

ORD Resource History, FYs 2004-2010
(Dollars in Millions)

	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget	
	Resources	FTE	Resources	FTE										
ORD Total	\$646.5	1974.8	\$620.9	1954.3	\$594.7	1931.9	\$556.5	1915.1	\$547.6	1880.6	\$562.7	1901.3	\$587.2	1911.3
<i>EPM</i>	\$1.4	0.0	\$2.2	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>S&T</i>	\$598.7	1842.2	\$581.4	1840.1	\$563.1	1822.8	\$524.9	1806.1	\$520.4	1772.8	\$535.1	1788.5	\$559.1	1798.5
<i>Superfund/Superfund Transfer</i>	\$44.4	129.8	\$35.8	111.4	\$30.2	106.3	\$30.2	106.2	\$25.7	105.0	\$26.4	110.0	\$26.8	110.0
<i>Oil</i>	\$0.9	0.9	\$0.9	0.9	\$0.8	0.9	\$0.8	0.9	\$0.9	0.9	\$0.7	0.9	\$0.7	0.9
<i>LUST</i>	\$0.6	1.9	\$0.6	1.9	\$0.6	1.9	\$0.6	1.9	\$0.6	1.9	\$0.5	1.9	\$0.5	1.9
<i>STAG</i>	\$0.5	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Goal 1: Clean Air	\$83.7	259.7	\$89.8	251.9	\$90.4	246.4	\$78.1	244.5	\$78.9	236.2	\$80.5	269.5	\$83.2	269.5
Congressional Add Ons	\$5.0	0.0	\$8.0	0.0	\$7.4	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>EPM</i>	\$0.0	0.0	\$0.3	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>S&T</i>	\$5.0	0.0	\$7.6	0.0	\$7.4	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Air Toxics ²	\$16.9	59.5	\$17.0	55.6	\$16.2	55.5	\$12.6	52.6	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Particulate Matter ¹	\$56.6	185.9	\$60.9	184.8	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Tropospheric Ozone ¹	\$5.1	14.3	\$4.0	11.5	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
NAAQS ²	\$0.0	0.0	\$0.0	0.0	\$66.8	190.9	\$65.5	191.9	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Clean Air	\$0.0	0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$78.9	\$236.2	\$80.5	\$269.5	\$83.2	\$269.5
Goal 2: Clean and Safe Water	\$103.8	443.4	\$101.9	445.9	\$100.4	456.9	\$105.4	454.0	\$107.3	446.6	\$109.8	427.0	\$110.4	427.0
Congressional Add Ons	\$14.6	0.0	\$8.2	0.0	\$4.0	0.0	\$0.0	0.0	\$3.7	0.0	\$3.6	0.0	\$0.0	0.0
<i>EPM</i>	\$0.3	0.0	\$0.1	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>S&T</i>	\$14.3	0.0	\$8.1	0.0	\$4.0	0.0	\$0.0	0.0	\$3.7	0.0	\$3.6	0.0	\$0.0	0.0
Drinking Water	\$44.1	214.1	\$48.7	215.7	\$45.2	209.6	\$48.3	208.6	\$47.6	207.2	\$46.9	190.2	\$47.9	190.2
Water Quality	\$45.1	229.3	\$45.0	230.2	\$51.3	247.3	\$57.0	245.4	\$56.0	239.4	\$59.3	236.8	\$62.5	236.8
Goal 3: Land Preservation and Restoration	\$47.8	146.4	\$45.1	144.2	\$40.0	145.1	\$33.4	142.8	\$32.0	141.3	\$35.7	154.7	\$36.4	154.7
Congressional Add Ons	\$4.7	0.0	\$5.0	0.0	\$2.8	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Land Preservation	\$37.1	136.7	\$33.6	134.5	\$36.0	135.4	\$33.4	142.8	\$32.0	141.3	\$35.7	154.7	\$36.4	154.7
<i>S&T</i>	\$9.4	47.9	\$9.1	48.2	\$11.6	51.6	\$10.4	50.8	\$10.8	50.4	\$13.6	58.8	\$13.8	58.8
<i>SF</i>	\$26.1	86.0	\$23.0	83.5	\$22.9	81.0	\$21.5	89.2	\$19.7	88.1	\$20.9	93.1	\$21.4	93.1
<i>LUST</i>	\$0.6	1.9	\$0.6	1.9	\$0.6	1.9	\$0.6	1.9	\$0.6	1.9	\$0.5	1.9	\$0.5	1.9
<i>Oil</i>	\$0.9	0.9	\$0.9	0.9	\$0.8	0.9	\$0.8	0.9	\$0.9	0.9	\$0.7	0.9	\$0.7	0.9
Superfund Innovative Technology Evaluation (SITE)	\$6.0	9.7	\$6.6	9.7	\$1.2	9.7	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Goal 4: Healthy Communities and Ecosystems	\$348.4	996.1	\$327.5	990.1	\$326.8	999.6	\$313.5	993.5	\$305.8	980.3	\$315.4	979.3	\$333.1	989.3
Congressional Add Ons	\$14.5	0.0	\$17.5	0.0	\$4.6	0.0	\$0.0	0.0	\$0.5	0.0	\$0.7	0.0	\$0.0	0.0
<i>EPM</i>	\$0.2	0.0	\$0.7	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>S&T</i>	\$13.8	0.0	\$16.8	0.0	\$4.6	0.0	\$0.0	0.0	\$0.5	0.0	\$0.7	0.0	\$0.0	0.0
<i>STAG</i>	\$0.5	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Homeland Security	\$29.9	38.9	\$24.6	40.4	\$31.7	50.9	\$35.6	50.9	\$33.4	50.9	\$37.0	57.5	\$35.6	57.5
<i>S&T</i>	\$21.6	17.0	\$22.5	35.8	\$29.7	48.9	\$33.6	48.9	\$31.4	48.9	\$35.0	55.5	\$33.6	55.5
<i>SF</i>	\$8.4	21.9	\$2.1	4.6	\$2.0	2.0	\$2.0	2.0	\$2.0	2.0	\$2.1	2.0	\$2.0	2.0
Human Health Risk Assessments	\$36.0	159.8	\$36.3	172.3	\$39.4	184.0	\$39.1	183.9	\$42.7	182.1	\$42.7	178.6	\$48.5	188.6
<i>S&T</i>	\$32.6	147.6	\$32.7	158.7	\$35.6	170.4	\$32.8	168.9	\$38.7	167.2	\$39.4	163.7	\$45.1	173.7
<i>SF</i>	\$3.4	12.2	\$3.6	13.6	\$3.8	13.6	\$6.3	15.0	\$3.9	14.9	\$3.4	14.9	\$3.4	14.9
Computational Toxicology	\$11.8	23.0	\$12.0	24.1	\$12.3	36.8	\$14.7	34.3	\$11.5	34.3	\$15.2	32.7	\$19.6	32.7
Endocrine Disrupting Chemicals	\$10.9	55.0	\$10.4	51.5	\$10.5	54.8	\$10.5	54.8	\$10.2	54.4	\$11.5	50.1	\$11.4	50.1
Global Change	\$21.1	41.8	\$19.6	39.5	\$18.6	37.1	\$16.2	35.3	\$18.1	32.6	\$17.9	35.5	\$20.9	35.5
Human Health and Ecosystems Protection	\$181.2	508.0	\$167.4	520.3	\$167.7	509.8	\$161.2	509.3	\$154.2	497.0	\$153.8	484.9	\$158.3	484.9
Pesticides and Toxics	\$31.8	169.6	\$27.8	139.5	\$30.4	123.4	\$26.0	122.2	\$25.5	126.3	\$26.9	137.4	\$27.8	137.4
Fellowships	\$11.1	0.0	\$12.0	2.5	\$11.7	2.8	\$10.1	2.8	\$9.7	2.7	\$9.7	2.6	\$10.9	2.6
Goal 5: Compliance and Environmental Stewardship	\$62.8	129.2	\$56.5	122.2	\$37.1	83.9	\$26.2	80.3	\$23.6	76.2	\$21.3	70.8	\$24.1	70.8
Congressional Add Ons	\$16.2	0.0	\$15.5	0.0	\$5.6	0.0	\$0.0	0.0	\$0.1	0.0	\$0.1	0.0	\$0.0	0.0
<i>EPM</i>	\$0.9	0.0	\$1.1	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>S&T</i>	\$15.4	0.0	\$14.5	0.0	\$5.6	0.0	\$0.0	0.0	\$0.1	0.0	\$0.1	0.0	\$0.0	0.0
ETV	\$3.6	6.0	\$3.2	6.0	\$3.0	4.7	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Pollution Prevention ³	\$42.9	123.2	\$37.8	116.2	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>S&T</i>	\$42.3	123.2	\$37.2	116.2	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
<i>SF</i>	\$0.6	0.0	\$0.6	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Economic and Decision Sciences ³	\$0.0	0.0	\$0.0	0.0	\$2.4	3.0	\$2.3	3.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Sustainability ³	\$0.0	0.0	\$0.0	0.0	\$26.1	76.2	\$23.9	77.3	\$23.5	76.2	\$21.2	70.8	\$24.1	70.8
<i>S&T</i>	\$0.0	0.0	\$0.0	0.0	\$25.8	76.2	\$23.6	77.3	\$23.4	76.2	\$21.1	70.8	\$24.1	70.8
<i>SF</i>	\$0.0	0.0	\$0.0	0.0	\$0.3	0.0	\$0.3	0.0	\$0.1	0.0	\$0.1	0.0	\$0.0	0.0

Totals may not add due to rounding.

- In FY 2006, the Particulate Matter and Tropospheric Ozone Program/Projects were combined to form the NAAQS Program/Project
- In FY 2008, the NAAQS and Air Toxics Program/Projects were combined to form the Clean Air Program/Project
- In FY 2006, The Pollution Prevention Program/Project was divided into the Economics and Decision Sciences and Sustainability Program/Projects

**ORD's Homeland Security: Preparedness, Response, and Recovery
Program/Project Resources by Research Area**
(Dollars in Millions)

ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Decontamination and Consequence Management	\$8.3	21.9	\$2.1	4.6	\$11.7	23.3	\$14.7	23.6	\$12.8	23.5	\$14.3	23.7	\$14.8	23.7	\$0.5	0.0
Water infrastructure Protection	\$11.6	10.7	\$11.5	20.1	\$9.9	15.8	\$10.7	15.6	\$10.6	15.6	\$10.5	15.3	\$10.1	15.3	(\$0.4)	0.0
Threat and Consequence Assessment	\$10.0	6.3	\$11.0	15.7	\$10.1	11.8	\$10.2	11.7	\$10.0	11.8	\$12.2	18.5	\$10.7	18.5	(\$1.5)	0.0
Total	\$29.9	38.9	\$24.6	40.4	\$31.7	50.9	\$35.6	50.9	\$33.4	50.9	\$37.0	57.5	\$35.6	57.5	(\$1.4)	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

Homeland Security: Preparedness, Response, and Recovery

Program Area: Homeland Security

Goal: Land Preservation and Restoration

Objective(s): Restore Land

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Environmental Program & Management	\$4,105.3	\$3,378.0	\$3,443.0	\$65.0
Science & Technology	\$40,807.3	\$43,671.0	\$42,409.0	(\$1,262.0)
<i>Hazardous Substance Superfund</i>	<i>\$45,283.2</i>	<i>\$53,641.0</i>	<i>\$53,543.0</i>	<i>(\$98.0)</i>
Total Budget Authority / Obligations	\$90,195.8	\$100,690.0	\$99,395.0	(\$1,295.0)
Total Workyears	176.5	174.2	174.2	0.0

Program Project Description:

EPA's Homeland Security Emergency Preparedness and Response program develops and maintains an agency-wide capability to respond to large-scale catastrophic incidents with emphasis on those that may involve Weapons of Mass Destruction (WMD). The program builds upon EPA's long standing emergency response and removal program, which is responsible for responding to and cleaning up both oil and hazardous substance releases. EPA's homeland security effort expands these responsibilities to include threats associated with Chemical, Biological, and Radiological (CBR) agents. Over the next several years, the Agency will continue to focus on building the capacity to respond to multiple simultaneous large-scale catastrophic incidents. To meet this challenge, EPA will continue to use a comprehensive approach that brings together all emergency response assets to implement efficient and effective responses. Another priority for this program is improving research, development, and technical support for potential threats and response protocols.

FY 2010 Activities and Performance Plan:

In FY 2010, efforts to develop the capability to respond to multiple incidents will concentrate on four key areas: 1) maintaining a highly skilled, well-trained and equipped response workforce that can rise to the challenge of responding to simultaneous incidents as well as threats involving WMD substances; 2) continuing the development of decontamination options, methods, and protocols to ensure that the nation can quickly recover from nationally significant incidents; 3) operating and maintaining a nationwide environmental laboratory network capability to enhance coordination and standardization of laboratory support which includes expanding Agency Chemical Warfare Agent (CWA) fixed and field capabilities; and 4) implementing the EPA's National Approach to Response (NAR) to effectively manage EPA's emergency response assets during large-scale activations. EPA activities in support of these efforts include the following:

- Develop and maintain the skills of EPA's On-Scene Coordinators (OSCs) through specialized training, exercises, and equipment. In FY 2010, EPA and its Federal, state, local, and tribal homeland response partners will continue to develop and participate in a wide range of exercises and trainings designed to test EPA's response capabilities.
- Strengthen the Agency's responder base during large-scale catastrophic incidents by training volunteers of the Response Support Corps (RSC) and members of an Incident Management Team (IMT). These volunteers provide critical support in Headquarters and Regional Emergency Operations Centers and in assisting with operations in the field. To ensure technical proficiency, this new cadre of response personnel requires initial training and yearly refresher training to include opportunities to participate in exercises and workshops, health and safety training, medical monitoring, and equipment acquisition, as necessary. The focus is on their assigned responsibilities during a response, interactions with the emergency response program personnel, and understanding lines of communication within an IMT.
- Accelerate current efforts to build laboratory capacity and capability to analyze, verify, and validate CWA samples during a nationally significant incident. The Agency will maintain and operate existing fixed CWA labs and a Portable High-Throughput Integrated Laboratory Identification System (PHILIS) unit. A recent analysis, conducted by the Department of Homeland Security (DHS), has shown a substantial gap between the Agency's current capacity and what may be needed to analyze chemical and biological warfare agents. To continue to make progress towards reducing that gap, EPA will upgrade two existing PHILIS units to enhance the Agency's mobile analytical capability for CWA and also will award grants and/or interagency agreements (IAGs) to state and/or Federal agencies for fixed CWA labs to increase capacity. Working with DHS, the Department of Defense, and the states, EPA will implement standard operating procedures and standards of performance. The Agency will continue to actively participate with the Integrated Consortium of Laboratory Networks, maintaining and updating a laboratory compendium of Federal, state, and commercial capabilities, and maintain a chemical surety program. EPA also will work with DHS to implement a competitive state grant for an All Hazards Receipt Facility for the purpose of screening *unknown* chemical, biological, radiological, and/or nuclear (CBRN) agents.
- Operate and expand the Environmental Response Laboratory Network (ERLN) in Headquarters and Regional offices to provide lab analysis for routine and emergency response and removal operations including a terrorist attack. In addition, in FY 2010, EPA will continue to improve an electronic data deliverable (EDD) for ERLN laboratories. The EDD enables laboratories to report analytical data electronically rather than manually via hard copy reports, which will support and potentially expedite decision-making. The current EDD basically reports results only. An improved version will include additional quality parameters.
- Continue to develop and validate environmental sampling, analysis, and human health risk assessment methods for known and emerging biological threat agents. These sampling and analysis methods are critical to ensuring appropriate response and recovery

actions and developing necessary laboratory support capacity. The human health risk assessment methods also are extremely important to decision makers who are faced with determining when decontaminated facilities and equipment can be returned to service. This decontamination and consequence management research will produce data, information, and technologies to assist EPA in developing standards, protocols, and capabilities to recover from and mitigate the risks associated with biological attacks.

- Implement the NAR to maximize Regional interoperability and to ensure that EPA's OSCs will be able to respond to terrorist threats and large-scale catastrophic incidents in an effective and nationally consistent manner.
- Continue to maintain one Airborne Spectral Photometric Environmental Collection Technology (ASPECT) aircraft. The EPA ASPECT provides direct assistance to first responders by remotely detecting chemical and radiological vapors, plumes, and clouds.
- Continue to populate the Decontamination Portfolio with additional agents and maintain existing agent information.
- Improve and enhance Agency systems to accept a wider variety of environmental data, including sampling, monitoring, hazardous debris and facilities reconnaissance, and to make these data easily and rapidly accessible for a variety of uses. Implementation of these activities will create a seamless data flow from the field and laboratory to the various Incident Command System (ICS) units and to the general public. It also will improve EPA's ability to make rapid and accurate response decisions and keep the public informed of health and environmental risks.
- Maintain and improve the Emergency Management Portal (EMP). EPA will continue to manage, collect, and validate new information including the portfolio content as new techniques are developed, or as other information emerges from the scientific community.
- Maximize the effectiveness of EPA's involvement in national security events through pre-deployments of assets such as emergency response personnel and field detection equipment. Pre-deployments allow immediate response should an incident occur at a national security event. EPA estimates it will participate in three pre-deployments in FY 2010.
- Conduct one WMD Decontamination course for EPA OSCs, Special Teams, and Response Support Corp personnel to improve decontamination preparedness for biological, chemical, and radiological agents.

Performance Targets:

Work under this program supports multiple strategic objectives. Currently, there are no performance measures for this specific Program.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$887.0) This reflects an increase for payroll and cost of living for existing FTE.
- (-\$1,000.0) This change reflects significant progress the Agency has made in equipment procurement, thereby reducing the need for such procurements in FY 2010.
- (+\$15.0) This increase supports research in the areas of environmental sampling, analysis, and human health risk assessment methods.

Statutory Authority:

CERCLA Sections 104, 105, 106; Clean Water Act; Oil Pollution Act.

Homeland Security: Preparedness, Response, and Recovery

Program Area: Homeland Security

Goal: Clean Air and Global Climate Change

Objective(s): Radiation

Goal: Healthy Communities and Ecosystems

Objective(s): Chemical and Pesticide Risks; Enhance Science and Research

(Dollars in Thousands)

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Total Workyears	176.5	174.2	174.2	0.0

Program Project Description:

Through research, development, and technical support activities, EPA's Homeland Security Research Program enhances the Nation's preparedness, response, and recovery capabilities for homeland security large-scale catastrophic incidents involving chemical, biological, or radiological threats and attacks. EPA continues to evaluate tools and capabilities so that cost effective response and recovery approaches can be identified for future use by the response community, elected and appointed decision makers, and risk managers. Research will further state-of-the-art approaches to address all phases of emergency response and recovery to ensure public and worker safety, protect property, and facilitate recovery. The Agency also continues to work with other Federal agencies and organizations, through collaborative research efforts, to strengthen remediation capabilities.

FY 2010 Activities and Performance Plan:

EPA homeland security research on chemical, biological, and radiological (CBR) contaminants will continue to fill critical gaps in our ability to effectively respond to and recover from threats, attacks, and large-scale catastrophic incidents. EPA has unique knowledge and expertise related to decontamination and disposal of contaminated materials. Additionally, the Agency has demonstrated results meeting the needs of decision makers and emergency responders across government and industry.

FY 2010 Homeland Security Research Program funds will be used to deliver science and engineering research results to the program's customers to better facilitate and enable their ability to carry out their homeland security missions. Customer needs, identified jointly, are the primary consideration used in prioritizing research activities. Key customers include EPA's Water, Solid Waste and Emergency Response, and Air and Radiation programs, among others. EPA's research program provides support and assistance in interactions with water utilities to

help ensure the nation's water systems are secure and drinking water is acceptable. The Agency's research program also is increasing its responsiveness to the science needs of the EPA emergency response community (National Decontamination Team, Environmental Response Team, Radiological Emergency Response Team, Removal Managers, and On-Scene Coordinators). Research will focus on providing tools and support to facilitate response to and recovery from large-scale catastrophic incidents. Along with this customer focus, the program has enhanced communication throughout EPA's Homeland Security program and the Regional offices to improve collaboration and to ensure that needs are met.

Decontamination Research: EPA's decontamination research program directly supports the Agency's National Response Plan (NRP) as well as its homeland security responsibilities. In many cases, the research program also supports the Department of Homeland Security's requirements for EPA expertise in a number of key areas including water infrastructure, materials decontamination and disposal, threat assessment, sampling, and analytical methods. Activities in FY 2010 include the following:

- Threat and consequence assessment research will continue to focus on products and information to aid decision-makers in assessing risks to human health from biological and chemical agents and to further identify research gaps. The information to be collected, generated, and evaluated includes data on the toxicity, infectivity, mechanism of action, fate, transport, and exposure consequences for Chemical, Biological, and Radiological (CBR) contaminants. It also will be used to develop relationships of human response to varying doses of biological organisms to assist in the development of cleanup goals. Research will continue to identify risks during incidents and to develop improved methods to communicate those risks to decision-makers and the public.
- Technology testing and evaluation research will continue to develop innovative methods and test commercially-available technologies. These efforts will enhance the Nation's ability to detect and decontaminate CBR contaminants resulting from terrorist attacks on infrastructure and outdoor areas such as urban centers.
- Response capability enhancement research will continue to support the development of the Environmental Response Laboratory Network (ERLN). EPA will continue to expand the Standardized Analytical Methods (SAM) and create Reference Laboratory capability. SAM identifies high risk chemical, biological, and radiological agents and analytical methods for the ERLN that are required to document safe restoration exposure levels. Reference Laboratories serve as an authoritative source in the ERLN for method development, verification, and validation.
- Decontamination and consequence management research will continue to develop and improve decontamination and disposal techniques and technologies for CBR contaminants. This research includes the remediation and clean-up of building exteriors and infrastructure (e.g., subways, bridges, stadiums, airports, train stations, rail lines, highways, drinking water and wastewater systems). It also involves the clean-up of various outdoor areas (e.g., walks, streets, parks) in both urban and non-urban areas, as well as the safe disposal of contaminated materials and decontamination residue.

Decontamination research will produce many science and engineering products in FY 2010 to support EPA's National Response Plan and first responders in carrying out their homeland security missions. The following are several key products to be completed in FY 2010:

- Methods for rapid determination of CBR contaminant viability on surfaces and in environmental media;
- Improved understanding of the ability of anthrax to re-aerosolize from various indoor and outdoor surfaces;
- Methods to combine infectivity and exposure assessments into a scientifically defensible characterization of risk of humans exposed to anthrax;
- Data on the persistence of CB contaminants in the indoor and outdoor environments and in landfills;
- Evaluations of and improvements to methods for removal of radioactive contaminants from outdoor urban surfaces;
- Improvements in methods for decontamination of CB contaminants, including low-tech methods for clean-up after wide-area releases;
- Data on materials compatibility for various decontamination methods;
- Demonstration of scaled-up decontamination technologies shown to be efficacious in laboratory studies;
- Provisional Advisory Levels (PALs) for 15 chemicals to guide responders on human health risk of exposure to toxic industrial chemicals and chemical warfare agents. PALs apply to exposure durations ranging from 24 hours to two years. They complement the Acute Exposure Guideline Levels (AEGLs) program, which derives limits for exposure durations of up to eight hours; and
- Expanded *Disposal Decision Support Tool* to include additional options for the disposal of radioactive wastes and wastes from agroterrorism.

Water Infrastructure Protection Research: Water Infrastructure Protection Research will focus on developing, testing, demonstrating, communicating, and implementing enhanced methods for detection, treatment, and containment of CBR agents and bulk industrial chemicals intentionally introduced into drinking water and wastewater systems. This is consistent with the Critical Infrastructure Protection Plan (CIPP) developed for water infrastructure and with the Water Security Research and Technical Support Action Plan. The program will produce many science and engineering products in FY 2010 to support EPA's Water Program and water utilities in carrying out their homeland security missions. The following are several key products to be completed in FY 2010:

- Computer tools to assess water utility vulnerabilities, to optimally place sensors, and to manage consequences of both terror and non-terror events;
- Cost-effective online water quality monitors (i.e. pH, TOC, chlorine, etc) essential to real-time monitoring of distribution systems;
- Decontamination approaches for water distribution systems;
- Distribution system flushing options for reducing spread of contaminants;
- Treatment approaches for dealing with contaminated water; and
- Validated chemical Standard Analytical Protocols (SAP) for water.

