur Final Rulemaking. (February 10, 2000) Regulatory Impact Analysis. Chapter VII: Benefit-Cost Analysis. (EPA 420-R-99-023, December 22, 1999) Available through the internet: http://www.epa.gov/otaq/regs/ld-hwy/tier-2/frm/ria/chvii.pdf .

    See also EPA's Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements .(December 21, 2000). Chapter VII: Benefit-Cost Analysis. Regulatory Impact Analysis

(EPA420-R-00-026, December 2000) Available through the internet: http://www.epa.gov/otaq/regs/hd2007/frm/ria-vii.pdf

12.For more information, see http://www.energystar.gov/.

13.Clean Water Act, 40 *Code of Federal Regulations*, Part 122.

14. Resource Conservation and Recovery Act, 40 *Code of Federal Regulations*, Part 264, Subpart D; Part 265, Subpart D; and Part 279.52.

EPA's Oil Pollution Prevention Regulation (40 CFR part 112)

USCG-FRP (49 CFR part 194)

DOT/RSPA-FRP (49 CFR part 194)

OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)

OSHA HAZWOPER (29 CFR 1910.120)

CAA RMP (40 CFR part 68

15.John H. Marburger, III and Mitchell E. Daniels, Memorandum for the Heads of Executive Departments and Agencies, June 5, 2003, pages 5-10. Available online at http://www.ostp.gov/html/OSTP-OMB%20Memo.pdf: Executive Office of the President of the United States, Office of Science and Technology Policy Web Site, Washington, DC.

16.Government Performance and Results Act of 1993, Public Law 103-162 (August 1993).

17.U.S. Environmental Protection Agency, Office of Inspector General. *Multi-Year Plan, Fiscal 2003-2005*. Washington DC. EPA-350-R-03-002. Available online at http://www.epa.gov/oigearth/ereadingroom/MultiYearPlan2003-2005.pdf

18.Description adapted from: Office of Management and Budget, The Executive Office of the President. 2003. *Performance and Management Assessments, Budget of the United States Government, FY 2004*. Washington, DC: Government Printing Office. Available online at http://www.whitehouse.gov/omb/budget.

Appendix 3
Summary of Consultation Efforts

Consultation with EPA's federal, state, and tribal government partners and with our many stakeholders is integral to the Agency's strategic planning and vital to achieving our goals and objectives. Because we anticipated substantial revision to the goals and objectives presented in our 2000 plan, EPA launched an extensive, national consultation effort to ensure that our many partners and stakeholders were offered opportunities to participate during each phase of the development of our 2003 *Strategic Plan*.

The leaders of EPA's five strategic architecture workgroups (one for each of our goals) and the Agency national and regional managers organized meetings, participated in conferences, and presented briefings to ensure that our partners and stakeholders fully understood our process for developing our *Strategic Plan* and had the opportunity to participate. We distributed our proposed strategic architecture—goals, objectives, and sub-objectives—and subsequently the full-text draft of the *Strategic Plan* to hundreds of our partners and stakeholders, including other federal agencies, states, more than 550 Indian tribes, environmental and industry groups, and academic and public policy groups. We posted information on EPA's Internet site and solicited input, providing groups and individuals several options for submitting comments to the Agency. We carefully considered all of the comments we received at each stage of the development process.

This appendix presents a chronology of major activities we conducted to consult with parties interested in or likely to be affected by EPA's *Strategic Plan*. It briefly highlights our consultation with the U.S. Congress and with our state and tribal partners, and it includes a list of all organizations and federal agencies we contacted to solicit input as we developed this *Strategic Plan*.[1]

Chronology of Major Consultation Activities

- *National Meeting of Partners and Stakeholders*

  On October 16, 2002, EPA hosted a national meeting of Agency staff with organizations representing our partners and stakeholders to gather views on the challenges and opportunities we will face in protecting human health and the environment during the coming years. Participants were asked to identify some of the problems and issues that EPA and its partners will need to address within each of its five goal areas. Approximately 125 people attended, representing such diverse groups as the U.S.

Congress, other federal agencies, states, tribes, local governments, environmental groups, public policy and academic organizations, and the regulated community.

- *Release of Draft Goals, and Objectives*

  EPA incorporated some of the input gathered during the October meeting in the draft strategic architecture that we released for public review and comment on December 31, 2002. We provided the draft architecture, which included our goals, objectives, and sub-objectives, to states and state organizations; tribes; other federal agencies; members of environmental, academic, and public policy groups; and representatives of the regulated community. We also posted the draft architecture on EPA's Internet site and provided a mechanism for reviewers to submit comments electronically. The Agency solicited comments through January 31, 2003.