Safe Buildings Research: EPA's Safe Buildings research focuses on identifying, developing, and testing better, less expensive, and safer decontamination methods to facilitate building reoccupancy after a terrorist attack involving CBR contaminants. This research also involves developing procedures to use before and after an attack that would minimize the spread of contaminants inside a building, protect building occupants, and limit the area needing decontamination. An indoor contamination event typically results in a significant quantity of building decontamination residue, and this research also addresses safe disposal of these residues. The program will produce science and engineering products in FY 2010 to support EPA's National Response Plan and first responders in carrying out their homeland security missions, including:

- Performance information on commercially-available biological decontamination technologies to assist decision making on clean-up following an attack.
- Strategies to contain fumigants used in the decontamination of buildings.

Radiation Monitoring: Maintenance and enhancement of the RadNet air monitoring network supports EPA's responsibilities under the Nuclear/Radiological Incident Annex to the National Response Framework (NRF). The network includes deployable monitors and near real-time stationary monitors.

The Agency will continue to upgrade and expand the RadNet air monitoring network. These near real-time monitors will replace or augment the pre-existing system of 60 conventional air samplers. Fixed stations will operate routinely and in conjunction with as many as 40 deployable monitors following a radiological incident. Through FY 2010, EPA expects to install at least 130 monitors providing near real-time radiation monitoring coverage for over 95 of the 100 most populous U.S. cities. As the RadNet air monitoring network is upgraded and expanded, average response time and data dissemination will be reduced from days to hours and will provide the Agency and first responders with greater access to data, improving officials' ability to make decisions about protecting public health and the environment during and/or after an incident. Additionally, the data will be used by scientists to better characterize the effect of a radiological incident.

Improve National Radiological Laboratory Capacity and Capability: In FY 2010, EPA will continue to augment EPA's existing radiological laboratory to meet emerging homeland security needs and serve as the Agency's radiological reference laboratory. EPA will continue to upgrade the Agency's laboratory response capability which will include a network of "go-to" state laboratories to ensure a minimal level of surge capacity for radiological terrorism incidents; enhance the existing capability to conduct chemical and radiological analysis simultaneously; and coordinate the Radiological Emergency Response Team's sample handling protocols with the mobile triage units. Additionally, EPA will align and integrate related radiological activities with existing National Lab Networks. The Agency will continue a pilot project, begun in FY 2007, to improve state radiological laboratory capacity through provision of additional laboratory instruments, training, quality assurance testing, and audits of the selected state laboratories. Recently, EPA awarded grants to state laboratories in Connecticut, Texas, and Washington. EPA will continue to do audits and performance evaluation studies to assess and continually improve laboratory competency. As additional laboratories are audited, the number of available core

laboratories that can support the Agency will increase. In addition, a template for a common radiological electronic data deliverable will be developed. This will help to ensure that the laboratories report the data in a common format, making the compilation of data from various laboratories more efficient.

Biodefense: EPA will continue work to develop and validate methods to evaluate the efficacy of antimicrobial products against bioterrorism agents, expanding this work to address unique formulations, additional surface types, and additional bioterrorism agents and emerging pathogens. The Agency will continue to address critical gaps in efficacy test methodology and knowledge of microbial resistance. In addition to vegetative bacteria, EPA also will continue efforts to address threatening viruses and other emerging pathogens in environmental media. EPA will invest in the development and evaluation of efficacy test protocols for products designed to control viruses in the environment during decontamination. The development of “decon toolboxes” for specific bioterrorism agents or classes of bacteria/viruses will remain a priority in FY 2010. Finally, EPA will continue to work with the USDA to evaluate the efficacy of disinfectants against highly pathogenic Foreign Animal Disease (FAD) agents that pose a significant threat to U.S. agriculture and the human food production system.

In order to improve the Agency’s ability to respond to events involving biothreat agents, EPA will increase the number of standardized and validated methods for evaluating the efficacy of decontamination agents. EPA will continue to seek independent third-party analysis for method validation efforts through recognized standard setting organizations. As new methods are developed, statistical modeling for various biodefense scenarios will be critical to the development of science-based performance standards. Microbial persistence, resistance to antimicrobial agents, and an understanding of biofilm environments are also key factors in evaluating the efficacy of decontamination tools.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of water security initiatives.	83	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of efficient and effective clean-ups and safe disposal of contamination wastes.	92	100	100	100	Percent

Work under this program supports multiple strategic objectives. In FY 2010, the program plans to meet its targets of completing and delivering 100 percent of its planned outputs in support of: 1) the efficient and effective clean-up and safe disposal of decontamination wastes, 2) the Water

Security Initiative, 3) the rapid assessment of risk and the determination of clean-up goals and procedures following contamination, 4) the establishment of the National Laboratory Response Network, and 5) validated standardized methods for evaluating efficacy of antimicrobial products against a variety of biological pathogens. In achieving these targets, the program will contribute to EPA's goal of providing scientifically sound guidance and policy decisions related to the health of people, communities, and ecosystems.

EPA is on track through its ongoing work to meet its FY 2011 strategic plan goal of protecting public health and the environment from unwanted releases of EPA regulated radioactive waste and to minimize impacts to public health from radiation exposure. EPA has developed new outcome-oriented strategic and annual performance measures for this program. In addition, the program developed an efficiency measure that demonstrates that the program utilizes total resources efficiently.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$1,000.0) This reflects an increase for payroll and cost of living for existing FTE.
- (-\$683.0) This represents a realignment of funds associated with equipment purchases and repairs across Agency research programs.
- (+\$89.0) This increase will support efforts related to increasing the Agency's radiological laboratory capability/capacity and evaluating the efficacy of antimicrobial products.
- (-\$1,668.0) This change reflects a shift in priorities from the evaluation and testing of decontamination and disposal techniques and the assessment of human health risks associated with CBR agents to focus on performing decontamination and water security research. This research will address gaps in the Agency's ability to effectively respond to and recover from threats, attacks, and large-scale catastrophic incidents.

Statutory Authority:

Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq. (1970), and Reorganization Plan #3 of 1970; CAA; CERCLA; SARA; Executive Order 12241 of September 1980, National Contingency Plan, 3 CFR, 1980; Executive Order 12656 of November 1988, Assignment of Emergency Preparedness Responsibilities, 3 CFR, 1988; Public Health Service Act, as amended, 42 U.S.C. 201 et seq.; Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, 42 U.S.C. 5121 et seq.; SDWA; Title XIV of the National Defense Authorization Act of 1997, PL 104-201 (Nunn-Lugar II) National Response Plan; Public Health Security and Bioterrorism Emergency and Response Act of 2002; TSCA; Oil Pollution Act; Pollution Prevention Act; RCRA; EPCRA; CWA; FIFRA; Federal Food, Drug and Cosmetic Act; FQPA; Ocean Dumping Act; Public Health Service Act, as amended; 42 U.S.C. 201 et seq.; Executive Order 10831 (1970); Public Law 86-373; PRIA.

Research: Drinking Water Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Drinking Water																
Regulated Contaminants	\$18.0	71.3	\$22.6	72.5	\$18.7	71.0	\$17.0	69.8								
Unregulated Contaminants	\$21.3	121.5	\$22.4	121.4	\$23.0	119.6	\$25.1	119.8								
Distribution systems and source water protection	\$4.8	21.3	\$3.7	21.8	\$3.5	19.0	\$6.2	19.1								
Characterize risks associated with drinking water sources, treatment, distribution, and use ¹									\$12.4	66.5	\$10.1	54.6	\$10.3	54.4	\$0.2	(0.2)
Control, manage, and/or mitigate potential health risks ¹									\$35.2	140.7	\$36.7	135.6	\$37.6	135.8	\$0.9	0.2
Total	\$44.1	214.1	\$48.7	215.7	\$45.2	209.6	\$48.3	208.6	\$47.6	207.2	46.9	190.2	\$47.9	190.2	\$1.0	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2009, ORD revised its Long Term Goal structure within the Drinking Water program. This was made retroactive to the FY 2008 Enacted.

Research: Drinking Water

Program Area: Research: Clean Water

Goal: Clean and Safe Water

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Science & Technology</i>	\$48,228.2	\$46,873.0	\$47,909.0	\$1,036.0
Total Budget Authority / Obligations	\$48,228.2	\$46,873.0	\$47,909.0	\$1,036.0
Total Workyears	200.9	190.2	190.2	0.0

Program Project Description:

EPA's Drinking Water Research Program provides sound scientific approaches for ensuring safe and sustainable drinking water through integrated, multidisciplinary applied research. This program provides methodologies, data, tools, models, and technologies in support of health risk assessments and other needs pertaining to regulatory decisions under the Safe Drinking Water Act's (SDWA) statutory requirements. Research also is targeted at implementation of regulatory decisions, addressing simultaneous compliance issues, promoting the sustainability of water resources, and the reliable delivery of safe drinking water, as well as developing approaches to improve water infrastructure. The program is designed around the water cycle and the research is organized around five theme areas (assessment tools, exposure/health effects, source water protection, treatment strategies, and distribution/storage/infrastructure). This structure provides opportunities for integrating method development with health effects research and applications in treatment technologies and water distribution systems. In addition, this structure provides an opportunity to integrate water availability, water efficiency and energy considerations into the risk characterization-risk management paradigm.

Research in the Drinking Water Research Program is coordinated with the Agency's regulatory activities and timelines and is responsive to EPA's water program and Regional offices. Current research topics include: the Revised Total Coliform Rule (R-TCR) and related research on distribution systems; implementation of recent regulatory decisions including the Ground Water Rule, the Stage 2 Disinfection Byproduct Rule (DBP2), and the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR); and research support for simultaneous compliance challenges, particularly co-compliance with the Lead and Copper Rule (LCR), Microbial and Disinfectant Byproduct (M/DBP) rules, and National Primary Drinking Water Regulations (NPDWR). Research also is targeted at supporting the proposed revisions to the Underground Injection Control (UIC) regulations that pertain to geologic sequestration of carbon. Another major component of the research program is addressing the information gaps associated with chemicals and microorganisms that are on the soon-to-be-released third Contaminant Candidate List (CCL3) and supporting the unregulated contaminant monitoring rule (UCMR).

Several peer-reviewed research strategies^{34,35} and guidance from external experts^{36,37,38,39} have provided input and guidance for charting the research directions. The Agency also maintains a Drinking Water Research Program (DWRP) Multi-Year Plan⁴⁰ (MYP) that outlines steps for meeting these needs and annual performance goals and measures for evaluating progress. The drinking water MYP has been revised to reflect anticipated science and regulatory needs in FY 2010 and beyond. These plans are subjected to rigorous peer review⁴¹ and address high priority research questions related to the safety of drinking water and the safety, reliability, and sustainability of drinking water infrastructure.

In 2007, the Drinking Water research program underwent a mid-cycle progress review by the Board of Scientific Counselors (BOSC), a Federal advisory committee comprised of qualified, independent scientists and engineers.⁴² The BOSC was “favorably impressed” with the program’s revised structure and concluded that the formation of five thematic areas (i.e. Assessment tools, Exposure/Health Effects, Source water/Water resources, Treatment/Residuals, and Distribution/Storage/Infrastructure) “allows focus on statutory requirements such as the 6-year review or the Contaminant Candidate List (CCL) with the flexibility to address emerging drinking water research issues such as nanotechnology”. The Drinking Water research program is adopting specific BOSC recommendations, including identifying opportunities for collaboration and resource leveraging while continuing to plan anticipatory drinking water research. A complete BOSC review is scheduled for FY 2010.

FY 2010 Activities and Performance Plan:

In FY 2010, the Drinking Water research program will focus on characterizing and managing health risks associated with the sources, production and distribution of drinking water for public water supplies. The research plan reflects a progressive shift from addressing single contaminants towards developing exposure and health effects information that can be applied to classes of contaminants. Efforts also are being directed at integrating concepts of water availability, energy-water interdependencies, and the sustainability of water systems in the context of the program’s long-term goals. The thematic areas of the program are: assessment tools, exposure/health effects, source water protection, treatment strategies, and water distribution/storage/infrastructure systems.

Assessment tools: Research is focused on developing tools for the analysis, monitoring, screening and prioritization of drinking water constituents. Research will continue to develop methods to measure CCL chemicals and pathogens to assist in assessing occurrence under

34 U.S. EPA, Office of Research and Development. *Research Plan for Microbial Pathogens and Disinfection By-Products in Drinking Water*. EPA 600-R-97-122, Washington, D.C.: U.S. Government Printing Office (1997).

35 U.S. EPA, Office of Research and Development. *Research Plan for Arsenic in Drinking Water*. EPA 600-R-98-042, Washington, D.C.: U.S. Government Printing Office (1998).

36 National Research Council. *Classifying Drinking Water Contaminants for Regulatory Consideration*. Washington, D.C.: The National Academies Press (2001).

37 National Academies of Science. *From Source Water to Drinking Water: Workshop Summary*. Washington, D.C.: The National Academies Press (2004).

38 National Research Council. *Indicators for Waterborne Pathogens*. Washington, D.C.: The National Academies Press (2004).

39 National Research Council. *Public Water Supply Distribution Systems: Assessing and Reducing Risks--First Report*. Washington, D.C.: The National Academies Press (2005).

40 U.S. EPA, Office of Research and Development, Drinking Water Research Program Multi-Year Plan. Washington, D.C. Available at: <http://www.epa.gov/osp/myrp.htm>.

41 Science Advisory Board. *Review of EPA’s 2003 Draft Drinking Water Research Program Multi-Year Plan* (2005). Available at: <http://www.epa.gov/sab/pdf/sab-05-008.pdf>.

42 U.S. EPA, Board of Scientific Counselors. *Mid-Cycle Review Of The Office Of Research And Development’s Drinking Water Research Program At The U.S. Environmental Protection Agency*. (Washington: EPA, 2007). Available at: <http://www.epa.gov/OSP/bose/pdf/dwmc082007rpt.pdf>

Unregulated Contaminant Monitoring Rules and for evaluating the effectiveness of treatment techniques. Exposure biomarkers for use in exposure and epidemiology studies, as well as measurement methods (recovery, viability, speciation) will be improved for compliance monitoring and Contaminant Candidate List (CCL) classification and prioritization. FY 2010 efforts will:

- Integrate sample collection, concentration, purification and detection for real-time quantitative detection methods for CCL related organisms.
- Characterize virulence and/or infectivity of potential CCL pathogens.
- Develop microarray methods to detect cyanobacteria and cyanotoxin genes in drinking water reservoirs.
- Develop and validate a virulence-factor Biochip for screening and identification of select CCL pathogens (E. Coli, Cryptosporidium, and Norovirus) and other waterborne microorganisms.
- Evaluate virulence factor activity relationships (VFARs) in characterizing CCL pathogens.

Exposure/Health Effects: A major research focus is clarifying potential health effects of CCL contaminants, waterborne disease outbreak analysis, and epidemiological studies, including the potential exposure and health significance of newly identified regulated disinfection byproducts (DBPs) and mixtures of DBPs, particularly from the use of alternatives to chlorine disinfection. Work in FY 2010 will focus on:

- Factors that influence the toxicity of Disinfection By-Product Mixtures.
- Health effects of select cyanobacterial toxins, nanoparticles.
- Results from a population-level study to assess the relationship between measured and modeled parameters of a metropolitan water distribution system and the incidence of gastrointestinal disease.
- Completing research on arsenic exposure and health effects; bioavailability of arsenicals associated with target foods biotransformation pathways due to gastrointestinal microflora.
- Characterizing biomarkers of virus exposure through drinking water consumption.

Source Water Protection: Protection of surface water and ground water sources of drinking water requires reliable monitoring methods coupled with implementation of best management practices (BMPs). In addition to watershed research, protection of ground water sources will be a focus in FY 2010 with increasing emphasis on underground injection control (UIC), aquifer storage and recovery (ASR), and ground water recharge. Research will continue toward answering key questions associated with minimizing risks of geologic sequestration of carbon on underground sources of drinking water (USDW). Studies are underway to develop models to assess risk associated with underground injection of carbon dioxide, field monitoring techniques to assess leakage of injected carbon dioxide into sources of drinking water, and tools to support implementation aspects of the proposed UIC rule on geological sequestration.

Treatment Strategies: The emphasis of the research will be on evaluating existing treatment strategies for control of CCL and other emerging contaminants, development of point-of-

use/point-of-entry systems for small systems, implementation issues for regulated contaminants, and preventing simultaneous compliance issues. Major focus areas include disinfection efficacy, control of emerging contaminants, corrosion control, and optimizing energy and water efficiency in producing and delivering potable water.

Distribution/Storage/Infrastructure: Research efforts will be directed at integrated research on water supply distribution systems and infrastructure. The Agency is participating in a “Distribution System Research and Information Collection Partnership” to develop a prioritized research agenda focused on decision relevant issues related to cross connections, back-flow, intrusion, main breaks and repairs, biofilms, nitrification, and solids accumulation. This work is in support of the revisions to the Total Coliform Rule (TCR) and the next round of 6-year review. Studies will be conducted to better understand the growth and colonization of viral, bacterial and protozoan pathogen in distribution systems including the role of free-living amoebae in fate, transport and infectivity; nitrification reactions that occur in distribution systems, accumulation and mobilization of contaminants from distribution systems including lead, arsenic, and vanadium, and disinfection. Research started in FY 2007 under the "Water Infrastructure for the 21st Century" Initiative, will continue in FY 2010 and will include focusing on field investigations and modeling of how distribution system characteristics (age, materials, capacity) and management/operation practices (flushing, pressure, hydrodynamics, storage, mixing of water sources, corrosion control) impact biofilms, water chemistry, corrosion, and drinking water quality. The Agency will explore integrated approaches for managing and assessing risks in the distribution system and the development of innovative, real-time condition assessment, technology, repair or rehabilitation techniques. Anticipated research products include:

- Advanced condition assessment for drinking water mains
- Microbial characterization of distribution systems
- Nitrification reactions in drinking water distribution systems.
- Evaluation of childhood febrile and gastrointestinal health effects associated with contaminated ground water and distribution system vulnerabilities

Within the five general thematic areas outlined above, the Drinking Water research program will continue to provide support for the SDWA-mandated 6-year review of regulated contaminants (e.g., draft revision of the Total Coliform Rule, potential revisions to the Lead and Copper rule, etc). Bench and pilot scale research on simultaneous compliance issues resulting from the Ground Water Rule and the Enhanced Surface Water Treatment Rule will be continued. Modeling and field studies will continue to address UIC research needs associated with geologic sequestration of carbon.

By conducting research in support of SDWA, this research program will assist the Agency in pursuing its strategic objective of providing, by 2011, drinking water that meets all applicable health-based drinking water standards to 91 percent of the population served by community water systems.

To improve program management efforts, the program is currently: 1) working to set targets for the remainder of its long-term and annual measures, and 2) improving its oversight of partners. The program collected initial long-term measurement data during its mid-cycle BOSC review in

May 2007, and will collect formal long-term measurement data during its comprehensive BOSC review scheduled for FY 2010.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned methodologies, data, and tools delivered in support of EPA's Office of Water and other key stakeholders needs for developing health risk assessments, producing regulatory decisions, implementing new and revised rules, and achieving simultaneous compliance under the Safe Drinking Water Act.	100	100	100	100	%

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned risk management research products delivered to support EPA's Office of Water, Regions, water utilities, and other key stakeholders to manage public health risks associated with exposure to drinking water, implement effective safeguards on the quality and availability of surface and underground sources	100	100	100	100	%

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
	of drinking water, improve the water infrastructure, and establish health-based measures of program effectiveness.					

The research conducted under this program supports EPA Strategic Objective 2.3 – Enhance Science and Research. Specifically, the program conducts leading-edge, sound scientific research to support the protection of human health through the reduction of human exposure to contaminants in drinking water. The program gauges its annual and long-term success by assessing its progress on several key measures. In 2010, the program will strive to complete 100 percent of its planned outputs in support of its long-term goals. In achieving these targets, the program will contribute to EPA’s goal of protecting human health through the reduction of human exposure to contaminants in drinking water.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$412.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$173.0) These resources will fund research to characterize and manage health risks associated with the sources, production and distribution of drinking water for public water supplies.
- (+\$246.0) This represents a realignment of funds associated with equipment purchases and repairs across Agency research programs.
- (+\$205.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

Statutory Authority:

SDWA; CWA; ERDDA; MPRSA.

Research: Water Quality Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Water Quality																
Criteria to support designated uses	\$22.2	121.1	\$22.9	118.8	\$22.7	114.5	\$22.6	112.9								
Assessment of aquatic systems impairment	\$9.7	47.0	\$9.9	51.3	\$12.7	60.0	\$12.8	59.3								
Protection and restoration of aquatic systems	\$10.7	50.2	\$9.9	49.5	\$13.5	62.3	\$19.8	62.7								
Biosolids	\$2.5	11.0	\$2.3	10.6	\$2.4	10.5	\$1.8	10.5								
Criteria development ¹									\$20.1	101.9	\$23.2	98.5	\$20.3	98.5	(\$2.9)	0.0
Watershed management: assessment, measures, and incentives ¹									\$30.0	111.4	\$30.1	112.3	\$35.7	112.3	\$5.6	0.0
Source control and management research: urban uses ¹									\$5.8	26.1	\$6.0	26.0	\$6.5	26.0	\$0.5	0.0
Total	\$45.1	229.3	\$45.0	230.2	\$51.3	247.3	\$57.0	245.4	\$56.0	239.4	\$59.3	236.8	\$62.5	236.8	\$3.2	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2009, ORD revised its Long Term Goal structure within the Water Quality program. This was made retroactive to the FY 2008 Enacted.

Research: Water Quality
 Program Area: Research: Clean Water
 Goal: Clean and Safe Water
 Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$53,343.0	\$59,291.0	\$62,454.0	\$3,163.0
Total Budget Authority / Obligations	\$53,343.0	\$59,291.0	\$62,454.0	\$3,163.0
Total Workyears	237.7	236.8	236.8	0.0

Program Project Description:

The Water Quality research program is designed to support the Clean Water Act (CWA), providing scientific information and tools to the Agency and others to help protect and restore the designated uses of water bodies that sustain human health and aquatic life. The program conducts research on the development and application of water quality criteria; the implementation of effective watershed management approaches; and the application of technological options to restore and protect water bodies using information on effective treatment and management alternatives.

The Water Quality research program is responsive to the needs of EPA’s Water program and Regional Offices, which are the program’s primary clients in developing research priorities. The Agency maintains a Water Quality Research Program Multi-Year Plan⁴³ (MYP) that outlines steps and provides a timeline for meeting these needs along with related annual performance goals and measures for evaluating progress. EPA’s Board of Scientific Counselors (BOSC), a Federal advisory committee comprised of independent expert scientists and engineers, evaluated the Water Quality research program in January 2006. The BOSC review found “the Water Quality research program appropriately addresses EPA’s Strategic Goal 2 of Clean Water by creating the tools necessary for the Water program to establish water quality criteria and respond when those criteria are not being met, this includes using research results to comply with regulations and advance fundamental understanding. The program is responsive to EPA’s Water program, the program’s primary client, in developing their research priorities.”⁴⁴

FY 2010 Activities and Performance Plan:

Research efforts within the water quality research program are aligned with the Agency’s strategic objectives⁴⁴ under the CWA to:

- promulgate protective standards,
- identify contaminant contributions to impaired waters,

⁴³ U.S. EPA, Office of Research and Development, *Water Quality Research Program Multi-Year Plan*. Washington, D.C.: EPA. Available at: <http://www.epa.gov/osp/myrp.htm>.

² U.S. EPA, Board of Scientific Counselors, *Review of the Office of Research and Development’s Water Quality Research Program at the U.S. Environmental Protection Agency* (Washington: EPA, 2006). Available at: <http://www.epa.gov/osp/bosc/pdf/wq0605rpt.pdf>

⁴⁴ U.S. EPA, Office of the Chief Financial Officer, 2006-2011 EPA Strategic Plan, Washington, D.C.:EPA. Available at www.epa.gov/ocfo/plan/plan.html

- use tools to restore and protect the nation's waters with due consideration to minimizing impacts from point and non-point sources of contamination, and
- maintain and improve the nation's aging infrastructure.