- *Release of Full-Text Draft Strategic Plan*

  In March 2003, EPA provided a full-text draft of its *Strategic Plan* to states (through ECOS), to the more than 550 federally recognized tribes, to other federal agencies, and to more than 200 business, industry, environmental, and public policy groups for a 45-day public review period. EPA also posted the full-text draft *Strategic Plan* on its Internet site and provided a mechanism for electronic comment. During the comment period, EPA senior managers took advantage of meetings and conferences to obtain perspectives of various constituencies, including states, tribes, and other organizations. Discussion focused on the Agency's proposed objectives and targets and the means and strategies presented for achieving these goals.

Consulting with State and Tribal Partners

Consulting States

Much of EPA's consultation and coordination with its state partners was conducted through the Agency's collaboration with the Environmental Council of States (ECOS), the national association of state and territorial environmental commissioners. Throughout the development of this *Strategic Plan*, ECOS assisted the Agency by providing information and materials for review to individual state agencies. In particular, EPA worked closely with the ECOS Planning Committee to solicit state perspectives and to consider state input that we used to help frame the goals, objectives, and strategies presented in our 2003 *Strategic Plan*.

Consulting Tribes

In June 2002, EPA staff participated in two large tribal conferences, the National Tribal Environmental Council meeting and the National Conference on Environmental Management, to discuss the revision of EPA's *Strategic Plan*. These meetings, which brought together tribal leaders and senior tribal environmental managers from across the country, provided the Agency a forum from which to solicit tribal perspectives on the most pressing and important environmental challenges we will face in Indian country and Alaskan Native villages in the years ahead. EPA continued to consult with tribes at the national and regional levels throughout the development of the *Strategic Plan*. The Agency communicated with tribes individually and through coordinated efforts led by the Tribal Caucus and the Tribal Operations Committee.

Consulting with Congress

EPA began its consultation with Congress in Fall 2002. We invited Congressional staff representing individual Members and authorizing and appropriating committees to our National Meeting of Partners and Stakeholders, and two staff members from the Senate Environment and Public Works Committee appeared on a panel which opened the facilitated plenary session of the meeting. During the afternoon, Congressional staff participated in smaller group discussions of EPA's proposed new strategic goals and raised issues of specific interest and concern.

In December and January, we provided chairmen and ranking minority Members of these committees, their staffs, and interested Members with copies of our draft strategic goals, objectives, and sub-objectives. We sent the full-text draft of the Agency's *Strategic Plan* to Members and Congressional staff on March 18, 2003. Congressional contacts were encouraged to submit comments on these documents electronically, via the comments link on EPA's Internet site, by telephone, or by mail.

On May 1, 2003, EPA staff met with interested Senate and House staff (hosted by the Senate Environment and Public Works Committee) to discuss issues arising from their review of the full-text draft. EPA managers and goal team leaders carefully considered Congressional comments as they finalized the Agency's goals, objectives, and sub-objectives and developed the strategies that are presented in this *Strategic Plan*.

List of Organizations Consulted

In preparing our 2003 *Strategic Plan*, EPA consulted with several hundred organizations and individuals. In addition to the state and tribal groups mentioned above, EPA provided draft documents to and solicited input from the following organizations.

Organizations

Air and Waste Management Association
Alaska Federation of Natives, Incorporated
Alternatives for Community and Environment
American Association for the Advancement of Science
American Chemical Council
American Chemical Society Task Force on Environmental Research
American Farm Bureau Federation
American Farmland Trust
American Fisheries Society
American Forest and Paper Association
American Forests
American Industrial Health Council
American Lung Association
American Petroleum Institute
American Public Health Association
American Recreation Coalition
American Rivers
American Society of Civil Engineers
American Society of Heating, Refrigeration, and Air Conditioning Engineers
American Society of Science & Engineering
American Water Works Association
Association of American Pesticide Control Officials
Association of State and Interstate Water Pollution Control Administrators
Association of State Drinking Water Administrators
Association of State and Territorial Health Officials
Association of State and Territorial Solid Waste Management Officials
Businesses for Social Responsibility
Business Roundtable
California Department of Pesticide Regulation
Center for Biological Diversity
Center for Health, Environment and Justice
Center for International Environmental Law
Center for Plant Conservation
Center for Regulatory Effectiveness
Chemical Industry Institute of Toxicology
Children's Defense Fund
Chippewa Ottawa Resource Authority
Citizens for a Sound Economy
Clean Water Action

Clean Water Network
Coalition for Effective Environmental Information
Coalition for Environmentally Responsible Economies
Conservation International
Corporate Environmental Enforcement Council, Incorporated
Council for Excellence in Government
Council of Energy Resource Tribes
Council of State Governments
Council on Environmental Quality
Defenders of Wildlife
Doris Day Animal League
Ducks Unlimited, Incorporated.
Duke University
Earth Island Institute
Earthjustice
Earthjustice Legal Defense Fund
Electric Power Research Institute
Endangered Species Coalition
Environmental and Energy Study Institute
Environmental Defense
Environmental Health Coalition
Environmental Justice Fund
Environmental Law Institute
Environmental Working Group
Forest Guardians
Friends of the Earth
Fund for Animals
G.E. Energy and Environmental Research Corporation
Global Environment & Technology Foundation
Greenpeace
Heritage Foundation
Historically Black Colleges and Universities
H. John Heinz III Center for Science, Economics, and the Environment
Indigenous Environmental Network
INFORM, Inc.
Institute for Advanced Study
Inter-Tribal Timber Council
International City/County Management Association
International Institute for Energy Conservation
International Wood Products Association
Intertribal Agriculture Council