In FY 2010 the Water Quality research program will support priorities set in consultation with EPA's Water program and Regional offices, taking into account such factors as pollutant/stressor type, water body types, and source of pollutants (e.g. agricultural versus urban). Research activities are categorized within three areas: 1) Water Quality Integrity Research; 2) Watershed Management Research; and, 3) Source Control and Management Research. Although the quality of the nation's waters has shown improvement, threats to water quality remain, and new threats continue to be identified.

Water Quality Integrity research priorities support regulatory driven needs related to revising aquatic life guidelines, recreational water criteria, and developing criteria for emerging contaminants [e.g., pharmaceuticals and personal care products (PPCPs) and invasive species], nutrients, toxics, sediments, and multiple stressor effects on stream biota, including research on biological condition gradients for Tiered Aquatic Life Uses (TALU). Specific stressors include habitat alteration, nutrients, pathogens, and emerging contaminants. EPA's water program is the major client for research products developed under this research and will use them in the development and application of water quality criteria. In FY 2010, research will continue to help provide the data and analysis to support revisions to recreational water criteria.

Research on diagnostic methods will enable EPA to continue its focus on the causes and sources of aquatic system impairment. Specifically, this research will provide the scientific foundation and information management scheme for an integrated process for assessing, listing, and reporting water quality conditions that meet or fail to meet statutory requirements, including a classification framework for surface waters, watersheds, and regions. As EPA directs and informs the efforts of the States to adopt nutrient criteria for individual water bodies, research is required to identify nutrient responses based on geographic region, water body type, and designated use. Research will continue toward linking stressor-response relationships to a biological condition gradient and TALU framework, while providing information on technical guidance for the development of nutrient water quality criteria for coastal wetlands and estuaries and Great Lakes.

The Water Quality program supports the adoption and implementation of *watershed management* approaches by States and Tribes as they require strong standards, monitoring, Total Maximum Daily Load (TMDL) determinations, and implementation programs, including best-management practices, restoration, and TMDL watershed plans. Watershed Management Research supports the TMDL allocation processes with the development of information and integrated water quality and quantity modeling and monitoring tools, including tools for targeting and prioritizing monitoring and restoration. This research supports assessing condition, diagnosis of impairment, mitigation, and achieving success, including support for CWA Section 305(b) reporting, use attainability analyses identifying designated uses, and TMDL adaptive management. Research efforts in this area include Gulf of Mexico Hypoxia research aimed at developing risk-based forecasting capability to aid water resource managers in making scientifically defensible nutrient management decisions to reduce the hypoxia problem, restore

the natural habitats, and restore food web assemblages along the Gulf coast. Other research addresses identifying the locations and connectivity of headwater streams and wetlands (complementary research on how and what role headwater streams and isolated wetlands play in reducing pollutant loads, and their effect on downstream quality is being conducted under the Agency's Ecological Research program to enhance our understanding of the benefits and value of ecological services); and technical assistance for watershed modeling, decision support tools, and monitoring the biological condition of the nation's aquatic resources. Key users of these products will be at the regional, state, and local level.

Research will continue on the development of microbial source tracking (MST) indicators that can be used to distinguish human from non-human pathogens and amongst different sources of non-human pathogens (e.g., cows versus geese). Such work is generally important to supporting improved TMDLs that will more accurately identify the sources of pathogens that must be managed to meet water quality standards. In particular, the results of this research support the development of revisions to the ambient water criteria for recreational settings.

In addition, existing models of pollutant transport and fate will be expanded to allow the evaluation of alternative strategies for restoring and protecting local and state watersheds. Particular emphasis will be placed on strategies for nutrient control in rural/agrarian settings and on strategies for pollutant control in urban settings. Approaches will be studied for effectively monitoring the reduction in the water column pollutants and improvements in aquatic ecosystems and for demonstrating the effectiveness of protecting designated uses from future development or other impacts.

In FY 2010, EPA's research and development program will put increased focus on wet weather flow problems in urban areas, looking particularly at how green infrastructure options could improve efficiency. Many municipalities are faced with multi-million dollar costs associated with controlling wet weather flow and particularly combined sewer overflows (CSOs). Green infrastructure options have the potential to reduce costs of control compared to traditional "grey" infrastructure, but are less proven.

Green infrastructure has the potential to provide a number of other environmental and economic benefits in addition to improving the water quality outcomes. They include the recharge of ground water and surface water supplies; cleaner air; reduced urban temperatures; reduced energy demand; carbon sequestration; reduced flooding; community benefits such as improved aesthetics, improved human health, recreational and wildlife areas; new jobs creation; and potential cost savings associated with lower capital costs for paving, curb and gutter, and building large stormwater collection and conveyance systems.⁴⁵ However, design criteria and guidance information is lacking for the placement installation, operation and maintenance for many of the green infrastructure alternatives. Additional research is also needed to collect information on measuring the environmental and economic improvements so that technical information can be provided to communities nationwide.

⁴⁵ Testimony of Michael Shapiro, Acting Assistant Administrator for Water, U.S. Environmental Protection Agency; before the Subcommittee on Water Resources and the Environment Committee on Transportation and Infrastructure; United States House of Representatives; March 19, 2009.

Research will be conducted on application of green BMPs in different urban settings, on incentives for private land owners to put such units on their sites, and on effective monitoring of the water quality improvements that result.

The preservation and restoration of wetlands will be supported with research on how wetland processes assimilate nutrient contaminants. The water quality research that defines wetland performance is fundamental to the implementation of water quality trading programs. It will include a comparison of natural and constructed wetlands to determine how seasonal changes in hydrologic regime, stressor load, and upland land use affect the functioning of these systems and will inform the protection and restoration of wetlands. Economic assessments of the use of wetlands in water quality trading also will be conducted.

Research on the release of pathogens and pathogen indicator organisms from manure-treated farmlands is needed to ensure that environmentally responsible practices are available to the agricultural community, and will continue. Field studies at concentrated animal feed operations (CAFOs) will determine the magnitude of releases to ground waters and surface waters and evaluate control options with emphasis on pathogen and nutrient contaminants. This work will support the development of effective TMDLs and National Pollutant Discharge Elimination System (NPDES) permits.

Source Control and Management (SCM) research priorities will develop information and tools to characterize, control, and manage point and non-point sources of water quality impairment. Research addresses aging infrastructure, green infrastructure, wet weather flows and residuals management. Major users of these products will be the Agency, states, regional authorities and municipalities.

In FY 2010, research will continue on the development of innovative solutions to manage the Nation's aging wastewater infrastructure. Research started in FY 2007 under the "Water Infrastructure for the 21st Century" initiative will continue to develop the science and engineering to improve and evaluate promising innovative technologies and techniques to increase the effectiveness and reduce the cost of operation, maintenance, and replacement of aging and failing wastewater conveyance systems. Research efforts will demonstrate technologies and approaches for new and innovative condition assessment, rehabilitation, and design of wastewater collection systems and comprehensive asset management. This research will support EPA in developing policy and revolving funds allocation decisions to address this multi-billion dollar problem faced by the Nation, and will support utilities and other stakeholders involved in meeting community watershed management goals and in the cost-effective assessment, rehabilitation and management of their systems.

Research will continue on the public health and environmental risk posed by of microbial releases from publically owned treatment works (POTWs) during periods of significant wet weather events. During these events wastewater flow may exceed POTW treatment capacity, resulting in diversion of wastewater around secondary treatment units followed by recombination (i.e., "blending") with flows from the secondary treatment units or discharging it directly into waterways from the treatment plant.

Research on the performance of non-point source best management practices (BMPs) will be conducted in order to provide information to watershed managers and others for the more cost-effective reduction of pollutant loading to surface waters. Particular emphasis will be placed on green infrastructure (a subcomponent of aging water infrastructure research; below) and on the variation of BMP cost and performance with geographical and other major influencing variables. EPA will continue to support the Pathogens Equivalency Committee (PEC) which evaluates innovative approaches to sewage sludge treatment for the purposes of determining whether they meet requirement of Part 503 (biosolids) regulations.

The “Water Quality Research.” program has implemented several actions to improve management and performance. The program has established a process by which the BOSC will assign a progress rating to each program long-term goal as part of its reviews.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs (in support of WQRP long-term goal #1) delivered	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs (in support of WQRP long-term goal #2) delivered	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of WQRP publications rated as highly cited publications.	15.2	15.7	No Target Provided (biennial)	16.7	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of WQRP publications in high impact journals.	13.8	14.7	No Target Provided (biennial)	15.7	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs (in support of	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
	WQRP long-term goal #3) delivered					

The research conducted under this program supports EPA Strategic Objective 2.3- Enhance Science and Research. Specifically, the program conducts leading-edge, sound scientific research to support the protection of human health through the reduction of human exposure to contaminants in fish and shellfish, and recreational waters, and to support the protection of aquatic ecosystems.

In FY 2010, the program plans to accomplish its goals of completing and delivering 100 percent of its planned outputs. In achieving these targets, the program will contribute to EPA’s goal of supporting the protection of human health through the reduction of human exposure to contaminants in fish, shellfish, and recreational waters, and to support the protection of aquatic resources. Additionally, the program strives to improve its number of publications per FTE to 82 percent. In achieving these targets, the program will better enable EPA to meet its goals.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$3,000.0) This increase will fund the expansion of green infrastructure research to assess, develop and compile scientifically rigorous tools and/or models that will be used by EPA’s Water program, States, and municipalities. This research will address region and climate-specific concerns and provide technical information that can be used to help quantitatively determine the benefits of green infrastructure and reduce the uncertainty involved in using it for compliance purposes. Research will also be conducted to advance the use of gray water, particularly in areas facing water shortages, to help reduce the burden on water supplies and infrastructure.
- (+\$328.0) This provides resources in the area of Criteria Development and Watershed Management and Source Control.
- (+\$152.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.
- (+\$98.0) This reflects an increase for payroll and cost of living for existing FTE.
- (-\$415.0) This represents a realignment of funds associated with critical equipment purchases and repairs across Agency research programs.

Statutory Authority:

CWA; ODBA; SPA; CVA; WRDA; WWWQA; MPPRCA; NISA; CZARA; CWPPRA; ESA; NAWCA; FIFRA; TSCA; ERDDA.

Research: Human Health and Ecosystems Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE			\$M	FTE										
Ecosystems	\$108.0	333.1	\$86.5	325.5	\$86.3	299.1	\$79.3	295.6	\$71.8	288.6	\$71.0	272.4	\$71.3	272.4	\$0.3	0.0
Assess ecosystem condition	\$49.4	116.2	\$38.6	108.5	\$34.2	99.2	\$31.3	97.8	\$26.5	99.8						
Protect and restore aquatic ecosystems	\$7.5	33.3	\$7.8	35.6	\$10.7	34.1	\$8.2	33.9	\$7.4	34.1						
Ecosystem diagnosis	\$23.8	85.0	\$17.6	81.4	\$17.9	75.6	\$17.5	75.6	\$16.9	74.4						
Ecosystem Forecasting	\$27.3	98.7	\$22.5	100.0	\$23.5	90.2	\$22.3	88.2	\$21.0	80.3						
Decision Support Platform ¹											\$10.3	38.4	\$10.9	38.4	\$0.6	0.0
Mapping Monitoring, and Modeling ¹											\$42.4	167.3	\$42.7	167.3	\$0.3	0.0
Nitrogen Assessment ¹											\$2.8	6.6	\$1.6	6.6	(\$1.2)	0.0
Ecosystem Type Assessment ¹											\$4.1	15.2	\$4.0	15.2	(\$0.1)	0.0
Place Based Projects ¹											\$11.3	44.9	\$12.0	44.9	\$0.7	0.0
Human Health	\$50.4	142.0	\$60.2	171.9	\$61.6	193.0	\$60.8	187.9	\$63.2	185.7	\$59.4	195.0	\$62.7	195.0	\$3.3	0.0
Mechanistic Data to reduce uncertainty	\$7.8	38.3	\$9.9	40.3	\$11.0	51.1	\$10.5	49.1							\$0.0	0.0
Aggregate and Cumulative Risk	\$9.5	29.6	\$17.5	50.4	\$17.3	49.5	\$16.9	47.5							\$0.0	0.0
Susceptible Subpopulations	\$31.5	70.5	\$30.0	77.6	\$31.3	88.9	\$32.0	87.8	\$28.4	71.7	\$26.8	72.5	\$29.1	72.5	\$2.3	0.0
Evaluating public health outcomes	\$1.7	3.7	\$2.8	3.6	\$2.0	3.5	\$1.5	3.5								
Use of Mechanistic Information ¹									\$9.3	46.6	\$9.0	48.9	\$9.3	48.9	\$0.3	0.0
Cumulative Risk ¹									\$20.9	57.3	\$19.5	62.9	\$20.1	62.9	\$0.6	0.0
Assess risk management decisions ¹									\$4.6	10.2	\$4.1	10.7	\$4.2	10.7	\$0.1	0.0
Mercury	\$7.0	7.7	\$5.2	7.2	\$3.7	12.7	\$3.9	13.1	\$3.9	13.1	\$4.1	10.8	\$4.6	10.8	\$0.5	0.0
Assess and manage mercury risks	\$0.4	2.0														
Mercury source characterization and treatment	\$3.5	5.2	\$3.7	5.2	\$3.4	10.9	\$3.4	10.3	\$2.9	10.3	\$3.1	8.9	\$3.5	8.9	\$0.4	0.0
Transport and fate of mercury and its effects on receptors	\$3.1	0.5	\$1.5	2.0	\$0.3	1.8	\$0.4	2.8	\$0.9	2.8	\$1.0	1.9	\$1.1	1.9	\$0.1	0.0
Emerging Risk Issues and Risk Policy Assessment Forum	\$15.7	25.2	\$15.5	15.7	\$11.3	5.0	\$12.2	12.7	\$10.3	9.6	\$14.4	6.7	\$14.7	6.7	\$0.3	0.0
Advanced Monitoring Initiative	\$0.0	0.0	\$0.0	0.0	\$4.9	0.0	\$5.1	0.0	\$4.9	0.0	\$4.9	0.0	\$5.1	0.0	\$0.2	0.0
Total	\$181.2	508.0	\$167.4	520.3	\$167.7	509.8	\$161.2	509.3	\$154.2	497.0	\$153.8	484.9	\$158.3	484.9	\$4.5	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2009, ORD revised its Long Term Goal structure within the Ecosystems and Human Health programs. For Human Health, this was made retroactive to the FY 2008 Enacted.

Research: Human Health and Ecosystems

Program Area: Research: Human Health and Ecosystems

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Science & Technology</i>	<i>\$146,871.2</i>	<i>\$153,760.0</i>	<i>\$158,310.0</i>	<i>\$4,550.0</i>
Total Budget Authority / Obligations	\$146,871.2	\$153,760.0	\$158,310.0	\$4,550.0
Total Workyears	500.8	484.9	484.9	0.0

Program Project Description:

EPA’s health and ecological research programs provide the scientific foundation for the Agency’s actions to protect Americans’ public health and environment. The Agency conducts human health and ecosystems research to: 1) identify and characterize environment-related human health problems, determine exposures to and sources of agents responsible for these health concerns, and use public health indicators to evaluate the effectiveness of risk management decisions, and 2) quantify the impacts of human activities on the benefits and services provided by ecosystems, measure the relationship between human well-being and ecosystem services, and provide tools for policy makers and managers to protect and restore ecosystem services through informed decision making at multiple spatial and temporal scales. The program also supports mercury research, advanced monitoring research, nanotechnology research, exploratory research, and the Agency’s Report on the Environment (ROE).

Both the Human Health Research program and Ecosystem Services Research Program (ESRP) are continually evolving. The Human Health Research program is working to continue its success in “characterizing and reducing uncertainties in risk assessment” while orienting the program toward “developing and linking indicators of risk” along the source-exposure-effects-disease continuum. This information, in turn, is used to demonstrate and measure reductions in human, environmental-related disease incidence or severity resulting from risk management decisions. The program is designed to include research that addresses limitations, gaps, and challenges articulated in EPA’s Report on the Environment (2008) and the National Research Council’s 2007 report “Toxicity Testing in the 21st Century: A Vision and a Strategy” and 2008 report “Science and Decisions: Advancing Risk Assessment.”

In FY 2009, the Ecosystem Services Research Program fully transitioned to its new focus on conserving and protecting ecosystem services through proactive decision-making. This focus synthesizes and builds upon the program’s previous accomplishments in quantifying the ecological condition of the nation’s aquatic resources, as well as in developing ecological stressor-response models, methods to forecast alternative future scenarios, and methods to restore ecological functions and ecosystem services within degraded systems. By integrating these tools within a common framework to assess ecosystem services, the program can better

investigate and advance opportunities for more quickly achieving desired environmental outcomes at lower cost and with fewer unintended consequences.

Research is guided by the “Human Health Research Strategy”⁷⁰ and the “Ecological Research Strategy,”⁷¹ which were developed in collaboration with major clients (e.g., EPA’s program and Regional offices). These strategies outline research needs and priorities. In addition, several multi-year plans (MYPs)⁷² (e.g., human health, ecological research, and mercury) convey research priorities and approaches for achieving the goals and objectives of protecting communities. MYPs outline the steps for meeting client research needs, as well as annual performance goals and key research outputs for evaluating progress.

The Human Health Research program and the ESRP have both received successful evaluations from EPA’s research advisory committee, the Board of Scientific Counselors (BOSC). In March 2005, the BOSC stated, “The research of the human health research program is of high quality and appropriately focused, it is multidisciplinary, yet coherent and coordinated, and the research benefits from managerial excellence across all aspects of the program.”⁷³ The BOSC also commented that planned actions and initiatives provide “great potential for significant impacts in the future.” In 2007, mid-cycle reviews of each program resulted in a rating of “Meets Expectations” for work completed.⁷⁴ The Human Health Research program was reviewed again in January 2009 and received a preliminary rating of “Meets Expectations” (report expected June 2009).

During its BOSC reviews, the ESRP was recognized as holding a unique position within the federal government for its research to establish and communicate a greater understanding of the value of ecosystem services and their interdependent relationship to human activities and well being (BOSC 2005, 2007)⁷⁵. In 2007, the mid-cycle BOSC review of the ESRP resulted in a rating of “Meets Expectations” for work completed to date.⁷⁶ The ESRP name came from a recommendation by the SAB EPEC to adopt a name that better reflects the program’s role as the Agency’s first integrated research program to address the difficult topic of maintaining, enhancing, and restoring the services provided by the natural environment.

In 2008, EPA’s Science Advisory Board’s (SAB) Ecological Processes and Effects Committee (EPEC) stated in its review of the Program that the “draft Plan articulates a new strategic direction that focuses on quantifying ecosystem services and their contribution to human health and well-being. The SAB strongly supports this strategic direction and commends the Agency for developing a research program that, if properly funded and executed, has the potential to be transformative for environmental decision making as well as for ecological science. The SAB finds that the research focus on ecosystem services represents a suitable approach to integrate ecological processes and human welfare. The ESRP’s focus on ecosystem services can provide a

70 U.S. EPA, Office of Research and Development. *Human Health Research Strategy*. Washington, DC: EPA. Available at: http://www.epa.gov/nheerl/humanhealth/HHRS_final_web.pdf

71 For more information, see <http://www.epa.gov/ord/htm/documents/eco.pdf>.

72 For more information, see <http://www.epa.gov/ord/htm/multi-yearplans.htm>.

73 *Report of the Subcommittee on Health*, revised July 27, 2005, Board of Scientific Counselors, pg 9. For more information, see <http://www.epa.gov/osp/bosc/pdf/hh0507rpt.pdf>.

74 U.S. EPA, Board of Scientific Counselors. *Mid-Cycle Review of the Office of Research and Development’s Human Health Research at the U.S. Environmental Protection Agency*. (Washington: EPA, 2007). Available at: <http://www.epa.gov/osp/bosc/pdf/hhmc0707rpt.pdf>.

75 BOSC 2007 <http://www.epa.gov/osp/bosc/pdf/ecomc082307.rpt.pdf>

76 U.S. EPA, Board of Scientific Counselors. *Mid-Cycle Review of the Office of Research and Development’s Human Health Research at the U.S. Environmental Protection Agency*. (Washington: EPA, 2007). Available at: <http://epa.gov/osp/bosc/pdf/hhmc072307rpt.pdf>

sound foundation for environmental decisions and regulation based on the dependence of humans on ecological conditions and processes.”⁷⁷

FY 2010 Activities and Performance Plan:

Human Health Research

In FY 2010, EPA’s research under this program is designed to identify indicators of risk (effects, susceptibility, and exposure indicators) that can be used to demonstrate reductions in human health risks (i.e., evaluate effectiveness of risk management or regulatory decisions). Of the total \$82 million requested in FY 2010 for Human Health research, \$63 million is requested for research in this area. This research will focus on the development of sensitive and predictive methods and models to identify reliable bioindicators of exposure, susceptibility, and effect that could be used to evaluate public health impacts at various geospatial and temporal scales. Research also will focus on developing models to predict biological effects based on internal dose methodologies.

EPA will continue to support research on mode of action information that can be used to reduce reliance on default assumptions in risk assessments for individual and related families of chemicals, particularly as related to selection of appropriate dose-response and cumulative risk models and to protection of vulnerable and susceptible populations. Such research will inform the re-evaluation of acceptable levels of arsenic and its metabolites in drinking water, the risk assessments of cancer and non-cancer effects of conazoles and structurally related fungicides, and risks of cumulative exposures to classes of pesticides and to multiple species of water disinfection byproducts. Additional research efforts guided by the National Research Council’s report, “Toxicity Testing in the 21st Century: A Vision and a Strategy (2007)”⁷⁸, will develop emerging molecular and genomic methods, and use “systems biology” approaches to identify critical toxicity pathways, *e.g.*, oxidative stress pathways and receptor-based and signaling pathways (such as those involved in endocrine and neuroendocrine signaling) for characterizing the potential health effects of chemicals (such as particulate matter, metals, pesticides, and chemical contaminants in drinking water).

In addition, FY 2010 research will focus on developing tools for identifying communities (*e.g.*, localities, populations, groups) at greatest risk from exposure to multiple chemicals, identifying and quantifying the factors influencing these exposures, and developing and implementing appropriate risk reduction strategies. Research on intervention and prevention strategies will ultimately be used make decisions which would reduce human risk associated with exposures to single and multiple environmental stressors. Cumulative risk research will develop models and approaches for reconstructing exposures based upon biomarker data generated in large-scale exposure and epidemiological studies and linking these exposures to their primary sources, and for using exposure, biomarker, and pharmacokinetic data in cumulative risk assessments. For example, in 2007, EPA’s Human Health Research program discovered a biomarker that can predict the severity of an asthmatic response in susceptible persons, resulting in new protocols

⁷⁷ EPA-SAB-08-011

⁷⁸ National Academies Press (2007). Available at: http://www.nap.edu/catalog.php?record_id=11970#toc.

for improving indoor air quality and providing the scientific basis for public education policies and risk management strategies involving exposure to molds.

Other human health research will continue to focus on exposures to environmental contaminants and subsequent effects during critical life-stages, such as early development, childhood, or aging. Efforts related to children's health include identification of the key factors influencing children's exposures to environmental toxicants (including chemical exposure in schools) and the production of high quality children's exposure data to reduce current uncertainties in risk assessment. Human health research focused on physiological and biochemical changes during critical life-stages will be used as a basis for understanding susceptibility and the role of environmental stressors, including non-chemical stressors, in the exacerbation or pathogenesis of diseases such as asthma that disproportionately impact children and the aging. Emerging risks of long term health effects resulting from early life exposures (e.g., during pregnancy and early childhood) will be examined in laboratory animal models and children's cohort studies.

To this end, EPA will continue to support and collaborate with the EPA/National Institute of Environmental Health Sciences (NIEHS)-sponsored Centers for Children's Environmental Health and Disease Prevention Research. This FY 2010 request includes \$6 million for EPA to support advanced epidemiological research on the impact of environmental factors on children's health. Beginning in FY 2010, the Science to Achieve Results (STAR) grants program will fund both traditional and formative centers.⁷⁹ These centers were highlighted in the 2009 BOSC subcommittee review, which judged EPA's children's health program to "Exceed Expectations."

These unique Children's Centers perform targeted research in children's environmental health and translate their scientific findings into intervention and prevention strategies by working with communities. The Children's Centers have established long-term birth and school age cohorts that follow participants over many years to consider the full range of health effects resulting from exposure to environmental chemicals, as summarized recently in the EPA report "A Decade of Children's Environmental Health" (2007). Additionally, the Children's Centers are tracking a wide range of environmental exposures at multiple stages of development to evaluate relationships between these exposures and observed health effects. Additional and related research supported by STAR grants and within EPA's in-house research program is developing methods and models for community based risk assessment, including the impacts of non-chemical stressors.

Finally, in FY 2010, research on public health outcomes will continue to assess the cumulative impact of a suite of air pollution reduction programs on environmental public health indicators, especially those relevant to children and older populations. Research on new tools to measure the effectiveness of regulatory decisions, such as upgrades to water treatment facilities based on the incidence of infectious disease from waterborne pathogens, will continue. In response to gaps identified in EPA's Report on the Environment (2008), EPA will move toward integrating a range of valid and predictive bioindicators of exposure, susceptibility and effects to develop approaches to assess public health impacts of regulatory decisions. These efforts include developing and validating novel environmental health outcome indicators in community settings through the STAR grant program. This aspect of the Human Health Research program received

⁷⁹ For more information, see <http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-08-002.html>.

a preliminary rating of “Exceeds Expectations” from the 2009 Human Health BOSC subcommittee review.

EPA’s Human Health Research program is greatly enhanced by the STAR program’s competitive, peer-reviewed grants program. The STAR program has funded and will continue to fund an array of outstanding grantees that fill unique needs for exposures science, epidemiologic, and community-based participatory research on environmental public health outcomes of great concern, especially for vulnerable lifestages and populations like children and Tribal communities. For example, the program will continue to fund research to develop and validate predictive bioindicators of exposure, susceptibility, and effects that are needed to develop approaches to assess public health impacts of regulatory decisions, including developing environmental health outcome indicators. In addition, given the heightened interest in documenting the benefits of green building practices, the program will create opportunities to examine the impact of green schools on the health and performance of students and teachers.

A 2005 performance review of the “Human Health Research” program found that it had a focused design, meaningful performance measures, and that the program’s research results were being used to reduce uncertainty in risk assessment. Since then, and in response to key recommendations, the program has implemented all follow-up recommendations resulting from its 2005 BOSC review; has established preliminary targets for its long-term measures based on BOSC mid-cycle review feedback; and has worked to improve its budget and performance integration.

Ecosystem Services Research

In FY 2010, the total level of funding requested for Ecosystems research is \$76 million. Within this is the ESRP multi-media program (FY 2010 Request, \$71 million). The ESRP responds directly to numerous scientific and policy reports over the last decade that document the need to conserve irreplaceable services provided by ecosystems (e.g., NAS, 1997⁸⁰; MA, 2005⁸¹; BOSC, 2005⁸²; EPA Stewardship Initiative, 2006⁸³; EBASP, 2006⁸⁴; SAB C-VPESS 2007⁸⁵; Restoring Nature’s Capital, 2007⁸⁶). The Millennium Assessment (MA) is one of the most comprehensive reports to date, and documented declines in 15 of 24 ecosystem services worldwide.⁸⁷

In FY 2010, the ESRP will provide research critical to improving the policy and management decisions that affect the type, amount, and quality of benefits and services provided by ecosystem functions- including services derived from wetlands and coral reefs, two important ecosystems in which the Agency has regulatory responsibilities or other ongoing activities. The program will initially focus on methods development for a suite of ten ecosystem services. This

80 “NAS 1997” = [Building a Foundation for Sound Environmental Decisions](#), Chapter 4: EPA’s Position in the Broader Research Enterprise, National Academy of Sciences, 1997. available at <http://www.nap.edu/openbook/0309057957/html/49.html>

81 <http://www.millenniumassessment.org>

82 BOSC 2005 <http://www.epa.gov/osp/bosc/pdf/eco0508rpt.pdf>

83 www.epa.gov/epainnov/pdf/rpt2admin.pdf

84 US EPA. 2006. Ecological Benefits Assessment Strategic Plan. EPA-240-R-06-001. U.S. Environmental Protection Agency, Office of the Administrator, Washington, DC.

85 http://www.epa.gov/sab/07minutes/c-vpess_06-12-07_minutes.pdf

86 Restoring Nature’s Capital: An Action Agenda to Sustain Ecosystem Services, 2007” available at http://pdf.wri.org/restoring_natures_capital.pdf.

87 We define ecosystem services as the products of ecological functions or processes that directly or indirectly contribute to human well-being, or have the potential to do so in the future. This definition provides a broad interpretation of ecosystem services to characterize services that may or may not be quantifiable.

systems-based approach will create ways to examine how a suite of ecosystem services responds to multiple stressors, using both prospective scenario analyses as well as monitoring frameworks to empirically assess changes in ecosystem services over time.

The ultimate goal for the ESRP is that decision-makers routinely use information and methods developed by this program to make proactive policy and management decisions that protect the environment and human well-being by conserving and enhancing ecosystem services at local, regional, and national scales. To accomplish this, the ESRP will conduct research using several complementary research themes:

1. defining ecosystem services and their implications for human well-being and economic valuation;
2. measuring, monitoring, and mapping ecosystem services at multiple scales over time;
3. developing predictive models for quantifying and forecasting the changes in ecosystem services under alternative management scenarios; and
4. developing a decision support framework that enables decision-makers to integrate, visualize, and maximize diverse data, models and tools so they can anticipate and understand the likely consequences of management decisions on the sustainability of ecosystem services, their economic and non-monetary value, and their role in maintaining human well-being.

In addition, in FY 2010 the ESRP will examine ecosystem services from three distinct perspectives:

- (a) *Pollutant based*: examining the effects of pollutants on ecosystem services; in this case, reactive nitrogen, which has implications for several nationally important issues, including upcoming rules for air emissions of NOx/Sox, and NAAQS; hypoxia in the Gulf of Mexico; contribution to greenhouse gases; and management of non-point pollution sources from agricultural and other lands.
- (b) *Ecosystem based*: examining how stressors affect the suite of ecosystem services derived from wetlands and coral reefs, two important ecosystems for which the Agency has regulatory responsibilities.
- (c) *Place-based* assessments at five locations: the Willamette River Basin, OR; Tampa Bay, FL; the Coastal Carolinas; the upper Midwest U.S., and an arid-land Southwest U.S. study. These place-based studies are done in collaboration with stakeholders and illustrate how local, state, and Regional decision-makers can use alternative future scenarios to proactively conserve and enhance ecosystem services. These study locations represent a spectrum of physiographic and socioeconomic characteristics with a variety of drivers of ecosystem change operating at local, regional, and national scales, as well as different types and magnitudes of potential impacts resulting from resource management decisions.

There will be greatly expanded opportunities in FY 2010 to collaborate with non-traditional partners within and outside of EPA because the ESRP incorporates both natural and social sciences. The ESRP has already spurred significant advances in creating a unique, cross-disciplinary, broadly applicable research program. In collaboration with Agency partners, the ESRP has identified five immediate uses for information on ecosystem services:

- Provide technical support for agency policies, including voluntary measures such as environmental stewardship;
- Provide improved techniques for estimating the benefits and costs related to national rule-making;
- Develop metrics on ecosystem services (e.g., for use in the Report on the Environment);
- Create credible scientific foundations for market incentives (e.g., for ecosystem services trading or for investments in conservation); and
- Identify the “art of the possible;” that is, to explore how policy makers and managers can use this information to simultaneously address multiple environmental issues, identify trade-offs, and reduce conflict in strategies to achieve desired environmental outcomes.

The ESRP research also supports the *EPA Ecological Benefits Assessment Strategic Plan* and Executive Order 12866 which require assessing the costs and benefits of alternative strategies for environmental protection. As a result, the program will improve the scientific basis for performing more comprehensive valuations of ecosystem services than is currently possible by clarifying the economic, social and ecological ramifications of various management options.

Exploratory Grants and Nanotechnology Research

EPA’s Nanomaterials Research Program (FY 2010 Request, \$17.8 million, including \$3.4 million in the Land research program; \$13.9 million within the Human Health and Ecosystem research program; and \$0.2 million in both the Air and Sustainability research programs) generates information to ensure the safe development, use, recycling and disposal of products that contain nano-scale materials (“nanomaterials”). This research is necessary to support and inform future health and environmental safety decisions. The EPA research program currently focuses on five nanomaterials: carbon tubes and fullerenes, cerium oxide, iron, silver, and titanium dioxide. These nanomaterials, based on analyses by the Organization for Economic Cooperation and Development (OECD) and EPA, are most likely to be found in products and, therefore, potentially be present in the environment. EPA research will determine whether these materials present a potential hazard or exposure over their life cycles, and how these materials, when used in products, may be modified or managed to avoid or mitigate potential human health or ecological impacts. The research program is coordinated through the National Nanotechnology Initiative⁸⁸ and the OECD’s Working Party on Manufactured Nanomaterials.

In FY 2010, guided by EPA’s Nanomaterial Research Strategy⁸⁹, funds will support research on all five materials that characterizes source-to-dose, including releases and emissions; fate, transport, and transformation; and exposure. This research will identify material types that are found in biological systems at concentrations of potential concern. Targeted effects research will be prioritized based on greatest probability of exposure. Targeted human health and ecological effects research will identify the properties of these materials that are associated with adverse effects. Decision analysis research will be used to evaluate the application of traditional and new

⁸⁸ For more information, see <http://www.nano.gov/>.

⁸⁹ For more information, see http://es.epa.gov/ncer/nano/publications/nano_strategy_012408.pdf

risk assessment methods to nanomaterials, as well as develop approaches for making near- to medium-term decisions on nanomaterial safety in the absence of adequate information for formal risk assessment methodologies.

Green nanotechnology research will link exposure to associated adverse effects and develop prevention and mitigation methods using green chemistry and life-cycle analysis. This research will identify nanomaterial properties that may be modified or develop exposure controls to minimize potential risk from products containing nanomaterials, minimize inputs, and decrease energy usage during production. Also, the Agency's Science to Achieve Results (STAR) exploratory extramural grants program will provide continued support for the joint National Science Foundation-EPA funded Centers for the Environmental Implications of Nanotechnology.⁹⁰ In collaboration with other Federal agencies,⁹¹ STAR grants will be solicited for research on the Agency's five priority material types.

Report on the Environment

EPA's Report on the Environment (ROE) plays a critical role in the Agency's strategic planning activities as the Agency develops and implements more transparent and outcome-oriented measures and indicators. This program is based on strong intragency and interagency partnerships with active participation from headquarters and regional offices to ensure that the ROE provides credible and defensible indicators that can best inform planning and decision-making at the Agency. The ROE has a steering committee comprised of Agency Senior managers and representatives from other agencies (USDA, CDC, DoI) who aid in research, preparation and review of indicators. More than 50 percent of the ROE indicators are from other Federal agencies. *EPA's 2008 Report on the Environment* was released in May 2008 as a science-based document that presents trends in the nation's environment and human health. To provide greater transparency on how EPA can improve its ability to assess the nation's environmental quality and human health, and how we use that knowledge to better manage measureable environmental results, EPA released an interactive public website (the "eROE") that is updated quarterly with the most recent environmental indicator data and enhancements (www.epa.gov/roe). The next complete revision and hard copy release of the ROE is planned for FY 2012.

Advanced Monitoring Initiative

In FY 2010 the Advanced Monitoring Initiative (AMI) will work with EPA programs, offices, and regions to bring the best monitoring data and modeling results to improve decisions made by EPA and its partners. It will benefit fully from the interagency U.S. Group on Earth Observations (USGEO) Initiative and with the international community through the "Global Earth Observing System of Systems (GEOSS)," primarily as a user of data and information, through partnerships with Federal agencies. The GEOSS architecture integrates environmental observation, monitoring, and measurements with modeling that directly support health, climate change, air quality, and other social benefit areas. AMI will augment ongoing efforts on data

⁹⁰ For more information, see http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503124&org=BIO&from=home.

⁹¹ For more information, see <http://es.epa.gov/ncer/nano/>.

collection and management with an Agency-wide effort to provide a "knowledge base," and the tools to access and utilize it effectively.

In FY 2010, AMI will support EPA's three-to-five year cross-agency science priorities, particularly in the areas of climate and energy, environmental contaminants, and modernization of infrastructure. For each priority the AMI initiative will focus primarily on the development of decision support tools needed for implementation.

In addition, to respond to U.S. environmental technology needs, EPA USGEO's approach is to leverage environmental observation, monitoring, measurements, modeling, green technology development, commercialization and verification of development, technology transfer and applications of data, and information collected for decision making and tools. The GEOSS AMI will support environmental technology activities and integrated multi disciplinary research that aligns with the Agency's science priorities.

Mercury Research

EPA has developed a multi-year plan for studying mercury (FY 2010 Request, \$4.6 million), including its sources, control and treatment, environmental fate and behavior, impacts on ecological resources, and potential effects on human health.⁹² In FY 2010, the program will continue research to evaluate the transport of mercury from power plant stacks, including plume transport and ultimate deposition (e.g. mercury "hot spots") analyses. Although this research began to support the Agency's recently vacated Clean Air Mercury Rule (CAMR),⁹³ the research will still be needed to inform future mercury regulations. EPA also will study the aquatic fate and transport of mercury in order to better understand the relationship between emissions and mercury concentrations in fish tissue, an important pathway to human exposure.

In collaboration with the Department of Energy and others, research will focus on emissions monitors to determine the amount and characteristics of mercury emitted by sources such as coal-fired utilities. The program also will develop and evaluate emissions control technologies, with an emphasis on technologies that can simultaneously control mercury and other air pollutants, and investigate whether mercury removed from coal-fired power plant emissions remains stably trapped in combustion and scrubber residues.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the public health outcomes long term goal	100	100	100	100	Percentage

⁹² EPA, Office of Research and Development, *Mercury Research Multi-Year Plan* (Washington: EPA, 2003). See <http://www.epa.gov/osp/myp/mercury.pdf>.

⁹³ For more information, see <http://www.epa.gov/air/mercuryrule/>.

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the aggregate and cumulative risk long term goal	100	100	100	100	Percentage

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of mechanistic data long term goal	100	100	100	100	Percentage

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the susceptible subpopulations long term goal	100	100	100	100	Percentage

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Outcome	Percentage of Human Health program publications rated as highly cited papers (top 10% in field) in research journals	25.6%	25.5%	No Target Established (Biennial)	26.5%	Percentage

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Efficiency	Average time (in days) to process research grant proposals from RFA closure to submittal to EPA's Grants Administration Division, while	250	292	277	250	Days

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
	maintaining a credible and efficient competitive merit review system (as evaluated by external expert review)					

The research conducted under these programs supports EPA Strategic Objective 4.4. Specifically, these programs identify and synthesize the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions with a focus on human, community, and ecosystem health.

The programs gauge their annual and long-term success by assessing progress on several key measures. In FY 2010, the Human Health Research program plans to accomplish its goals of completing and delivering 100% of its planned outputs. The program is also targeting increases in the percentage of its peer reviewed risk assessments which are cited as supporting a decision to move away from or to apply default risk assessment assumptions, as was encouraged in the 2005 BOSC review, and in determining the extent to which key research products are cited in EPA decision documents.

In preparation for the FY 2007 mid-cycle and FY 2009 full BOSC reviews of the Human Health program, advanced computer programs were used to search EPA dockets and determine the extent to which scientific publications from this program were used in risk assessments, decision and policy documents, and guidance reports by EPA and other government regulators. Bibliometric analyses also were applied to measure the quality and stature of the journals in which Human Health papers were published and the extent to which these papers were cited in other scientific journals. Thus quantitative measures of both scientific quality and program relevance were incorporated into the BOSC review process.

In FY 2010, the ESRP intends to meet 100% of its planned outputs in support of each long-term goal while increasing program efficiency. As evidence of the utility of its research, the ESRP strives for continued improvements in its bibliometric measures for “highly cited” and “high impact” publications. In addition, based on research previously completed under this program, EPA plans to have forty-five states use a common monitoring design and appropriate indicators to determine the status and trends of ecological resources and the effectiveness of programs and policies. In its ongoing efforts to improve the ecosystem research program, ORD is engaging its BOSC to evaluate if the Agency’s research and development programs are “doing the right research and doing it well.”

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$2,188.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$1,257.0) These resources will provide research to inform policy and regulatory decisions for managing chemical risks to human health, including protecting children and other vulnerable groups and achieving environmental justice in American communities, and that affect the type, amount, and quality of benefits and services provided by ecosystem functions which will create ways to examine how a suite of ecosystem services responds to multiple stressors.
- (+\$867.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program/Project to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.
- (+\$639.0) This represents a realignment of funds associated with equipment purchases and repairs across Agency research programs.
- (+\$319.0) This is an increase in laboratory fixed costs, including maintenance, operations, utilities, and security costs.
- (-\$720.0) This reflects a reassignment of resources to the Office of Air and Radiation (OAR) to continue funding of Temporally Integrated Monitoring of Ecosystems/Long Term Monitoring (TIME/LTM) Programs. The focus of the research in the TIME/LTM programs was on the design of the monitoring program, development of indicators to measure changes, and reporting on those changes as a means of verifying the intended results. The defined goal for both of these research programs has been completed. In FY 2010, the resources are being transferred to the Clean Air Allowance Trading Program within the Air and Radiation program to assume monitoring responsibility for the programs.

Statutory Authority:

CAA; SDWA; ERDDA; CWA; FIFRA; FFDCA; RCRA; FQPA; TSCA; USGCRA.

Human Health Risk Assessment Program/Project by Research Area

(Dollars in Millions)

<i>ORD Multi-Year Plan</i> ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
<i>Human Health Risk Assessment</i>																
Human Health Risk Assessment and IRIS	\$18.0	78.3	\$19.8	91.8	\$20.8	99.5	\$22.0	98.0	\$24.9	110.5	\$25.1	109.5	\$31.0	121.1	\$5.9	11.6
Risk Assessment Research, Methods, Guidance, and Risk Assessment Forum	\$14.0	59.1	\$12.2	57.0	\$14.1	59.3	\$12.4	61.2	\$11.7	46.3	\$10.5	44.0	\$10.5	43.0	\$0.0	(1.0)
Integrated Science Assessments ¹	\$4.0	22.3	\$4.2	23.5	\$4.5	25.2	\$4.6	24.7	\$6.1	25.3	\$7.1	25.0	\$7.1	24.4	\$0.0	(0.6)
Total	\$36.0	159.8	\$36.3	172.3	\$39.4	184.0	\$39.1	183.9	\$42.7	182.1	\$42.7	178.6	\$48.5	188.6	\$5.8	10.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2008, ORD revised its process for supporting the setting of the NAAQS. The LTG was previously titled "Air Quality Criteria Documents."

Human Health Risk Assessment

Program Area: Research: Human Health and Ecosystems

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Science & Technology</i>	<i>\$34,569.9</i>	<i>\$39,350.0</i>	<i>\$45,133.0</i>	<i>\$5,783.0</i>
Hazardous Substance Superfund	\$6,799.6	\$3,377.0	\$3,395.0	\$18.0
Total Budget Authority / Obligations	\$41,369.5	\$42,727.0	\$48,528.0	\$5,801.0
Total Workyears	187.9	178.6	188.6	10.0

Program Project Description:

Human health risk assessment is a process where information is analyzed to determine if an environmental hazard might cause harm to exposed persons (National Research Council, 1983). EPA's Human Health Risk Assessment (HHRA) program generates health assessments that are used extensively by EPA Program and Regional offices, and other parties to determine the potential risk to public health from exposure to environmental contaminants to develop regulatory standards, and to manage environmental cleanups. EPA's human health risk assessment program provides the scientific foundation for the Agency's actions to protect Americans' public health and the environment.

Three complementary areas comprise the Human Health Risk Assessment program:

- 1) The Integrated Risk Information System (IRIS) and other priority health assessments,
- 2) Risk assessment guidance, methods, and model development, and
- 3) Integrated Science Assessments (ISA) of criteria air pollutants.

IRIS and other health hazard assessments: Peer reviewed, qualitative and quantitative health hazard assessments are prepared on environmental pollutants of major relevance to EPA's regulatory mandates. These assessments are used by EPA's program and Regional offices to support their decision-making, and are also disseminated to the public on the IRIS internet database.⁴⁶ IRIS is widely used throughout EPA and the risk assessment/risk management community as the premier source of hazard and dose-response information for environmental pollutants. At the end of 2008, 548 health hazard assessments were available through IRIS.

Risk assessment guidance, methods and model development: Improved risk assessment guidance, methods, and models are developed to enhance the quality and objectivity of assessments through the incorporation of contemporary scientific advances for use in decision-making by EPA's program and Regional offices. These scientific products are externally peer reviewed and disseminated through the published literature as well as EPA web sites, and are used in the development of IRIS assessments.

⁴⁶ Available at: <http://www.epa.gov/iris>.

Integrated Science Assessments: Congress requires that EPA regularly summarize the state-of-the-science for criteria air pollutants – ozone, particulate matter, sulfur and nitrous oxides, carbon monoxide, and lead – to assist EPA’s Air and Radiation program in determining the National Ambient Air Quality Standards (NAAQS). These integrated science assessments (formerly Air Quality Criteria Documents) are major risk assessments that undergo rigorous external peer review by the Clean Air Scientific Advisory Committee (CASAC).

This research program is guided by the Human Health Risk Assessment Multi-Year Plan⁴⁷ (MYP), which details the products planned under this program. The MYP also outlines research needs and priorities for making decisions central to EPA’s implementation of its statutory responsibilities and to its mission to protect human health and the environment. Performance outputs and outcomes are documented in the MYP and are linked to the program’s annual and long-term performance measures. The MYP also outlines coordination efforts with a number of EPA research strategies and plans⁴⁸ (e.g., Human Health Research Strategy, Drinking Water MYP, Clean Air MYP) to obtain the information necessary to inform risk assessment outputs and programmatic decisions.

In FY 2008, an evaluation by EPA’s Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of independent expert scientists and engineers—concluded that the Human Health Risk Assessment program “has been highly responsive to the needs of the program offices and regions,” producing products that are critical to EPA’s regulatory mission and form the foundation for regulatory decisions and policies. This prospective and retrospective review evaluated the program’s relevance, quality, performance, and scientific leadership. The evaluation found that the program is making substantial and satisfactory progress in each of the above areas based both on clearly defined milestones and by providing the additional support requested by EPA programs to respond to unscheduled emergency needs. The BOSC’s evaluation and recommendations are being used to help plan, implement, and strengthen the program over the next five years.

FY 2010 Activities and Performance Plan:

In FY 2010, EPA requests \$28.7 million for IRIS and other health hazard assessments, which includes an increase of \$5.0 million and ten work years to allow the IRIS program to increase the annual output of new IRIS assessments and updates of existing IRIS assessments. These additional resources are necessary to increase the number of completed critical risk assessments, in addition to decreasing the backlog of draft assessments and better meet the priority assessment needs of the Agency. EPA will continue to evaluate the process over time in response to the Government Accountability Office’s (GAO) High Risk Series report identifying weaknesses in the IRIS process to ensure that the program effectively meets the needs of EPA, the Federal government, and the American public.

In the area of risk assessment guidance, methods and models, the Agency requests \$9.4 million in FY 2010. This continued investment will make improvements in the following areas:

- Approaches for applying mode of action information in risk assessments;

⁴⁷ Available at: <http://www.epa.gov/ord/htm/multi-yearplans.htm>

⁴⁸ Available at: <http://www.epa.gov/ord/htm/researchstrategies.htm> and <http://www.epa.gov/ord/htm/multi-yearplans.htm>.

- Approaches for characterizing risks to susceptible populations;
- Approaches for characterizing environmental exposures for use in risk assessments;
- Approaches that improve quantification of health risks (e.g., PBPK and BBDR modeling, categorical regression, meta analysis approaches);
- Approaches that improve characterization of variability and uncertainty analysis in risk assessment;
- Approaches for applying cumulative risk assessment principles to health assessments (e.g., whole mixture and component based approaches).