IUCN US Multilateral Office
Izaak Walton League of America
Land Trust Alliance
Law Engineering and Environmental Services, Inc.
Maine Department of Agriculture
Mercatus Center
Minnesota Department of Agriculture
Missouri Department of Agriculture
Mni Cose Inter-Tribal Water Rights
National Academies
National Academy of Public Administration, Center for the Economy and the Environment
National Advisory Council for Environmental Policy and Technology
National Association of Attorneys General
National Association of Conservation Districts
National Association of Home Builders
National Association of Manufacturers
National Association of Schools of Public Affairs and Administration
National Association of State Departments of Agriculture
National Association of State Universities and Land Grant Colleges
National Audubon Society
National Congress of American Indians
National Council for Science and the Environment
National Environmental Policy Institute
National Environmental Trust
National Federation of Independent Business
National Fish and Wildlife Council
National Fisheries Institute
National Governors Association
National Mining Association
National Parks Conservation Association
National Petroleum Council
National Pollution Prevention Roundtable
National Recreation and Park Association
National Tribal Environmental Council
National Tribal Development Association
National Wildlife Federation
Natural Resources Defense Council
Nelson Institute of Environmental Medicine/NY University, School of Medicine
Nuclear Information and Resource Service
Nuclear Regulatory Commission
Oak Ridge National Laboratory

Oceana
Ocean Conservancy
OMB Watch
Pan American Health Organization
People for the Ethical Treatment of Animals
Performance Track Participants Association
Quinault Indian Nation
RAND Environmental Science and Policy Center
Resources for the Future
River Network
Rocky Mountain Institute
Scenic America
Sierra Club
Society of Toxicology
Soil Science Society of America
Southern Organizing Center for Economic and Social Justice
State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials
Sustainable Ecosystems Institute
The Nature Conservancy
Tennessee Valley Authority
Tribal Pesticide Program Council
Tribal Association on Solid Waste and Emergency Response
Trust for Public Land
Urban Ecology Institute/Boston College
Union of Concerned Scientists
University of Delaware
University of Maryland
U.S. Public Interest Research Group (PIRG)
U.S. Chamber of Commerce
West Harlem Environmental Action
Western Governors' Association
Wilderness Society
Wildlife Habitat Enhancement Council
Woodrow Wilson School/Princeton University
World Resources Institute
World Wildlife Fund
Worldwatch Institute

Federal Agencies

Agency for International Development
Consumer Product Safety Commission
Department of Agriculture
Department of Commerce
Department of Defense
Department of Education
Department of Energy
Department of Health and Human Services
Department of Housing and Urban Development
Department of the Interior
Department of Justice
Department of Labor
Department of State
Department of Transportation
Department of the Treasury
Federal Emergency Management Agency
Federal Energy Regulatory Commission
General Services Administration
Geological Survey, Department of the Interior
National Aeronautics and Space Administration
National Oceanographic and Atmospheric Administration
National Science Foundation
Office of Science Technology and Policy
Small Business Administration

Notes

1.For a discussion of EPA's consultation and coordination with other federal agencies, see Appendix 4: Coordination Between EPA and Other Federal Agencies.

Appendix 4
Coordination Between EPA and Other Federal Agencies

The chart below identifies areas of continued cooperation or coordination with other federal agencies according to EPA's goals.

Department/Agency	**GOAL**				
	1	**2**	**3**	**4**	**5**
Agriculture	■	■		■	■
Army Corps of Engineers	■	■	■	■	■
Commerce	■	■	■	■	■
Consumer Product Safety Commission	■			■	
Defense	■	■	■	■	■
Education	■		■		■
Energy	■	■	■	■	■
Federal Emergency Management Agency		■	■	■	
General Services Administration			■		■
Health and Human Services	■	■		■	■
Homeland Security	■	■	■	■	■
Housing and Urban Development	■	■		■	■
Interior	■	■	■	■	■
Justice	■		■	■	■
Labor		■		■	■
National Aeronautics and Space Administration	■		■		■
National Science Foundation				■	■
Nuclear Regulatory Commission	■				
Office of Science and Technology Policy				■	
Small Business Administration	■	■	■		■
State	■	■		■	

Transportation	■	■	■	■	■
Treasury	■				■
Tennessee Valley Authority		■			
US Agency for International Development	■	■		■	
US Trade Representative				■	

Goal 1: Clean Air and Global Climate Change
Goal 2: Clean and Safe Water
Goal 3: Land Preservation and Restoration
Goal 4: Healthy Communities and Ecosystems
Goal 5: Compliance and Environmental Stewardship