In addition, EPA requests \$7.1 million in FY 2010 for the Human Health Risk Assessment program to conduct Integrated Science Assessments (ISA). These funds will support work on the following key assessments:

- Continuing to improve and implement a process to identify, compile, characterize, and prioritize new scientific studies for ISAs of criteria air pollutants, as a mandated prerequisite to EPA’s review of the NAAQS and effectively meet court ordered deadlines to provide these assessments; and
- Delivering final ISAs for Particulate Matter and Carbon Monoxide
- Delivering final ISAs for Particulate Matter and Carbon Monoxide and release *external review draft* ISAs for Ozone and Lead program to contribute to EPA’s Office of Air and Radiation’s review of the NAAQS and creation of state-of-the-science methods for continuous evaluation of assessments of new scientific information on criteria air pollutants.

These continued investments will allow the Human Health Risk Assessment program to make significant progress toward its long-term goals of providing state-of-the-science health hazard assessment information. The ISAs provide important scientific analytics in support of many of EPA’s important rulemakings.

The Human Health Risk Assessment program is taking a number of steps to further improve itself. The program is currently 1) revising its management controls to better incorporate both programmatic priorities and the level of effort required to increase the number of IRIS assessments completed; 2) revising its efficiency measure and using it to improve performance management; and 3) investigating alternative approaches for measuring progress related to providing timely, high quality scientific assessments. The program has taken action on each of these recommendations. For example, the program is examining how best to expand its efficiency measure to ensure consistency with other approaches being developed across EPA’s Research and Development program.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Efficiency	Average cost to produce Air Quality Criteria/Science Assessment documents.	Available FY 2010	3,796K	4,253K	4,003K	Average Cost

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of HHRA Technical Support Documents.	89	90	90	90	Percent

The research conducted under this program supports EPA Strategic Objective 4.4. Specifically, the program identifies and synthesizes the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions related to the health of people and communities.

The program gauges its annual and long-term success in meeting this objective by assessing its progress on several key measures. The program continues to track the percent completion of key milestones. In response to GAO recommendations to streamline the current IRIS process, the program's newest measures, which are reported in EPA's quarterly *EPAstat* report, will be revised and the targets for outputs increased appropriately.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$5,000.0 / +10.0 FTE) This reflects an increase to support the Integrated Risk Information System (IRIS), including 10 FTE and associated payroll of \$1,390.0. The increment would allow the IRIS Program to better meet the priority assessment needs of the Agency by increasing the annual output of new IRIS assessments and updates of existing IRIS assessments. This would enable the IRIS program to focus on its large backlog of assessments for chemicals previously identified by EPA programs as priority needs. A further benefit would be the development and application of new approaches to human health risk assessment in collaboration with EPA's Prevention, Pesticides, and Toxic Substances program and the Agency's Computational Toxicology program.
- (+\$408.0) This reflects an increase for payroll and cost of living for all FTE.
- (+\$190.0) This reflects resources to fund research in the area of risk assessment guidance, methods and model development.
- (+\$185.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

Statutory Authority:

CAA; SDWA; CWA; TSCA; FIFRA; CERCLA; SARA; FQPA; ERDDA.

Human Health Risk Assessment

Program Area: Research: Human Health and Ecosystems

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$34,569.9	\$39,350.0	\$45,133.0	\$5,783.0
<i>Hazardous Substance Superfund</i>	\$6,799.6	\$3,377.0	\$3,395.0	\$18.0
Total Budget Authority / Obligations	\$41,369.5	\$42,727.0	\$48,528.0	\$5,801.0
Total Workyears	187.9	178.6	188.6	10.0

Program Project Description:

The Human Health Risk Assessment (HHRA) program provides health hazard assessments and develops assessment methods. EPA's HHRA program provides the scientific foundation for the Agency's actions to protect Americans' public health and environment. It receives resources under both the Science and Technology and the Superfund appropriations.

Risk assessments and methodologies to support EPA's Superfund program are detailed in the HHRA MYP¹⁶. This risk assessment work is informed by EPA's superfund research program. This superfund research is described in the *Waste Research Strategy*¹⁷, which was developed with participation from major clients and outlines research needs and priorities. These research efforts are guided by multi-year plans (MYPs)¹⁸, developed with input from across the Agency, including scientific staff in the Superfund program and the Regional offices. The MYPs outline steps for meeting the needs of Agency programs and for evaluating progress through annual performance goals and measures.

In FY 2003, a Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of qualified, independent scientists and engineers—subcommittee review found that the National Center for Environmental Assessment (NCEA) had made several key advancements including completion of a strategic plan, targeting cutting-edge risk assessments, enhancing communication, and improving capabilities to provide assessment resources in response to significant events. A subsequent BOSC subcommittee program review was completed in April 2008. This prospective and retrospective review evaluated the program's relevance, quality, performance, and scientific leadership. The BOSC summarized the HHRA program's

¹⁶ Available at: <http://www.epa.gov/osp/bosc/pdf/hhramypdraft.pdf>.

¹⁷ U.S. EPA, Office of Research and Development, *Waste Research Strategy*. Washington, D.C.: EPA. For more information, see <http://www.epa.gov/ord/htm/documents/wastepub.pdf>.

¹⁸ For more information, see <http://www.epa.gov/ord/htm/multi-yearplans.htm>.

The *Waste Research Strategy* outlines the research needs and priorities at the time it was prepared. To guide these research efforts as progress is made and new needs emerge, EPA develops multi-year research plans that are revised periodically. EPA is currently merging the Contaminated Sites and RCRA Multi-Year Plans (MYPs) into one cohesive Land Research MYP, with input from across the Agency, to ensure research conducted continues to support the Agency's mission to protect human health and the environment.

performance as making substantial and satisfactory progress in each of the above areas based both on clearly defined milestones and on providing the additional support requested by EPA programs including technical support in response to unscheduled emergency needs. The BOSCS's evaluation and recommendations will provide guidance to EPA to help plan, implement, and strengthen the program over the next five years.

FY 2010 Activities and Performance Plan:

The Superfund portion of the program includes:

The Integrated Risk Information System (IRIS)¹⁹, Provisional Peer-Reviewed Toxicity Values (PPRTVs), and other health hazard assessments (FY 2010 Request, \$2.3 million): Based on the expressed needs of EPA's Solid Waste and Emergency Response program, the Human Health Risk Assessment program prepares IRIS hazard characterization and dose-response profiles for environmental pollutants of specific relevance to superfund site assessments and remediation. At the end of 2008 more than 548 health hazard assessments were available through IRIS, and the majority of these chemicals assessments are relevant to superfund's decision making. Where IRIS values are unavailable, the HHRA program develops PPRTVs for evaluating chemical specific exposures at Superfund sites. Support for these PPRTV assessments is provided through EPA's Superfund Technical Support Centers. At the end of 2008, new or renewed PPRTVs had been developed for 231 chemicals.

Risk assessment guidance, methods, and model development (FY 2010 Request, \$1.1 million): As part of the Human Health Risk Assessment program's broader efforts to improve risk assessment guidance, methods, and models, Superfund resources are used to support EPA's Superfund program through the development of exposure-response data arrays, revised reference concentration (RfC) methodology and cumulative risk tools to better estimate potential effects of exposures at Superfund sites on humans, and the consultative support necessary for the application of these methods.

In FY 2010, the HHRA program will continue to directly support key elements of EPA's Strategic Plan relating to Superfund - particularly the characterization of risks, reduction of contaminant exposures, and cleanup of contaminated sites. Risk assessment activities relevant to Superfund cleanups will include:

- Continuing to work toward the completion of IRIS health hazard assessments for high priority chemicals found at multiple Superfund sites and thereby contributing to decision-making needs for Superfund and other Agency programs (also supported by HHRA under the Science and Technology appropriation);
- Completing 50 new or renewed Provisional Peer Reviewed Toxicity Values (PPRTV) which consist of provisional reference doses/concentrations (pRfD/Cs), and/or cancer slope factors. The Solid Waste and Emergency Response program develops and prioritizes requests for these PPRTV's, which provide health hazard evaluations for priority pollutants to support Agency risk management decisions;

¹⁹ Available at: <http://www.epa.gov/iris>.

- Communicating results of peer reviewed publications on methods and tools for assessing cumulative risk (also supported by HHRA under the Science and Technology appropriation); and
- Continuing to provide technical support to Superfund site and program managers on human health risk assessment through the Superfund Technical Support Centers.

The Human Health Risk Assessment program has a variety of performance measures that demonstrate its effectiveness. The BOSC's independent evaluations have found that "In the absence of IRIS values for a chemical, PPRTVs can have a significant impact on regulatory decisions." In response to recent performance assessments, the program is currently 1) revising its management controls to better incorporate both programmatic priorities and the level of effort required to increase the number completions of IRIS assessments; 2) revising its efficiency measure and using it to improve performance management; and 3) investigating alternative approaches for measuring progress related to providing timely, high quality scientific assessments. The program has taken action on each of these recommendations. For example, the program is examining how best to expand its efficiency measure to ensure consistency with other approaches being developed across EPA's Research and Development program.

Performance Targets:

The research conducted under this program supports EPA Strategic Objective 4.4. Specifically, the program identifies and synthesizes the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions related to the health of people and communities.

The program gauges its annual and long-term success in meeting this objective by assessing its progress on several key measures. The program continues to track the percent completion of key milestones. In FY 2010, the program plans to meet at least 90 percent of its planned outputs in support of 1) HHRA Health assessments and 2) HHRA Technical Support Documents. In response to recommendations in the Government Accountability Office's High Risk Series report to streamline the current IRIS process, the program's newest measures, which are reported in EPA's quarterly *EPAstat* report, will be revised and the targets for outputs increased appropriately.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$45.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$13.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

- (-\$40.0) This reflects a decrease to research in the area of risk assessment guidance, methods and model development.

Statutory Authority:

SWDA; HSWA; SARA; CERCLA; ERDDA.

Research: Computational Toxicology Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Safe Pesticides/Safe Products (SP2)																
Predictive Tools	\$11.8	23.0	\$12.0	24.1	\$12.3	36.8	\$14.7	34.3	\$11.5	34.3	\$15.2	32.7	\$19.6	32.7	\$4.4	0.0
Total	\$11.8	23.0	\$12.0	24.1	\$12.3	36.8	\$14.7	34.3	\$11.5	34.3	\$15.2	32.7	\$19.6	32.7	\$4.4	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

Research: Computational Toxicology

Program Area: Research: Human Health and Ecosystems

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Science & Technology</i>	<i>\$13,987.1</i>	<i>\$15,156.0</i>	<i>\$19,602.0</i>	<i>\$4,446.0</i>
Total Budget Authority / Obligations	\$13,987.1	\$15,156.0	\$19,602.0	\$4,446.0
Total Workyears	37.8	32.7	32.7	0.0

Program Project Description:

Computational Toxicology is the application of mathematical and computer models to help assess the risk chemicals pose to human health and the environment. Supported by advances in informatics, high-throughput screening, and genomics, computational toxicology offers scientists the ability to develop a more detailed understanding of the risks posed by large numbers of chemicals, while at the same time reducing the use of animals for toxicological testing.

Established in 2003, EPA's Computational Toxicology Research Program (CTRP) has the long-term goal of improving understanding about the relationship of source to outcomes (e.g. chemical to health effect) by providing tools for screening and prioritizing chemicals, and for improving the pace and quality of risk assessments. The National Center for Computational Toxicology (NCCT)⁴⁹ was established in FY 2005 to play a critical coordination and implementation role in these activities across the Agency. The strategic directions of the CTRP are highly consistent with the National Research Council report "Toxicity Testing in the Twenty-first Century: A Vision and a Strategy"⁵⁰, and includes several substantial and innovative projects in chemical screening and prioritization, informatics, and systems biology⁵¹.

The CTRP also includes three EPA-funded Science to Achieve Results (STAR) centers in bioinformatics and computational toxicology. In addition, the STAR Program has issued a solicitation to fund one additional center in FY 2009 that will integrate *in vitro* biochemical and cellular response data with computational models of core processes that drive embryonic development, including patterning, morphogenesis, selective growth and cell differentiation. This research will lead to a more detailed understanding of biological pathways that are critical to understanding environmental risk to human development.

All of these CTRP efforts are being coordinated with other Federal partners through the Tox21 initiative, in order to hasten this transformation in environmental health protection⁵². The CTRP efforts are at the core of *The U.S. Environmental Protection Agency's Strategic Plan for*

⁴⁹National Center for Computational Toxicology <http://www.epa.gov/ncct/>

⁵⁰Toxicity Testing in the Twenty-first Century: A Vision and a Strategy http://dels.nas.edu/dels/rpt_briefs/Toxicity_Testing_final.pdf

⁵¹ http://www.epa.gov/ncct/pdf/ORD_NCCT_Imp_Plan.pdf

⁵² Collins et al., 2008, *Science*; <http://www.sciencemag.org/cgi/reprint/319/5865/906.pdf>

*Evaluating the Toxicity of Chemicals*⁵³. The *Strategic Plan* and the pending CTRP Implementation Plan for FY2009-2012 highlight the unique capabilities of EPA to provide the necessary science to transform how chemical and other risk assessments are performed, and thus support improved management of environmental contaminants and chemical risk.

Scientific review of the CTRP is conducted by EPA's Board of Scientific Counselors (BOSC), a Federal advisory committee comprised of independent expert scientists and engineers. The third review of the CTIRP by the BOSC subcommittee occurred in December 2007. This review focused specifically on the topics of information management, high-throughput screening, and systems biology. In its report⁵⁴ the BOSC expressed strong support for the ToxCast, ExpoCast, ACToR, and the Virtual Liver and Virtual Embryo research projects. These projects are discussed further in the following section. Together, these efforts are providing the foundation to advance high-throughput toxicology and risk assessment that will close the critical data gaps present for many chemicals of concern to the EPA.

FY 2010 Activities and Performance Plan:

Consistent with the *U.S. Environmental Protection Agency's Strategic Plan for Evaluating the Toxicity of Chemicals*, these funds will support the next CTRP Implementation Plan for FY 2009-2012, which will focus on three key areas in FY 2010: 1) chemical prioritization and categorization tools; 2) information technology; and 3) systems biology models. In addition, emphasis will be placed on transitioning these computational tools for use by EPA's regulatory program offices.

Chemical Prioritization and Categorization Tools

A key programmatic need for EPA is improving its capability to predict which chemicals are in greatest need of toxicology testing, and which endpoints would be the most important to examine. To address this need, in FY 2007, EPA launched its ToxCast research program, which employs new automated laboratory methods, developed by the pharmaceutical industry, to test chemicals for their impacts on cell function in less time and for less cost than animal studies. This "high-throughput screening" (HTS) will enable testing of a backlog of chemicals that have not previously been tested, or have not been thoroughly tested, to determine if they are toxic to humans or the environment.

In Phase I of ToxCast, the Agency obtained high-throughput screening data on 320 chemicals with known toxicological profiles. HTS techniques rapidly and efficiently test large batches of chemicals for bioactivity utilizing robotics and automation applied to both molecular biology and assay methods. To date, ToxCast has generated more than 600 endpoints on each chemical. ToxCast efforts have been expanded by EPA partnerships with NIH via the Tox21 collaboration. The Tox21 partnership brings together the hundreds of ToxCast assays, with the thousands of chemicals being tested at the NIH Chemical Genomics Center⁵⁵.

53 National Service Center for Environmental Publications P.O. Box 42419 Cincinnati, OH 45242 # 100K09001

54 <http://www.epa.gov/osp/bosc/pdf/ctox0809rpt.pdf>

55 Collins et al., 2008, *Science*; <http://www.sciencemag.org/cgi/reprint/319/5865/906.pdf>

With the increase in the FY 2010 President's request, efforts will support Phase II of ToxCast to profile the activities of up to 500 additional compounds in order to broaden chemical diversity and evaluate the predictive nature of bioactivity signatures. With successful completion of Phase II (scheduled for FY 2012), ToxCast technologies can be applied to chemicals and other materials of concern to EPA program offices (e.g. nanomaterials and pharmaceuticals).

In FY 2010, a new effort, ExpoCast, will be launched. Whereas ToxCast provides information on the biological activity of various chemicals, ExpoCast will employ models that use data from ToxCast and other sources to predict the impacts of chemical exposure on the human body. ExpoCast will also be a high-throughput system capable of generating a great deal of information in a short period of time.

Information Technology

Advanced information management systems are needed to mine existing data for patterns, and to appropriately place new chemicals of unknown hazard within the context of data on existing chemicals. These advanced systems allow the integration of data from many different domains of toxicology, and allow for efficient expansion with information on new chemicals and other materials.

EPA has developed several advanced data management applications. The Aggregated Computational Toxicology Resource project (ACToR)⁵⁶, is a public, web-based resource that currently has information from over 200 sources on over 500,000 chemicals and other substances. ACToR organizes information from various data generation efforts including 1) NCCT's ToxCast and ExpoCast programs; 2) EPA's Toxicology Reference Database (ToxRefDB)⁵⁷ and 3) the Tox21 high-throughput screening collaboration of EPA and NIH. These data generation and management systems will be expanded throughout FY 2010.

Systems Biology Models

Modeling now plays a crucial role in practically all areas of biological research. Systems models integrate information at all levels of organization and aid in bridging the source-to-outcome gap and in conducting quantitative risk assessments. In FY 2010, this research will continue to: (1) provide standards for developing, documenting, archiving, and accessing quantitative mathematical models; (2) utilize systems-modeling approaches for the latest biological, chemical, and exposure data for quantitative risk assessment; (3) develop guidance on best practices for the construction, analysis and reporting of toxicological models that link pharmacokinetic information with the dynamic responses of target organs; and (4) implement the Virtual Liver and Virtual Embryo Projects. Collectively, these elements will provide a framework that integrates mechanistic information and data for predicting the risk of adverse outcomes in humans through dynamic simulation.

⁵⁶ <http://actor.epa.gov/actor/faces/ACToRHome.jsp>

⁵⁷ <http://www.epa.gov/ncct/toxrefdb/>

Performance Targets:

Work under this program supports EPA Strategic Objective 4.4. Specifically, the program identifies and synthesizes the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions with a focus on human, community, and ecosystem health. Currently, there are no formal performance measures for this specific Program. However, the NCCT develops annual research milestones as part of its multi-year implementation plans, and tracks and manages performance through the timely completion of those milestones.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$5,000.0) This increase would enhance modeling efforts to provide regulatory offices with detailed hazard assessment profiles on thousands of chemicals of concern, as well as information on human exposure potential, including chemical screening and prioritization, and toxicity pathway-based risk assessment (i.e., accelerate efforts to develop the virtual liver and the virtual embryo, and initiate planning for the virtual cardiopulmonary system). Specifically, this higher level of funding will provide for the high-throughput screening of up to 200 additional chemicals (i.e., a total of 500 instead of 300 chemicals in Phase II) in the ToxCast program, with complementary exposure predictions from ExpoCast for some of these chemicals, and the deployment of this information in databases with supporting analysis tools, via computer programs and Agency websites.
- (+\$133.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.
- (+\$121.0) These resources would fund research to provide predictive tools for risk assessment.
- (-\$59.0) This represents a realignment of funds associated with equipment purchases and repairs across the Agency's research programs.
- (-\$749.0) This decrease is the net effect of increases for payroll and cost of living for existing FTE, combined with a reduction based on the recalculation of base workforce costs.

Statutory Authority:

TSCA; FIFRA; FQPA; SDWA; ERDA.

Research: Endocrine Disruptors Program/Project by Research Area

(Dollars in Millions)

<i>ORD Multi-Year Plan</i> ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
<i>Endocrine Disrupting Chemicals</i>	\$10.6	53.8	\$10.1	50.3	\$10.2	53.6	\$10.2	53.6	\$9.9	53.2	\$11.1	48.9	\$11.1	48.9	\$0.0	0.0
EDCs' effects, exposure, assessment and management	\$4.7	22.6	\$5.3	20.3	\$5.3	22.0	\$4.8	22.0	\$4.6	22.5	\$5.9	21.7	\$6.0	21.7	\$0.1	0.0
Extent of impact of EDCs	\$3.9	16.8	\$2.5	15.4	\$2.5	15.7	\$2.7	15.7	\$2.5	14.9	\$2.7	14.4	\$2.7	14.4	\$0.0	0.0
Screening and testing	\$2.0	14.3	\$2.3	14.6	\$2.4	15.9	\$2.7	15.9	\$2.8	15.8	\$2.4	12.8	\$2.4	12.8	\$0.0	0.0
<i>Human Health</i>	\$0.2	1.2	\$0.3	1.2	\$0.3	1.2	\$0.3	1.2	\$0.3	1.2	\$0.4	1.2	\$0.3	1.2	(\$0.1)	0.0
Susceptible Subpopulations	\$0.2	1.2	\$0.3	1.2	\$0.3	1.2	\$0.3	1.2	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0
Cumulative Risk	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0	\$0.3	1.2	\$0.4	1.2	\$0.4	1.2	\$0.0	0.0
Total	\$10.9	55.0	\$10.4	51.5	\$10.5	54.8	\$10.5	54.8	\$10.2	54.4	\$11.5	50.1	\$11.5	50.1	\$0.0	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

Research: Endocrine Disruptor

Program Area: Research: Human Health and Ecosystems

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$11,158.9	\$11,486.0	\$11,442.0	(\$44.0)
Total Budget Authority / Obligations	\$11,158.9	\$11,486.0	\$11,442.0	(\$44.0)
Total Workyears	53.3	50.1	50.1	0.0

Program Project Description:

The Endocrine Disruptors Research program provides direct support to EPA’s endocrine screening and testing programs (mandated under the Food Quality Protection Act of 1996 and the Safe Drinking Water Act Amendments⁵⁸ of 1996) by evaluating current testing protocols and developing new protocols to evaluate potential endocrine effects of environmental agents. The research program also develops and applies methods, models, and measures to evaluate real-world exposures to endocrine disruptors and characterize related effects resulting from these exposures for humans and wildlife. In addition, the program develops risk management tools to prevent or mitigate exposures to endocrine disrupting chemicals (EDCs). Research assists decision-makers in reducing and preventing exposure of humans and ecosystems to endocrine disruptors. EPA’s Endocrine Disruptors Research program provides the scientific foundation for the Agency’s actions to protect Americans against unreasonable risk from exposure to toxics.

Research is guided by the Endocrine Disruptors Research Plan, which was developed with participation from major research clients and outlines research needs and priorities.⁵⁹ The Agency also maintains a multi-year plan (MYP)⁶⁰ for Endocrine Disruptors research that outlines steps for meeting these needs, as well as annual performance goals and key research outputs for evaluating progress.

Scientific review of the Endocrine Disruptors Research Program (EDRP) is conducted by EPA’s Board of Scientific Counselors (BOSC), a Federal advisory committee comprised of independent expert scientists and engineers. A BOSC subcommittee conducted an evaluation of the EDRP from September to November 2007 and commended the progress and direction of the research.⁶¹ The subcommittee rated the overall progress of the EDRP program as “*exceeds expectations.*”

58 SDWA Section 1457.

59 U.S. EPA, Office of Research and Development, *Research Plan for Endocrine Disruptors*. Washington, D.C.: EPA (1998). Available at: <http://www.epa.gov/ord/htm/documents/ORD-EDR-Feb1998.pdf>.

60 U.S. EPA, Office of Research and Development, *Multi-Year Plan for Endocrine Disruptors (draft)*. Washington, D.C.: EPA (2007). Available at: <http://www.epa.gov/ord/npd/pdfs/Draft-EDCs-MYP-091407.pdf>.

61 U.S. EPA, Office of Research and Development. *EDC Research Program Review*. Washington, D.C. (2008). Available at: <http://www.epa.gov/osp/bosc/pdf/edcmc0804rpt.pdf>.

The subcommittee noted that “this program has established itself as a leader in several areas of EDCs research. It has leveraged expertise across the Agency and with other federal and academic scientists; it has been quick to respond and adapt its focus and research questions to the rapidly changing research landscape of EDCs; and it has developed an excellent new MYP. The EDRP has accomplished a remarkable amount in the face of diminishing financial resources.” In reviewing EPA’s response to the recommendations⁶² from the previous BOSC review, the subcommittee acknowledged that the research program “partnered extensively with other agencies with interests in EDCs.” The subcommittee remarked that “EPA has been a leader in the development of genomics, proteomics, metabolomics, computational modeling, and whole animal endpoints to identify biomarkers of exposure to EDCs.”

FY 2010 Activities and Performance Plan:

In FY 2010, resources will continue to be used to develop, evaluate, and apply innovative DNA microarray and other state-of-the-art analytical methods for endocrine disrupting chemicals. EPA’s Endocrine Disruptors research program has developed and refined assays and improved other screening tools using genomics and high-speed computing capabilities so that the Agency has the necessary protocols for use in the Endocrine Disruptors Screening Program. Using genomics and related approaches to continue developing improved molecular and computational tools can help prioritize chemicals for screening and testing that will lead to a reduction of animal testing. This work has been highlighted as a priority for cross government investment. It is also consistent with the National Research Council’s 2007 report on “Toxicity Testing in the Twenty-first Century: A Vision and a Strategy,” which recommends that the Agency move toward using new technologies to prioritize and screen for chemicals.⁶³

Other important areas of research to be continued in FY 2010 include:

- Developing and improving the final two Tier 2 screening assays, the fish life-cycle and the amphibian growth and reproduction assays – a high priority for the Agency in implementing the Endocrine Disruptor Screening Program (EDSP);
- Developing the next generation of EDSP assays by applying newer computational and molecular approaches to develop models that predict a chemical’s ability to cause endocrine disruption;
- Determining classes and potencies of chemicals that act as endocrine disruptors, characterizing modes of action and the shape of the dose-response curve, developing approaches for assessing cumulative risk, and developing methods for extrapolating results across species, which would lead to reduced animal testing;
- Developing molecular indicators of exposure and analytical methods for detecting certain EDCs, identifying the key factors that influence human exposures to EDCs; and identifying sources of EDCs entering the environment, focusing on: wastewater treatment plants, concentrated animal feeding operations (CAFOs), and drinking water treatment plants; developing tools for risk reduction and mitigation strategies; and

⁶² U.S. EPA, Office of Research and Development, EDC Research Program Review. Washington, D.C. (2005).

Available at: <http://www.epa.gov/osp/bosc/pdf/edc0504rpt.pdf>.

⁶³ National Academies Press (2007). Available at: http://www.nap.edu/catalog.php?record_id=11970#toc.

- Applying methods, models, and tools developed by EPA and other research organizations to characterize the impact of environmental mixtures of EDCs on environmental media and aquatic organisms. Sources of EDCs to be examined include wastewater treatment plants, CAFOs, and drinking water plants.

The program has worked to articulate its research and development priorities to ensure compelling, merit-based justifications for funding allocations in response to assessments of its purpose, performance planning and management.

Performance Targets:

The research conducted under this program supports EPA Strategic Objective 4.4. Specifically, the program identifies and synthesizes the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions related to the health of people, community, and ecosystems, with a focus on endocrine-active pesticides and toxic chemicals.

The program's long-term performance measures are: (1) to provide OPPTS with improved screening and testing protocols for use in implementing the Agency's Endocrine Disruptors Screening Program; (2) to determine the extent of the impact of endocrine disruptors on humans, wildlife, and the environment to better inform the Federal and scientific communities; and (3) to reduce the uncertainty regarding the effects, exposure, assessment, and management of endocrine disruptors so that EPA has a sound scientific foundation for environmental decision-making. The research program also has developed performance indicators that monitor research activities and outputs. Targets for these include screening and testing protocols that EPA's Office of Prevention, Pesticides and Toxic Substances (OPPTS) will validate for use in evaluating the potential for chemicals to cause endocrine-mediated effects.

In 2008, the National Academy of Sciences (NAS) completed a study commissioned by EPA's Research and Development program to address OMB's recommendation to establish outcome-oriented efficiency measures.⁶⁴ According to the NAS study, "efficiency" in federal R&D programs is best assessed by using an external expert-review panel to evaluate the relevance, quality, and performance of the research. Considering these findings, the Office of Research and Development (ORD) is engaging its BOSC to evaluate if ORD's research programs are "doing the right research and doing it well."

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$71.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

64 National Academies Press. (2008) Evaluating Research Efficiency at the U.S. Environmental Protection Agency. Available at: http://www.nap.edu/catalog.php?record_id=12150.

- (+\$53.0) This provides resources to research in the area of providing a better understanding of science underlying the effects, exposure, assessment, and management of endocrine disruptors.
- (+\$29.0) This represents a realignment of funds associated with equipment purchases and repairs across the Agency's research programs.
- (-\$197.0) This decrease is the net effect of increases for payroll and cost of living for existing FTE, combined with a reduction based on the recalculation of base workforce costs.

Statutory Authority:

CAA; ERDDA; FIFRA; TSCA; FQPA; SDWA; CWA; RCRA; CERCLA; PPA.

Research: Pesticides and Toxics by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE			\$M	FTE	\$M	FTE								
Food Quality Protection Act (FQPA)	\$8.6	34.7	\$1.6	9.1												
FQPA risk assessment ¹	\$8.6	34.7	\$1.6	9.1												
Pollution Prevention	\$0.7	0.0	\$1.7	0.0												
Pollution Prevention Tools ²	\$0.7	0.0	\$1.7	0.0												
Safe Pesticides/Safe Products (SP2)	\$22.5	135.0	\$24.5	130.3	\$30.4		\$26.0	122.2	\$25.6	126.3	26.9	137.4	\$27.8	137.4	\$0.9	0.0
Predictive tools	\$8.5	62.6	\$9.8	57.8	\$12.6	50.3	\$10.1	49.8								
Wildlife risk assessment	\$6.8	46.9	\$7.2	45.0	\$8.6	46.2	\$8.2	45.8								
Chemical risk reduction	\$5.1	10.5	\$5.2	12.5	\$5.8	15.7	\$5.8	15.5								
Evaluation of new hazards	\$2.1	15.0	\$2.3	15.0	\$3.2	11.2	\$1.9	11.1								
Predictive tools for risk assessment ³									\$3.5	18.2	\$3.7	19.1	\$3.8	19.1	\$0.1	0.0
Wildlife risk reduction ³									\$16.9	93.0	\$19.3	104.6	\$19.9	104.6	\$0.6	0.0
Biotechnology ³									\$5.2	15.1	\$4.0	13.7	\$4.1	13.7	\$0.1	0.0
Total	\$31.8	169.6	\$27.8	139.5	\$30.4	123.4	\$26.0	122.2	\$25.6	126.3	\$26.9	137.4	\$27.8	137.4	\$0.9	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ Beginning in FY 2005, resources to support core human health research were shifted from FQPA to Human Health. No adverse impacts as research continued to address FQPA issues.

² Represents resources associated with persistent bioaccumulative toxics (PBTs). In FY 2006, these resources were redirected to support the Advanced Monitoring Initiative.

³ In FY 2009, ORD revised its Long Term Goal structure within the SP2 program. This was made retroactive to the FY 2008 Enacted.

Research: Pesticides and Toxics

Program Area: Toxic Research and Prevention

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$24,616.7	\$26,949.0	\$27,839.0	\$890.0
Total Budget Authority / Obligations	\$24,616.7	\$26,949.0	\$27,839.0	\$890.0
Total Workyears	128.9	137.4	137.4	0.0

Program Project Description:

The Pesticides and Toxics Research program is a multidisciplinary program that conducts research and development related to risks resulting from exposure to pesticides and toxic chemicals. The research supports the Agency’s efforts to reduce current and future risks to the environment and to humans by preventing and/or controlling the production of new chemicals and products of biotechnology that pose unreasonable risk, as well as assessing and reducing the risks of chemicals and products of biotechnology already in commerce. This research complements work conducted under the Human Health and Ecosystem Research, the Human Health Risk Assessment, and the Endocrine Disruptors Research programs. Research to develop and validate methods and models and assessments for predicting risks from pesticides, toxic substances, and products of biotechnology to human health and ecosystems is conducted under the Pesticides and Toxics research program. EPA’s Pesticides and Toxics Research program provides the scientific foundation for the Agency’s actions to protect against unreasonable risk from exposure to toxics.

Research is guided by the Biotechnology Research Strategy¹⁰⁴ and the Wildlife Research Strategy,¹⁰⁵ both of which were developed with broad participation from major clients (e.g. EPA’s Prevention, Pesticides and Toxic Substances program and Regional offices). The strategies outline the Agency’s research needs and priorities. The Safe Pesticides/Safe Products (SP2) multi-year plan (MYP)¹⁰⁶ outlines specific steps for meeting these needs, as well as annual performance goals and measures for evaluating progress.

The program’s focus is to develop methods, models, and data for use in decision making by EPA’s Office of Prevention, Pesticides and Toxic Substances (OPPTS) and other organizations. The research program’s three major goals are: (1) to provide predictive tools to prioritize testing requirements; enhance interpretation of data to improve human health and ecological risk assessments; and inform decision-making regarding high priority pesticides and toxic substances;

104 U.S. EPA, Office of Research and Development. *Biotechnology Research Strategy*. Washington, DC: EPA. Available at: http://www.epa.gov/nheerl/publications/files/biotechnology_research_program_4_8_05.pdf.

105 U.S. EPA, Office of Research and Development. *Wildlife Research Strategy*. Washington, D.C.: EPA. Available at: http://www.epa.gov/nheerl/publications/files/wildlife_research_strategy_2_2_05.pdf.

106 U.S. EPA, Office of Research and Development. *Safe Pesticides/Safe Products Multi-Year Plan*. Washington, D.C.: EPA (2006). Available at: <http://epa.gov/ord/npd/pdfs/SP2+MYP+120106final.pdf>.

(2) to develop probabilistic risk assessment methods and models to better protect natural populations of birds, fish, other wildlife, and non-target plants; and (3) to provide the tools necessary to make decisions related to products of biotechnology.

In February 2007, the Pesticides and Toxics research program underwent an external peer review by EPA's research advisory committee, the Board of Scientific Counselors (BOSC), which commended the progress and direction of the research and provided recommendations for improvement.¹⁰⁷ The BOSC stated that "SP2 is a very successful program. The research is of high quality and is focused on well-articulated goals. Its relevance to the Agency's mission is clear and apparent, and the SP2 Program fills a unique niche within the Agency, and serves the needs of OPPTS, its major client, very well." The BOSC also noted that, "the scientists involved in these projects are internationally recognized and their findings and organized panels serve to establish regulatory guidance around the world."

FY 2010 Activities and Performance Plan:

In FY 2010, the resources for Pesticides and Toxics research will continue to support the scientific foundation for addressing risks from human and wildlife exposure to pesticides and toxic chemicals. EPA will provide research on methods, models, and data to support prioritization of testing requirements, enhanced interpretation of data to improve human health and ecological risk assessments, and decision-making regarding specific individual or classes of pesticides and toxic substances that are of high priority. This research will continue to focus on:

- developing predictive biomarkers of neurotoxic effects for major classes of pesticides;
- developing alternative test methods for the hazard identification of developmental neurotoxicants;
- developing virtual chemical screening methods for risk-based prioritization and ranking needs for chronic non-cancer effects;
- developing quantitative structure activity relationships (QSARs) to relate various structural descriptions of molecules to toxicity endpoints;
- characterizing the toxicity and pharmacokinetics of certain perfluorinated chemicals (PFCs);
- evaluating the fate and transport of certain PFCs in soil; and
- evaluating the emissions of certain PFCs into the indoor environment from articles of commerce.

Research conducted in FY 2010 also will support the development of probabilistic risk assessments to protect natural populations of birds, fish, other wildlife, and non-target plants. This research directly supports Agency efforts to assure that endangered species are protected from pesticides while making sure farmers and communities have the pest control tools they need. Four key components of this research are:

- extrapolation among wildlife species and exposure scenarios of concern;
- population biology to improve population dynamics in spatially-explicit habitats;

107 U.S. EPA, Office of Research and Development, SP2 Research Program Review. Washington, D.C. (2007). Available at: <http://www.epa.gov/osp/bosc/pdf/sp2070723rpt.pdf>.

- models for assessing the relative risk of chemical and non-chemical stressors; and
- models to define geographical regional/spatial scales for risk assessment.

The program will develop methods for characterizing population-level risks of toxic substances to aquatic life and wildlife. Results of this research will help the Agency meet the long-term goal of developing scientifically valid approaches for assessing spatially-explicit, population-level risks to wildlife populations and non-target plants and plant communities from pesticides, toxic chemicals and multiple stressors while advancing the development of probabilistic risk assessment. This supports the Agency's obligation under the Endangered Species Act.

Additionally, FY 2010 resources will maintain a limited investment in biotechnology research to support decision-making related to products of biotechnology. Through its Science to Achieve Results (STAR) program, methods are being developed to assess the potential allergenicity of genetically engineered plants and to determine what factors influence allergenicity. As a result of a joint solicitation of proposals with the National Institute for Allergenicity and Infectious Diseases, EPA will continue to support grants that examine the genetic, developmental, or other determinants and mechanisms, and the influence of route, duration, and timing of dietary exposure that underlay the onset of food allergies. Together, the two Agencies are funding 16 grants.

The Pesticides and Toxics Research program continues to implement key improvement steps: it 1) developed a formal response to the BOSC report and is addressing action items and making progress toward long-term and annual targets; 2) is assessing the current efficiency measure to determine how best to capture the cost effectiveness of research activities, in light of the National Academy of Sciences' study (see below); and 3) is developing a process to better use performance information to improve program performance.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Efficiency	Percent variance from planned cost and schedule	Available 2010	-8	-6	-5	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the SP2 program's long-term goal one.	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the SP2	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
	program's long-term goal three.					

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the SP2 program's long-term goal two.	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of SP2 publications rated in highly cited publications	Available 2010	23.2	No Target Established (biennial)	24.2	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of SP2 publications in high impact journals	Available 2010	36.2	No Target Established (biennial)	37.2	Percent

The research conducted under this program supports EPA Strategic Objective 4.4. Specifically, the program identifies and synthesizes the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions related to the health of people, community, and ecosystems, with a focus on pesticides and toxic chemicals. A key focus for FY 2010 will be to develop the scientific underpinning related to the effects, exposures, and risk management of specific individual or classes of pesticides and toxic substances that are of high priority to the Agency to inform Agency risk assessment/management decisions.

In 2008, the National Academy of Sciences (NAS) completed a study commissioned by EPA's Research and Development program to address OMB's recommendation to establish outcome-oriented efficiency measures.⁶ According to the NAS study, "efficiency" in federal R&D programs is best assessed by using an external expert-review panel to evaluate the relevance, quality, and performance of the research. Considering these findings, ORD is engaging its BOSC to evaluate if ORD's research programs are "doing the right research and doing it well."

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$571.0) This reflects an increase for payroll and cost of living for all FTE.
- (+\$255.0) This represents a realignment of funds associated with equipment purchases and repairs across the Agency's research programs.

- (+\$11.0) These resources would fund research in the area of prioritizing testing requirements, enhancing interpretation of data to improve human health and ecological risk assessments.
- (+\$53.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program/Project to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

Statutory Authority:

FQPA; FIFRA; TSCA; CWA; CAA; ERDDA.

Program Area: Economics

Regulatory/Economic-Management and Analysis
Program Area: Legal / Science / Regulatory / Economic Review

Goal: Provide Agency-wide support for multiple goals to achieve their objectives. This support involves Agency-wide activities primarily provided by EPA's six (6) support offices - the Office of Administration and Resources Management (OARM), Office of the Chief Financial Officer (OCFO), Office of Environmental Information (OEI), Office of General Counsel (OGC), Office of the Administrator (OA), and the Office of Inspector General (OIG).

(Dollars in Thousands)

FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Environmental Program & Management</i>	\$17,379.6	\$16,729.0	\$22,403.0 \$5,674.0
Total Budget Authority / Obligations	\$17,379.6	\$16,729.0	\$22,403.0 \$5,674.0
Total Workyears	100.4	104.2	104.2 0.0

Program Project Description:

The Regulatory Economic, Management and Analysis program is designed to strengthen EPA's policy and program analysis, and ensure EPA's senior leaders and managers are provided with sound regulatory, policy, and program management information in a timely manner. The program works to fill gaps in EPA's ability to quantify the costs and benefits of environmental regulations and policies. The program seeks to improve operations and outcomes based on program and performance analysis. Resources are used to manage the EPA regulatory, policy, and guidance development process; develop, identify and analyze various regulatory and non-regulatory approaches and policy options; identify successful strategies and regulatory approaches; and address priority problem areas including small business and governmental entities.

Objectives of the program include:

- Ensuring that Agency decision-making processes are invested with high quality and timely information, including relevant science, policy, and economic factors, consideration of an appropriate range of alternatives to achieve the best overall environmental results, and efficient and effective internal procedures that facilitate timely action.
- Advancing the theory and practice of quality economics, and promoting policy analysis and risk analysis within the Agency.
- Providing information on the full societal impacts of reducing environmental risks, including the costs and benefits of regulatory options.

- Confirming and maintaining the accuracy and consistency of EPA's economic analysis, while promoting the use of economic, science, regulatory, and program analysis to make informed management decisions throughout the Agency.
- Leading Agency implementation of the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA), to address potential burdens on small entities.
- Improving program effectiveness and efficiency through analysis and information sharing.
- Promoting appropriate implementation of the Administrative Procedures Act, Congressional Review Act (CRA), and the Paperwork Reduction Act.

FY 2010 Activities and Performance Plan:

Program activities planned for FY 2010 include:

- Managing the Agency's internal *Action Development Process* and ensuring appropriate engagement across EPA offices and regions. Leading EPA's review of other agency and department actions. Informing the public about regulatory and policy actions under development. Providing training on the Agency's Action Development process, Economic Analysis Guidelines and related requirements (e.g., OMB Circular A-4). EPA will review and revise its economic guidelines so that they remain current with advancements and reflect best practices in the profession.
(Please refer to: <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html>;))
- Participating in the development of the Administrator's priority actions, reviewing economic and risk analyses conducted across EPA offices, and providing technical assistance when needed to help meet Agency goals. The Agency also will continue to chair the Small Business Advocacy Panels.
- Collaborating with state environmental agency representatives to reduce the state reporting burden associated with EPA activities.
- Conducting and supporting research on methods to improve the quality and quantity of economic science available to inform the Agency's decision makers, including management of the Science to Achieve Results in the Economic and Decision Sciences research program. Research priorities include estimation of the economic value of improvements in human health and welfare, integration of ecological and economic models to value improvements in ecological functions and services, and improvements in other data collection techniques used to measure economic costs and benefits. The Agency also will establish effective management systems to improve the quality and consistency of EPA's economic and risk assessment studies.

- Supporting data collection and the dissemination of information on the economic benefits, costs and impact of environmental regulations. The Agency conducts analysis on the impacts of environmental regulation on businesses, funding the Pollution Abatement Costs and Expenditures (PACE) survey with the assistance of the Department of Commerce's Bureau of the Census, which measures pollution abatement expenditures by U.S. manufacturing industries. (58 Please refer to: <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/pace2005.html>). The survey will be expanded to support Agency efforts to measure changes in expenditures resulting from newly implemented greenhouse gas reduction policies and regulations.
- Providing training on the Agency's Action Development process, Economic Analysis Guidelines, and related requirements (e.g., OMB Circular A-4) will allow the Agency to continue reviewing and updating its economic guidelines so it will remain current with advancements and reflect best practices in the profession. (59 Please refer to <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html>);
- Facilitating communication between the scientific community and Agency policy analysts by supporting workshops on priority economic and environmental policy issues (e.g., greenhouse gas reductions, environmental justice, benefits valuation, market mechanisms and incentives, and treatment of uncertainties in risk and economic analyses-60 For more information on these workshops, please refer to: <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/WorkshopSeries.html>.) Support the utilization of high quality outside technical peer review of influential economic models and methods used in Agency regulations.
- Improving the effectiveness and efficiency of Agency programs and policies through improved analysis, more efficient operations, and improved information sharing.

Performance Targets:

Work under this program supports multiple strategic objectives. Currently, there are no performance measures for this specific program.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$736.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$3,000.0) This change reflects additional funding that will support the development of science-based methods to assess disproportionate health impacts to form the Agency's Environmental Justice assessments and policy development; advances in the measurement of the beneficial effects of reducing pollutants, including supporting analyses and development of methods to improve the utility of cancer and non-cancer risk assessments consistent with recent recommendations from the National Academy of Sciences; and to support research to explore application of the comparative risk assessment framework and tools to disproportionate impact analysis.

- (+\$750.0) Additional resources will finance expansion of the present PACE survey of pollution abatement expenditures by industry to support the effective collection and measurement of costs to the U.S. economy of regulations and policies directed at reducing greenhouse gas emissions.
- (+\$1,188.0) This change reflects increased resources for contracts and grants that will improve the scope and quality of economic research, deliver more empirical studies on environmental economics, and increase the capacity of society to evaluate the economic benefits, costs, and impacts of environmental programs.

Statutory Authority:

TSCA sections 4, 5, and 6 (15 U.S.C. 2603, 2604, and 2605); CWA sections 304 and 308 (33 U.S.C. 1312, 1314, 1318, 1329-1330, 1443); SDWA section 1412 (42 U.S.C. 210, 300g-1); RCRA/HSWA: (33 USC 40(IV)(2761), 42 USC 82(VIII)(6981-6983)); CAA: 42 USC 85(I)(A)(7403, 7412, 7429, 7545, 7612); CERCLA: 42 USC 103(III)(9651); PPA (42 U.S.C. 13101-13109); FTTA.

Research: Sustainability Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE	\$M	FTE	\$M	FTE			\$M	FTE	\$M	FTE
Pollution Prevention/Sustainability¹	\$43.9	127.2	\$38.6	119.2	\$29.1	80.9	\$23.9	77.3	\$23.5	76.2	\$21.2	70.8	\$24.1	70.8	\$2.9	0.0
Pollution Prevention Tools	\$19.8	70.6	\$20.4	74.7	\$11.2	34.1	\$9.5	31.6								
Green Chemistry and Engineering	\$9.3	29.1	\$5.3	23.1	\$6.6	26.8	\$5.0	23.8								
Environmental Technology Verification (ETV)	\$3.6	6.0	\$3.2	6.0	\$3.0	4.7	\$1.6	7.7								
Environmental Systems Management	\$3.4	16.5	\$2.1	9.7	\$2.5	9.6	\$2.2	8.9								
Small Business Innovation Research (SBIR)	\$7.8	5.0	\$7.5	5.7	\$5.8	5.7	\$5.6	5.3								
Metrics and Indicators ¹									\$5.6	23.9	\$5.3	22.5	\$8.2	22.5	\$2.9	0.0
Decision Support Tools ¹									\$7.0	29.1	\$6.2	25.7	\$9.2	25.7	\$3.0	0.0
Technology: SBIR; People, Prosperity and the Planet (P3); ETV ¹									\$10.9	23.2	\$9.7	22.6	\$6.7	22.6	(\$3.0)	0.0
Socioeconomics²	\$2.6	2.0	\$2.4	3.0	\$2.3	3.0	\$2.3	3.0								
Valuation of health and ecosystem benefits	\$1.0	1.0	\$1.1	1.5	\$0.2	1.5	\$1.2	1.5								
Environmental compliance behavior and decision making	\$1.6	1.0	\$1.4	1.5	\$0.2	1.5	\$0.2	1.5								
Valuation of environment and health					\$1.0	0.0										
Market mechanism and economic incentives					\$0.9	0.0	\$1.0	0.0								
Total	\$46.5	129.2	\$41.0	122.2	\$31.4	83.9	\$26.2	80.3	\$23.5	76.2	\$21.2	70.8	\$24.1	70.8	\$2.9	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2009, ORD revised its Long Term Goal structure within the Sustainability program. This was made retroactive to the FY 2008 Enacted. In addition, consistent with strategic planning efforts, ORD refocused the program from pollution prevention to sustainability.

² In FY 2008, the Economic Decision Sciences/Socioeconomics program was shifted to the Office of Policy, Economics, and Innovation (OPEI).

Research: Sustainability

Program Area: Research: Sustainability

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

Goal: Compliance and Environmental Stewardship

Objective(s): Enhance Societies Capacity for Sustainability through Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$22,346.0	\$21,157.0	\$24,107.0	\$2,950.0
Hazardous Substance Superfund	\$99.7	\$79.0	\$0.0	(\$79.0)
Total Budget Authority / Obligations	\$22,445.7	\$21,236.0	\$24,107.0	\$2,871.0
Total Workyears	74.2	70.8	70.8	0.0

Program Project Description:

EPA’s Science and Technology for Sustainability (STS) research program provides information and tools to Agency Program and Regional offices and external stakeholders to aid them in taking more sustainable and preventive approaches to health and environmental problems. EPA’s focus on sustainability stems largely from the Pollution Prevention Act of 1990. EPA is committed to promoting sustainability—achieving economic prosperity while protecting natural systems and quality of life for the long-term. EPA’s Science and Technology for Sustainability Research program provides the scientific foundation for the Agency’s actions for the integrated management of air, water, and land resources, as well as changes in traditional methods of creating and distributing goods and services.

The STS program is designed to provide technologies, tool, and metrics to inform decision-makers. Adoption of sustainability concepts in environmental management requires a new way of thinking and depends heavily on scientific advances that provide technologies and decision tools needed to inform future risk management decisions. As decision-makers adopt these new sustainable approaches, they will need metrics to assist them in measuring the impacts of actions in the context of sustainability.

The Science Advisory Board’s (SAB) Environmental Engineering Committee reviewed EPA’s Sustainability Research Strategy⁹⁸ and the STS Multi-Year Plan in June 2006.⁹⁹ The SAB stated that it “strongly endorses the Agency’s proposal to establish a research program focused on sustainability because the results from such a program will improve the scientific foundation for a sustainable environment.”¹⁰⁰ In addition, EPA’s Board of Scientific Counselors (BOSC) completed a review of the STS research program in FY 2008.¹⁰¹ In its report, the BOSC notes

98 For more information, see http://www.epa.gov/sustainability/pdfs/EPA-12057_SRS_R4-1.pdf.

99 For more information, see http://www.epa.gov/osp/bosc/subcomm-sust_mid-2009.htm.

100 For more information, see [http://yosemite.epa.gov/sab%5Csabproduct.nsf/D24960CAEE6ECCAB852572FE00704EC0/\\$File/sab-07-007.pdf](http://yosemite.epa.gov/sab%5Csabproduct.nsf/D24960CAEE6ECCAB852572FE00704EC0/$File/sab-07-007.pdf).

101 For more information see, <http://www.epa.gov/osp/bosc/pdf/sust0803rpt.pdf>.

that the STS program “meets or exceeds expectations” in achieving long-term goals for the adoption of technology and tools.

The STS research program is designed to position EPA’s Research and Development program to provide scientific and technical support to regional and national sustainability policies and initiatives. To this end, the STS research program has established the following areas of emphasis:

- *Sustainability Metrics:* As sustainable solutions to environmental problems are developed and implemented, there is a need to measure the progress and impact of these efforts. The research in this area provides the underlying science needed to develop, apply, and implement these metrics. Efforts are focused on developing scientifically-based sustainability metrics and indices that will support understanding of the implications of different technology and risk management pathways, evaluation of regional ecosystem sustainability over time, and assessment of how various management strategies move a region towards sustainability. A related area of focus is developing national sustainability metrics suitable for use in the Agency’s Report on the Environment.
- *Decision Support Tools:*¹⁰² This research creates tools and methods that provide information to decision-makers in the public and private sectors on ways to evaluate environmental management issues in a holistic manner in order to achieve sustainable outcomes. This effort is built on the foundation of Life Cycle Analysis (LCA) and supply chain analysis techniques. These techniques address the sustainability of alternative policy options, production pathways, and product usage by describing the full environmental impact and sustainability implications of each alternative. Such methods and techniques are applied to specific problems of interest including consumer products, municipal solid waste management, and chemical production.
- *Technologies:* This research emphasizes the role that technologies have in facilitating sustainable outcomes. Through programs such as the Small Business Innovation Research (SBIR) program and the People, Prosperity, and Planet (P3) student design competition, emphasis is placed on finding solutions to client-driven problems while promoting sustainable design and implementation practices generate research *outputs* in the form of innovative, inherently benign, integrated, and interdisciplinary designs that will advance the scientific, technical, and policy knowledge necessary to further the goals of sustainability.

Over the long term, the STS program promotes and supports national and regional sustainability policies and initiatives. The program ensures that decision-makers within the EPA and at the local, regional and national levels have a scientifically sound set of scientific principles and management tools that promote stewardship and sustainability outcomes.

¹⁰² For more information, see <http://www.epa.gov/ord/NRMRL/std/sab>.

FY 2010 Activities and Performance Plan:

In FY 2010, the Agency requests \$24.1 million for the STS research program to continue its focus on sustainability metrics, decision support tools, and systems research. This includes a \$5 million increase for a biofuels research initiative to help decision-makers better understand the risk tradeoffs associated with biofuels use and production and to help identify options to maximize climate benefits and minimize unintended impacts. The initiative will focus on the life cycle environmental impacts of biofuels and the environmental challenges that occur in each of the four major phases of the biofuel supply chain—feedstock production, biofuel production, biofuel distribution, and biofuel end use. The work will inform the biofuels life-cycle analysis (LCA) and mandatory reporting requirements contained in the Energy Independence and Security Act (EISA).

In FY 2010, the STS program will continue development of systems metrics, which represent the measurement of energetic resources, human health, ecological burden (i.e., water, biota, air), and overall system function and health on a broad regional scale. For example, the San Luis Valley Project will complete the development and application of a set of four sustainability metrics (ecological and economic) to be used by environmental managers in supporting sustainable outcomes in San Luis Valley, Colorado. This will be followed by the launch of a new research project to apply sustainability metrics to management of regional ecosystems in Puerto Rico. Additionally as discussed, new research has begun in the area of sustainable production, distribution, and use of biofuels. The increase to the STS program will enable EPA's Research and Development program to implement and track sustainability metrics across the biofuels system.

Funding also will enable research in the area of decision support tools, including efforts to further develop a streamlined in-house Life Cycle Assessment methodology and incorporate material flow concepts into existing tools. The program will complete an environmental impact assessment model for land use and continue work on a water use model. Work will continue on extending an auction-based management approach to wet weather flow management in urban watersheds using the Cincinnati and Cleveland metropolitan areas as case studies.

The EPA also will continue to fund the development of new innovative technologies through the People, Prosperity and Planet (P3) program. This program not only advances the development of national and international environmental technology testing protocols and a global environmental technology network, but also encourages innovation in environmental stewardship.

EPA has taken steps to improve this program's performance through the development of the Science and Technology for Sustainability Multi-Year Plan (MYP). In addition, the program developed and finalized several annual output and long-term outcome measures. As noted previously, EPA's Board of Scientific Counselors (BOSC) completed a review of the STS research program in FY 2008.¹⁰³ The review identified that the STS program "meets or exceeds expectations" in achieving long-term goals for the adoption of technology and tools. The STS research program will continue to implement recommendations of the BOSC.

¹⁰³ For more information see, <http://www.epa.gov/osp/bosc/pdf/sust0803rpt.pdf>.

The program has also taken steps to measure efficiency. In 2008, the National Academy of Sciences (NAS) completed a study commissioned by EPA's Research and Development program to address OMB's recommendation to establish more outcome-oriented efficiency measures. According to the NAS study, efficiency in federal research and development programs is best assessed by using an external expert-review panel to evaluate the relevance, quality, and performance of the research. Considering these findings, EPA is engaging its Board of Scientific Counselors to evaluate whether the program is "doing the right research and doing it well." The program is also exploring a measure that tracks the percentage of its budget allocated to direct science activities.

Performance Targets:

Work under this program supports EPA's Strategic Plan Objective 5.4: Enhance Science and Research. The program manages performance through the timely completion of research milestones and the citation rates of research publications.

The program's bibliometric measure, which assesses the quality and impact of its scientific publications compared to other publications in the same field, demonstrates that the program's publications are "highly cited" 2.8 times more than other publications. At the close of FY 2009, the program aims to further increase its percentage of "highly cited" publications to 29.2 percent from 28.2 percent in FY 2007. Achieving these biennial bibliometric targets will ensure EPA continues to make significant progress toward providing the research needed to meet its long-term sustainability goals.

Additionally, in FY 2010 the STS program intends to deliver several tools, models, guidance, and reports to inform state and federal regulatory decision makers. In order to evaluate the sustainability of biofuels production, the STS program will expand the suite of environmental impact assessment models to include sustainable land use. The program also will provide decision makers at a local level with recommendations on the effectiveness of a small-parcel, best management practice approach to managing urban watersheds.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$5,000.0) This increase provides resources for a biofuels research initiative to aid decision-makers in better understanding the risk tradeoffs associated with biofuels use and production. The work will inform the life-cycle analysis and mandatory reporting requirements contained in the Energy Independence and Security Act (EISA). Additionally, the program will further develop and test the application of criteria and metrics to assess sustainable biofuel production.
- (+\$907.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$75.0) These resources would fund research in the area of sustainable technologies.
- (-\$297.0) This represents a realignment of funds associated with equipment purchases and repairs across the Agency's research programs.

- (-\$2,735.0) This reflects an adjustment for Small Business Innovation Research (SBIR). Enacted funding levels for this program project include the amount EPA is required to set aside for contracts to small businesses to develop and commercialize new environmental technologies. This adjustment is necessary because the SBIR set aside, at this point in the budget cycle, is redistributed to other research programs in the President's Budget request. After the budget is enacted, when the exact amount of the mandated requirement is known, the funds will be transferred to the SBIR program in this program project.

Statutory Authority:

CAA; CWA; FIFRA; PPA; RCRA; SDWA; SBA; SARA; TSCA; ERDDA; EISA.

Research: Sustainability

Program Area: Research: Sustainability

Goal: Compliance and Environmental Stewardship

Objective(s): Enhance Societies Capacity for Sustainability through Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$22,346.0	\$21,157.0	\$24,107.0	\$2,950.0
<i>Hazardous Substance Superfund</i>	\$99.7	\$79.0	\$0.0	(\$79.0)
Total Budget Authority / Obligations	\$22,445.7	\$21,236.0	\$24,107.0	\$2,871.0
Total Workyears	74.2	70.8	70.8	0.0

Program Project Description:

Under the Small Business Research (SBIR) Program²⁴, as required by the Small Business Act as amended²⁵, EPA sets aside 2.5 percent of its extramural research budget for contracts to small businesses to develop and commercialize new environmental technologies. Since its inception, EPA's SBIR Program has provided incentive funding to small businesses to translate their innovative ideas into commercial products that address environmental problems. These innovations are the primary source of new technologies that can provide improved environmental protection at lower cost with better performance and effectiveness. SBIR has helped spawn successful commercial ventures that not only improve our environment, but also create jobs, increase productivity and economic growth, and enhance the international competitiveness of the U.S. technology industry.

SBIR, the only activity contained in this program, will not be funded under the Superfund account at this time.

Performance Targets:

Work under this program supports EPA's Enhance Science and Research objective.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (-\$79.0) This reflects an adjustment for Small Business Innovation Research (SBIR). Enacted funding levels for this program project include the amount EPA is required to set aside for contracts to small businesses to develop and commercialize new environmental technologies. This adjustment is necessary because the SBIR set aside, at this point in the budget cycle, is redistributed to other research programs in the President's Budget request. After the budget is enacted, when the exact amount of the mandated requirement is known, the funds will be transferred to the SBIR program in this program project.

Statutory Authority:

CAA; CWA; FIFRA; PPA; RCRA; SDWA; SBA; SARA; TSCA.

²⁴ For more information, see <http://es.epa.gov/ncer/sbir>.

²⁵ U.S. Public Law 219, 79th Congress, 2nd session, 22 July 1982. *Small Business Innovation Development Act of 1982*. For more information, see <http://thomas.loc.gov/cgi-bin/bdquery/z?d097:s.881>.

Research: Global Change Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Global Change																
National/Regional Assessment	\$5.4	9.3	\$4.9	9.2	\$5.1	10.0	\$4.7	8.0								
Air Quality	\$8.5	14.5	\$7.4	14.4	\$7.0	13.4	\$5.9	12.7								
Ecosystems	\$6.5	14.3	\$6.4	12.2	\$5.7	10.4	\$3.8	11.0								
Water Quality	\$0.5	2.2	\$0.6	2.1	\$0.5	2.0	\$0.3	2.1								
Human Health	\$0.3	1.5	\$0.3	1.5	\$0.3	1.4	\$1.5	1.5								
Climate Change and Air Quality ¹									\$8.2	15.1	\$8.7	18.9	\$10.6	18.9	\$1.9	0.0
Climate Change and Water Quality/Aquatic Ecosystems ¹									\$8.3	13.7	\$7.6	13.1	\$8.6	13.1	\$1.0	0.0
USGCRP Assessments ¹									\$1.6	3.7	\$1.6	3.6	\$1.7	3.6	\$0.1	0.0
Total	\$21.1	41.8	\$19.6	39.5	\$18.6	37.1	\$16.2	35.3	\$18.1	32.6	\$17.9	35.5	\$20.9	35.5	\$3.0	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2009, ORD revised its Long Term Goal structure within the Global Change program. This was made retroactive to the FY 2008 Enacted.

Research: Global Change

Program Area: Research: Clean Air
Goal: Healthy Communities and Ecosystems
Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$17,423.9	\$17,886.0	\$20,909.0	\$3,023.0
Total Budget Authority / Obligations	\$17,423.9	\$17,886.0	\$20,909.0	\$3,023.0
Total Workyears	31.7	35.5	35.5	0.0

Program Project Description:

EPA’s Global Change research program is assessment-oriented, with primary focus on understanding the effects of global change—particularly climate variability and change—on air quality, water quality, aquatic ecosystems, human health and social well-being in the United States. The Agency strives to produce timely and useful information, decision support tools and adaptation strategies that will enable resource managers, policymakers, and other stakeholders to account for global change when making decisions. EPA also has begun to develop decision support tools to help decision-makers evaluate alternative strategies for reducing greenhouse gas emissions and the environmental implications of those strategies.

The program also partners with Program and Regional Offices to understand how climate change affects the Agency’s ability to fulfill its statutory, regulatory, and programmatic requirements, and identifies opportunities within the provisions of the statutes to address the anticipated impacts of a changing climate. Climate – Air Quality interactions will likely play a larger role in the context of ambient air health assessments in the future. To meet this challenge, the Clean Air Research Program is working closely with the Global Program to envision a framework for the research that will be most useful to stakeholders charged with public and environmental health.

The program is also an active participant in the U.S. Climate Change Science Program (CCSP), the interagency Federal effort to improve scientific understanding of climate change.²⁶ EPA’s program priorities are consistent with those of the CCSP, which coordinates and integrates climate change research among thirteen Federal departments and agencies, and CCSP’s Strategic Plan²⁷. The program also is guided by a multi-year research plan developed by EPA, which is currently under revision.

A subcommittee of EPA’s Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of qualified, independent scientists and engineers—conducted a peer review of the program in 2005, and reported that the program “has provided substantial benefits

²⁶ For more information, see <http://www.climate-science.gov/>.

²⁷ National Science and Technology Council, *Strategic Plan for the U.S. Climate Change Science Program* (Washington: NSTC, 2003). Available at: <http://climate-science.gov/Library/stratplan2003/>

to the nation and that it is on course to make significant further contributions.”²⁸ The subcommittee completed a mid-cycle review of the program in 2008 and reaffirmed its assessment of the program.

FY 2010 Activities and Performance Plan:

In FY 2010, EPA research will focus on four areas: (1) understanding how climate change will affect air quality in the United States, (2) understanding how climate change will affect water quality and aquatic ecosystems, (3) evaluating alternative strategies for reducing greenhouse gas emissions and the environmental implications of those strategies, and (4) supporting the statutory mandates of the CCSP to produce periodic assessments of the effects of climate change. Research and assessments will continue to improve understanding of the implications of climate change for human health, and the human health impacts of alternative adaptation and mitigation strategies in all four areas.

The Global Change research program will continue to provide support to decision makers with areas of responsibility likely to be affected by climate change, such as air quality district managers, state environmental agencies, watershed managers, and operators of waste and drinking water systems. FY 2010 funding will continue research to: 1) develop, in collaboration with EPA’s Water program, detailed watershed-based, stakeholder-driven studies focused on local issues and specific management solutions for addressing global change, and 2) in collaboration with EPA’s Air and Radiation program, assess the linkages between global climate change, regional air quality and health effects. This research will be the basis for key comprehensive assessments of how climate change will affect U.S. air quality and water quality and particular areas of vulnerability. These assessments will help EPA’s Air and Water programs, respectively, understand how climate change will affect their ability to meet statutory, regulatory, and programmatic requirements and account for climate change’s effects in their future actions.

As recommended in a recently released National Research Council report,²⁹ the program will continue decision support efforts by inventorying and assessing the climate-sensitive decisions made by local and state decision makers to identify which decisions are most impacted by climate change and which decisions can benefit most from EPA’s scientific findings. In FY 2009, EPA supported the stakeholder-oriented process by the Alaska Department of Environmental Conservation to develop a Climate Change Strategy. EPA will continue to assist the State of Alaska as it implements its adaptation strategy and expects that this will serve as a model for future state strategies. This research responds to the BOSC recommendation that the program develop a new strategy for place-based adaptation decision support activities that recognizes the importance of engaging local stakeholders while ensuring that the results of the investment have extended applicability of national significance.

28 U.S. EPA, Board of Scientific Counselors, Subcommittee on Global Change Research, *Review of the Office of Research and Development’s Global Change Research Program at the U.S. Environmental Protection Agency, Final Report*. Washington, D.C.: EPA (2006), 6. See <http://www.epa.gov/osp/bosc/pdf/glob0603rpt.pdf>.

29 For more information, see http://www.nap.edu/catalog.php?record_id=12626

In FY 2010, the program will continue to develop computer models that simulate how global change may affect U.S. air quality,³⁰ continuing progress toward the program goal to complete a framework linking global change to air quality. The program will model and evaluate potential adaptive responses to climate change, such as changes in energy, pollution control, and transportation technologies, and behavior in various regions and sectors of the U.S.³¹ These efforts will help air quality resource managers make informed decisions about how to respond to the effects of global change on air quality. They are also a critical component of the Assessment of the Implications of Global Change for Air Quality in the U.S, planned for release in 2012.

In FY 2009, the program began to shift its environmental and health effects research emphasis to support a comprehensive assessment of the effects of climate change on water quality, including aquatic ecosystems. In FY 2010, EPA will begin research on the effects of land use practices and climate change on water systems. This information will assist in determining climate change impacts on water resources in different regions and in the development of decision support tools needed to protect water quality and aquatic ecosystems.

In FY 2010, the program will also perform research, in collaboration with other programs, to provide information that will inform efforts to mitigate greenhouse gases and other radiative forcing compounds. The research will address environmental implications of mitigation technologies, support EPA Air and Water programs rulemaking activities, and identify potential mitigation options that could reduce both traditional air pollutants (e.g., Ozone and PM) and green house gases. Research on geologic sequestration of carbon dioxide, in partnership with EPA's Drinking Water research program and the Department of Energy, will support the Office of Water's carbon sequestration rulemaking.

The U.S. Global Change Research Act of 1990 mandates periodic scientific assessments of the effects of global change.³² Section 106 of the act states that these assessments should integrate and interpret the findings of the Federal government's climate change research; analyze the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; analyze current trends in global change; and project major trends for the next 25 to 100 years. EPA, beginning in FY 2006, has participated in the development of CCSP's Synthesis and Assessments Products (SAPs), serving as lead-Agency for three of the 21 assessments.³³ Two EPA SAPs, Adaptation Options for Climate-Sensitive Ecosystems and Resources (SAP 4.4) and Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems (SAP 4.6), were released in calendar year 2008. EPA will continue to participate in CCSP's programmatic, assessment, and planning activities.

The global change research program makes extensive use of the Science to Achieve Results (STAR) program's competitive, peer-reviewed grants. In FY 2010, STAR's global change component will focus on two research areas. First, new grants will be funded to develop effective strategies to both mitigate climate change and reduce air pollution while accounting for future

30 For more information, see <http://www.epa.gov/nerl/goals/global/>.

31 For more information, see <http://www.epa.gov/appcdwww/apb/greenegas.htm>.

32 See 15 USC §2936.

33 For more information, see <http://www.climatescience.gov/Library/sap/sap-summary.php> .

changes in climate, land use, and technology. Second, STAR funding will enable investigation of the sensitivity of U.S. water systems to global change by developing models to quantitatively assess the impacts of global change on water systems.

To improve the Research: Global Change program EPA has taken steps to (1) finalize independent, review-informed performance measures; (2) clarify the program’s framework and mission; (3) develop a means to measure the program’s efficiency; and (4) improve budget–performance integration. The program is finalizing long-term performance targets and will collect formal long-term measurement data during its comprehensive BOSC review scheduled for late 2009. Additionally, the program is revising its multi-year plan around a clearer framework, and has developed an approach for improving program efficiency.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered.	100%	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of Global publications rated as highly cited publications	Available 2010	No Target Provided (biennial)	23	No Target Provided (biennial)	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of Global publications in high-impact journals	Available 2010	No Target Provided (biennial)	24.6	No Target Provided (biennial)	Percent

The research conducted under this program supports EPA Objective 4.4. Specifically, the program identifies and synthesizes the best available scientific information, models, methods, and analyses to support Agency guidance and policy decisions related to the health of people, community, and ecosystems, with a focus on global change.

The program gauges its annual and long-term success in meeting this objective by assessing its progress on several key measures. In FY 2009, the program aims to further improve its bibliometric analysis results by (1) increasing the percentage of program publications rated as “highly cited” to 23 percent; and (2) increasing the percentage of program publications rated as “high impact” to 24.6 percent. Improvements in these measures demonstrate increased quality and utility of the program’s research. In addition, the program plans to meet 100 percent of its planned outputs, and complete additional work toward a framework linking global change to air quality. By meeting these targets, the research program will improve the Agency’s ability to make guidance and policy decisions related to global change.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$2,156.0) This increase supports global change research and will allow the program to expand its projections on the effects of climate change on air and water quality in the United States. The results will be used by air and water quality managers to evaluate how climate change influence will affect attainment of air and water quality standards. The increase also will be used to evaluate alternative strategies for reducing greenhouse gas emissions and the environmental implications of those strategies.
- (+\$368.0) This reflects an increase for payroll and cost of living for all FTE.
- (+\$253.0) This represents a realignment of funds associated with equipment purchases and repairs across the Agency's research programs.
- (+\$246.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

Statutory Authority:

USGCRA; NCPA; ERDDA.

Research: Clean Air Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Particulate Matter	\$56.6	185.9	\$60.9	184.8	\$65.2	182.1	\$64.4	183.1								
Effects of short-term exposure to particulate matter	\$18.5	62.1	\$19.8	56.4	\$18.6	49.8	\$19.2	50.1								
Effects of long-term exposure to particulate matter	\$13.6	42.2	\$16.1	47.5	\$17.9	44.8	\$16.4	45.0								
Implementation of the fine particle NAAQS	\$15.6	59.7	\$16.1	59.1	\$18.7	62.0	\$19.0	62.3								
Implementation to address residual non-attainment	\$9.0	21.9	\$8.9	21.8	\$10.0	25.5	\$9.8	25.7								
Tropospheric Ozone	\$5.1	14.3	\$4.0	11.5	\$1.6	8.8	\$1.0	8.8								
Implementation tools	\$5.1	14.3	\$4.0	11.5	\$1.6	8.8	\$1.0	8.8								
Air Toxics	\$16.9	59.5	\$17.0	55.6	\$16.2	55.5	\$12.6	52.6								
Reduce uncertainty in air toxics risks	\$10.9	40.3	\$11.3	35.9	\$9.2	33.1	\$7.9	30.9								
Implement risk reduction of air toxics	\$6.0	19.3	\$5.7	19.7	\$7.1	22.4	\$4.7	21.7								
Clean Air¹									\$78.9	236.2	\$80.5	269.5	\$83.2	269.5	\$2.7	0.0
Reduce uncertainty in standard setting and air quality management decisions									\$37.2	145.4	\$40.2	171.5	\$41.5	171.5	\$1.3	0.0
Assess source-to-health linkages and reduce uncertainty									\$41.8	90.8	\$40.3	98.0	\$41.7	98.0	\$1.4	0.0
Total	\$78.6	259.7	\$81.9	251.9	\$83.0	246.4	\$78.1	244.5	\$78.9	236.2	\$80.5	269.5	\$83.2	269.5	\$2.7	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2008, the Particulate Matter, Tropospheric Ozone, and Air Toxics MYPs were combined to form the Air MYP.

Research: Clean Air

Program Area: Research: Clean Air
Goal: Clean Air and Global Climate Change

Objective(s): Radiation; Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$57,575.5	\$80,541.0	\$83,164.0	\$2,623.0
Total Budget Authority / Obligations	\$57,575.5	\$80,541.0	\$83,164.0	\$2,623.0
Total Workyears	239.4	269.5	269.5	0.0

Program Project Description:

EPA’s Clean Air Research Program provides the scientific foundation for the Agency’s actions to protect the air Americans breathe. The program provides the underlying research to support the Agency’s implementation of the Clean Air Act (CAA), which mandates promulgation and enforcement of the National Ambient Air Quality Standards (NAAQS)¹ as well as the evaluation of risks associated with Hazardous Air Pollutants (HAPs).²

The program is primarily focused on particulate matter (PM),³ but in FY 2008, EPA integrated its air research activities around a multi-pollutant approach. Thus, the research addresses ozone and other criteria as well as HAPs. This reorganization was guided by recommendations from the National Academy of Sciences and the Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of independent expert scientists and engineers— as well as the emerging research needs of EPA’s Air and Radiation program. In moving toward the multi-pollutant theme, the program will increasingly focus on how to address specific source sectors contributing to air pollution, a holistic approach that will result in more effective and efficient air quality management strategies. The program currently is guided by a series of NAS reports⁴ and a multi-year plan⁵ that outlines research needs and plans to meet those needs, and establishes milestones for evaluating the program’s progress. However, Climate – Air Quality interactions will very likely play a larger role in the context of ambient air health assessments in the future, emphasizing the importance of a multi-pollutant perspective in addressing the possible change to air pollution profiles and effects. To meet this challenge, the program is working closely with the Global Change Research Program to develop a framework for research that will be useful to stakeholders charged with public and environmental health.

The scientific findings from EPA’s air research inform the development of Integrated Science Assessments, formerly known as Air Quality Criteria Documents, which are periodic reports that

1 The NAAQS set limits for criteria pollutants regulating levels of tropospheric ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen oxides, and lead. For more information, see <http://www.epa.gov/air/criteria.html>.

2 For more information, see <http://www.epa.gov/ttn/atw/188polls.html>

3 For more information, see <http://www.epa.gov/pmresearch/>.

4 2004 reports is: NRC, *Research Priorities for Airborne Particulate Matter: IV. Continuing Research Progress*. Washington, DC: <http://books.nap.edu/catalog/10957.html> and *Air Quality Management in the United States*, http://www.nap.edu/catalog.php?record_id=10728 National Academies Press (2004).

5 For more information, see <http://www.epa.gov/ord/npd/pdfs/Air-MYP-narrative-final.pdf>

synthesize the science relevant to setting the NAAQS. These assessments are prepared by the Human Health Risk Assessment program and used by EPA's Air and Radiation program to develop and propose revisions to the NAAQS. The program also provides the science necessary to support EPA Regional Offices and state regulatory agencies in identifying and designing effective strategies to meet the NAAQS. The research program is integrated with complementary research on the impacts of climate change and mercury conducted under the Research: Global Change and Research: Human Health and Ecosystems programs respectively.

A subcommittee of EPA's BOSC conducted an evaluation of the PM and tropospheric ozone research programs in calendar year 2005. A subcommittee also conducted a mid-cycle review of the program in September 2007, and noted in their final report that "the quality of the science was high, [and] that it was relevant to Agency and user clients." The BOSC also found that the science was highly informative to the science community itself, and that there was evident progress and program evolution with the advancement of the respective science fields.⁶

FY 2010 Activities and Performance Plan:

In FY 2010, EPA's Clean Air Research program will continue to study Americans' exposure to air pollution, and the links between sources of pollution and health outcomes.⁷ The program will develop computer models of emissions and the atmosphere, which are used to forecast air quality at local and national scales; predict public exposure to air pollutants; and assist states in developing and validating plans to meet the requirements of the Clean Air Act. The program also will study atmospheric chemistry, such as emission mixtures and the formation of secondary pollutants through in-atmosphere reactions. In addition, the program will develop ambient air sampling techniques; and conduct research to correlate ambient measurements of emissions with both their sources and with levels of human exposure.

EPA will continue its research to understand air pollution near roads attempting to link roadway emissions with health outcomes.⁸ EPA has selected Near-Roadway (FY 2010 Request, \$3.1M) as a model of how EPA can best approach source-based studies to draw direct relationships between the source and atmospheric concentrations of pollution; and how these ambient levels relate to exposure and ultimately health outcomes. EPA is conducting studies in Las Vegas and Detroit through 2010 in collaboration with the Federal Highways Administration, to measure and characterize emissions near roads and to understand potential exposures associated with vehicle and roadway "emissions." Exposure models will be developed for individual and multiple pollutants and will be used to develop risk estimates of health effects. The effectiveness of prevention and mitigation options (e.g., natural and man-made barriers) will be evaluated. Research addressing other sectors (e.g., pulp and paper, petroleum refineries, cement kilns), will also employ, like Near-Roadway, a holistic and integrated approach.

FY 2010 funding will continue support for research to inform Agency, state and Tribal air quality managers about the sources of air pollution and methods for managing emissions.⁹ The

⁶ The final report is available at: <http://www.epa.gov/osp/bose/pdf/pmmc080331rpt.pdf>

⁷ For more information, see <http://www.epa.gov/nerl/goals/air/>.

⁸ For more information, see <http://www.epa.gov/nerl/goals/air/linkages.html>.

⁹ For more information, see <http://www.epa.gov/appcdwww/>.

program will investigate and apply advanced methods to measure the quantity and chemical composition of airborne toxics and particulate matter emissions from man-made and natural sources. These data support development of improved emission inventories, which provide essential data for trend analysis; Regional, and local scale air quality modeling; regulatory strategies and impact assessments; and human exposure modeling.¹⁰ These methods also support source apportionment, which traces pollutants measured in ambient air to specific sources based on the unique chemical or structural markers in the pollutants. In addition, the program will generate emission samples from various sources for use in exposure and toxicology studies to understand how health effects vary by source, and develop and evaluate the cost and performance of technologies capable of reducing emissions.

EPA will continue to develop advanced air quality models, such as the Community Multi-scale Air Quality (CMAQ) model (FY 2010 Request, \$4.6M), that simulate transport and fate of pollutants in the atmosphere. These models are used by EPA and National Oceanic and Atmospheric Administration, state and local governments, and the general air pollution research and monitoring community to understand and forecast the location, composition and magnitude of air pollutants, and to develop effective emission control policies and regulations. In the BOSC evaluation, the program was commended for the strong relationships it has established with other funding organizations. The research collaboration and coordination supported by the FY 2010 budget request will ensure that the scientific and technical needs of the Air Research Program continue to be met with minimal duplication of effort.

Further, the Agency will continue epidemiological, clinical, and toxicological studies of air pollution's health effects.¹¹ In FY 2010, a priority area for the program's health effects research will be improving scientific understanding of how particle size and composition as related to specific sources influences particulate matter-associated health effects. Research will focus on determining how the toxicity of particles differs by particle size and chemical composition; understanding how emissions from different sources affect health; the degree to which genes, lifestyle, age, and diseases like diabetes and asthma affect susceptibility to air pollution; and understanding the mechanisms inside the human body by which air pollution causes harm. EPA also will investigate air pollution's effects on cardiopulmonary, nervous, reproductive, and immune systems and on development during pregnancy and infancy. The program also will conduct epidemiological studies of communities with single emission sources or industrial sectors to improve understanding of how health endpoints are connected to distinct sources of air pollution.

The program makes extensive use of the Science to Achieve Results (STAR) program's competitive, peer-reviewed grants.¹² In FY 2010, to reflect the shift towards a multi-pollutant program, the program will hold a new competition for Air Pollution Research Centers (previously Particulate Matter Centers). The new centers (FY 2010 funding, \$8.2 million) will address multi-pollutant air problems such as health effects of air pollution mixtures.¹³ The program also will continue to fund a ten-year grant (the largest in EPA's history) to the Multi-

10 For more information, see <http://www.epa.gov/ttn/chief/eiinformation.html>.

11 For more information, see <http://www.epa.gov/nheerl/research/cleanair.html>.

12 For more information, see: <http://es.epa.gov/ncer/science/pm/>.

13 For more information, see http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/outlinks.centers/centerGroup/19/.

Ethnic Study of Atherosclerosis (MESA)–Air Pollution Study.¹⁴ In FY 2010, MESA will report interim findings on cardiovascular disease associations with PM and co-pollutants. STAR also will continue to fund a five-year grant to the Health Effects Institute (HEI),¹⁵ a nonprofit research organization cosponsored by EPA and the automotive industry to conduct independent research on the health effects of air pollution. In addition, the program will fund grants to develop “dynamic” air quality management tools so that local and state air quality managers can adapt emission control plans to changing circumstances in near-real time. These studies link to climate-air quality relationships and interactions to develop realistic and forward-thinking models.

Finally, the program’s exposure research, done in collaboration with EPA’s Human Health research program and HEI, will emphasize development of a framework for assessing the effectiveness of air pollution regulations and control strategies. The framework will be especially important in assessing loss of benefits associated with air quality changes due to changes in climate.

EPA has finalized two long-term goals toward which the program commits to work: (1) reducing uncertainty in the science that supports standard-setting and air quality management decisions and (2) assessing the links between sources of air pollution and health outcomes. The program continues working to improve integration of its financial and performance data, developing and finalizing methods for measuring progress toward the program’s annual and long-term measures, and implementing annual program reviews.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of NAAQS program publications rated as highly cited papers		No Target Established (Biennial)	33.9	No Target Established (Biennial)	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percent planned actions accomplished toward the long-term goal of reducing uncertainty in the science that support standard setting and air quality management decisions.	100%	100	100	100	Percent

The research conducted under this program supports EPA Strategic Objective 1.6. Specifically, the program provides sound science to support EPA’s goal of clean air by conducting leading-edge research and developing a better understanding and characterization of human health and environmental outcomes.

¹⁴ For more information, see <http://depts.washington.edu/mesaair/>.

¹⁵ For more information, see <http://www.healtheffects.org/>.

The program gauges its annual and long-term success by assessing its progress on several key measures. In FY 2010, the program strives to complete 100 percent of its planned actions related to the long-term goal of reducing uncertainty in the science that supports standard setting and air quality management decisions. Additionally, the program plans to complete additional work toward a hierarchy of pollutant sources based on the linkages between source emissions and the concentration of pollutants in ambient air, and the risk they pose to human health. Feedback from the ongoing BOSC review is being used to refine this approach heading into FY 2010.

The program's bibliometric measure, which assesses the quality and impact of its scientific publications compared to other publications in the same field, demonstrates that the programs' publications are "highly cited" 3.3 times more than similar publications. In FY 2010, the program aims to further increase its percentage of "highly cited" publications, with a target of 34.9% in FY 2011. Achieving these ambitious targets will ensure EPA continues to make significant progress toward providing the research needed to meet its long-term clean air goals.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$645.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.
- (+\$206.0) These resources would fund work in the air research program, such as studying emission sources and investigating air pollutants health effects.
- (+\$104.0) This represents a realignment of funds associated with equipment purchases and repairs across Agency research programs.
- (+\$50.0) This is an increase in laboratory fixed costs, including maintenance, operations, utilities, and security costs.
- (+\$1,618.0) This reflects an increase for payroll and cost of living for all FTE.

Statutory Authority:

CAA; ERDDA.

Research: Land Preservation and Restoration Program/Project by Research Area
(Dollars in Millions)

ORD Multi-Year Plan ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted		
	\$M	FTE			\$M	FTE											
Contaminated Sites	\$33.6	98.5	\$31.1	96.0	\$25.6	93.5	\$23.0	92.0									
Contaminated Sediments	\$7.9	26.9	\$7.8	26.3	\$7.3	24.0	\$7.4	27.2									
Ground Water	\$5.3	10.8	\$4.9	9.4	\$5.2	11.6	\$5.3	15.5									
Soils/Land	\$3.8	14.4	\$3.6	13.8	\$2.3	5.8	\$1.0	5.6									
Multi-media ²	\$16.6	46.4	\$14.7	46.5	\$10.8	52.1	\$9.3	43.6									
Hazardous Wastes	\$9.4	47.9	\$9.1	48.2	\$11.6	51.6	\$10.4	50.8									
RCRA Corrective Action Support	\$0.6	4.0	\$0.0	0.0	\$0.0	0.0	\$0.0	0.0									
Waste Management	\$2.7	12.3	\$2.6	12.6	\$5.2	18.6	\$3.6	18.3									
Multi-Media Decision Making	\$6.2	31.6	\$6.4	35.6	\$6.4	33.0	\$6.8	32.5									
Land¹									\$32.0	141.3	\$35.7	154.7	\$36.4	154.7	\$0.7	0.0	
Land Restoration									\$21.2	90.9	\$22.1	95.9	\$22.6	95.9	\$0.5	0.0	
Materials Management and Emerging Issues									\$10.8	50.4	\$13.6	58.8	\$13.8	58.8	\$0.2	0.0	
Total	\$43.1	146.4	\$40.2	144.2	\$37.2	145.1	\$33.4	142.8	\$32.0	141.3	\$35.7	154.7	\$36.4	154.7	\$0.7	0.0	

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ In FY 2009, ORD revised its Long Term Goal structure within the Land program. This was made retroactive to the FY 2008 Enacted.

² Contains the Superfund Innovation Technology Evaluation (SITE) program, which was discontinued in FY 2007.

Research: Land Protection and Restoration

Program Area: Research: Land Protection

Goal: Land Preservation and Restoration

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Science & Technology</i>	<i>\$11,212.5</i>	<i>\$13,586.0</i>	<i>\$13,782.0</i>	<i>\$196.0</i>
Leaking Underground Storage Tanks	\$567.7	\$475.0	\$484.0	\$9.0
Oil Spill Response	\$794.6	\$720.0	\$737.0	\$17.0
Hazardous Substance Superfund	\$19,392.9	\$20,905.0	\$21,401.0	\$496.0
Total Budget Authority / Obligations	\$31,967.7	\$35,686.0	\$36,404.0	\$718.0
Total Workyears	132.9	154.7	154.7	0.0

Program Project Description:

Research performed under the Land Research program supports scientifically defensible and consistent decision-making for Resource Conservation and Recovery Act (RCRA) material management, corrective action, and emerging materials topics. EPA's Land Research Program provides the scientific foundation for the Agency's actions to protect America's land. Research under this program has been evolving from waste treatment to beneficial re-use, avoidance of more toxic materials, and operation of waste management facilities to conserve capacity and produce energy. To address emerging material management issues, the program made a strategic shift to focus on nanomaterial fate and transport. Research within this program addresses resource conservation and material reuse issues, the application of models and tools to support the Brownfield program, application of alternative landfill covers and the benefits of landfill bioreactors.

Research efforts are guided by the Land Research Program Multi-Year Plan (MYP),⁹⁴ developed with input from across the Agency, which outlines steps for meeting the needs of the Research and Development program's clients and for evaluating progress through annual performance goals and measures. To enhance communication with customers, EPA has developed a Land Research Program web site.⁹⁵ The site includes a description of the program; fact sheets (science issues, research activities, and research impacts); research publications and accomplishments; and links to tools and models. Specific human health risk and exposure assessments and methods are discussed and conducted under the Human Health Risk Assessment program.

The Land Protection and Restoration research program underwent an external process evaluation by a subcommittee of EPA's Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of independent, expert scientists and engineers—and the BOSC delivered their report to EPA in FY 2009 (December 2008). The BOSC found that, building on the full evaluation in FY 2006, the Land program has an MYP that articulates research goals for meeting

⁹⁴ EPA, Office of Research and Development, *Land Research Program MYP*. Washington, D.C.: EPA. For more information, see <http://www.epa.gov/ord/html/multi-yearplans.htm#land>.

⁹⁵ For more information, see www.epa.gov/ord/landscience.

the critical needs of the program. The BOSC also indicated that the Land Research program is responsive to recommendations for the implementation of research activities, and as a result of the review, the program received a rating of “exceeds expectations.”⁹⁶

FY 2010 Activities and Performance Plan:

In FY 2010, resources will continue to support research to address material management, land reuse and revitalization issues, and emerging research topics. Under land reuse, the program works with states to optimize operations and monitor several landfill bioreactors to determine their potential to provide alternative energy in the form of landfill gas while increasing the nation’s landfill capacity. This research directly contributes to Land Restoration long-term goals and will aid states and facility owners in pursuing permits for research and development of alternative options for disposal. The Agency works with the Association of State and Tribal Solid Waste Management Officials (ASTSWMO) to assist in the communication of research results on landfill bioreactors to the states.

Continuing support of Brownfields and land revitalization issues will include technology transfer of the decision support tool (SMARTe) to interested communities and countries. SMARTe is a joint effort of the U.S.-German Bilateral Working Group, the EPA, and the Interstate Technology Regulatory Council (ITRC) Brownfields Team for use by Brownfield project stakeholders for assessing both market and non-market costs and benefits of redevelopment options, clarifying both private and public financing options, evaluating and communicating environmental risks, and easing access to pertinent state-specific information related to specific projects. The Land research program also plans to initiate methamphetamine lab clean-up studies in response to the Methamphetamine Remediation Research Act,⁹⁷ which requires EPA to evaluate clean-up techniques and exposure risks.

Material management research areas in FY 2010 include coal combustion residue (CCR) disposal and reuse. Planned research products will address CCR leaching potential to support risk assessments, including the development of a decision support tool to evaluate options for coal ash disposal or beneficial reuse. The bioavailability of metals is an important issue in material reuse and research products will provide critical information to support risk assessments.

Under EPA’s nanomaterial research program (FY 2010 Request, \$17.7 million, including \$3.4 million in the Land research program, \$13.9 million in the Human Health and Ecosystem research program, and \$0.2 million in both the Air and Sustainability research programs), described in more detail in Research: Human Health and Ecosystems, the Land Research program addresses the fate and transport research theme, with a goal to lead the Federal government in addressing key science questions on the persistence and movement of nanomaterials in the environment. In FY 2010, continuing into FY 2011, the program will:

- Develop a state of the art simulation model for nanoparticle transport in groundwater.
- Publish a report on relation of surface chemistry factors to transport and fate of nanomaterials in soils and sediments.

⁹⁶ BOSC Land Restoration and Preservation Research Mid-Cycle Subcommittee Report. For more information, see <http://www.epa.gov/osp/bosc/pdf/landmc0901rpt.pdf>.

⁹⁷ For more information, see <http://thomas.loc.gov/cgi-bin/query/D?c110:5:./temp/~c11007oMUL:>

- Publish a report on the state-of-the-science for sampling and measurement of nanomaterials in environmental media.
- Publish studies on the fate and transformation of fullerenes in environmental systems.
- Assess ecological exposure to nanomaterials in support of risk characterization.
- Model nanomaterial chemical fate & transport in the air medium.

To improve performance management, the program established a process by which the BOSC rates each program long-term performance as part of its reviews. In addition, the National Academy of Sciences (NAS) completed a study commissioned by EPA's Research and Development program to address OMB's recommendation to establish outcome-oriented efficiency measures. According to the NAS study, efficiency in federal research and development programs is best assessed by using an external expert-review panel to evaluate the relevance, quality, and performance of the research. Considering these findings, the program is engaging the BOSC to better evaluate investment efficiency and the extent to which the program is "doing the right research and doing it well." The program is also exploring a measure that tracks the percentage of its budget allocated to direct science activities.

Performance Targets:

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Efficiency	Avg. time (in days) for technical support centers to process and respond to requests for technical document review, statistical analysis and evaluation of characterization and treatability study plans	Available 2010	29.0	28	27	Days

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the manage material streams, conserve resources and appropriately manage waste long-term goal.	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of planned outputs delivered in support of the mitigation, management and long-term stewardship of	100	100	100	100	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
	contaminated sites long-term goal.					

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of Land publications in high impact journals.	26.2	25.7	No Target Established (Biennial)	26.7	Percent

Measure Type	Measure	FY 2008 Actual	FY 2008 Target	FY 2009 Target	FY 2010 Target	Units
Output	Percentage of Land publications rated as highly cited publications.	18.0	26.8	No Target Established (biennial)	27.8	Percent

Work under this program supports EPA's Objective 3.3: Enhance Science and Research. Specifically, the program provides and applies sound science for protecting and restoring land by conducting leading-edge research, which, through collaboration, leads to preferred environmental outcomes. Performance measures for this specific program project are included under the Superfund Land Protection and Restoration program.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$146.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$66.0) These resources will fund research in the area of materials management.
- (+\$56.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.
- (-\$72.0) This represents a realignment of funds associated with equipment purchases and repairs across the Agency's research programs.

Statutory Authority:

SWDA; HSWA; ERDDA; SARA; CERCLA; RCRA; OPA; BRERA; MRRA.

Research: Land Protection and Restoration

Program Area: Research: Land Protection

Goal: Land Preservation and Restoration

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$11,212.5	\$13,586.0	\$13,782.0	\$196.0
Leaking Underground Storage Tanks	\$567.7	\$475.0	\$484.0	\$9.0
Oil Spill Response	\$794.6	\$720.0	\$737.0	\$17.0
<i>Hazardous Substance Superfund</i>	<i>\$19,392.9</i>	<i>\$20,905.0</i>	<i>\$21,401.0</i>	<i>\$496.0</i>
Total Budget Authority / Obligations	\$31,967.7	\$35,686.0	\$36,404.0	\$718.0
Total Workyears	132.9	154.7	154.7	0.0

Program Project Description:

The Land Research Program provides essential research to EPA's Superfund program and Regional Offices to enable them to accelerate scientifically defensible and cost-effective decisions for cleanup at complex contaminated sites. Research themes include: contaminated sediments, ground water, and multi-media issues. The research program also provides site-specific technical support through EPA labs and centers, as well as liaisons located in each Regional Office. EPA's Land Research Program provides the scientific foundation for the Agency's actions to protect America's land. As such, this program is a vital component of EPA's efforts to reduce and control risks to human health and the environment.

Research within this program is responsive to the Superfund law requirements under Section 209(a) of Pub. L. 99-499, which calls for "...a comprehensive and coordinated Federal program of research, development, demonstration, and training for the purpose of promoting the development of alternative and innovative treatment technologies that can be used in response actions under the CERCLA program." These research efforts are guided by the Land Research program Multi-Year Plan (MYP)²⁰ which outlines steps for meeting the needs of Agency programs and for evaluating progress through annual performance goals and measures. To enhance communication with customers, EPA has developed a Land research program web site.²¹ The site includes a description of the program; fact sheets (science issues, research activities, and research impacts); research publications and accomplishments; and links to tools and models. Specific human health risk and exposure assessments and methods are conducted under the Human Health Risk Assessment program.

The Land Protection and Restoration research program underwent an external process evaluation by a subcommittee of EPA's Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of independent, expert scientists and engineers—and the BOSC delivered

²⁰ EPA, Office of Research and Development, *Land Research Program MYP*. Washington, DC : EPA. For more information, see <http://www.epa.gov/ord/htm/multi-yearplans.htm#land>.

²¹ For more information, see www.epa.gov/ord/landscience.

their report to EPA in FY 2009 (December 2008). The BOSC found that, building on the full evaluation in FY 2006, the Land program has an MYP that articulates research goals for meeting the critical needs of the program. The BOSC also indicated that the Land research program is responsive to recommendations for the implementation of research activities, and as a result of the review, the program received a rating of “exceeds expectations.”²²

FY 2010 Activities and Performance Plan:

In FY 2010, research will continue to advance EPA’s ability to accurately characterize the transport and uptake of chemicals from contaminated sediments and determine the range and scientific foundation for remedy selection options by improving site characterization, monitoring the effectiveness of remediation and evaluation of novel remedial options. This work directly supports the program’s long term goal for the mitigation, management and long-term stewardship of contaminated sites. Planned research products for FY 2010 include key reports that will determine the degree of resuspended sediments and assess the significance of changes in bioavailability of organic and inorganic contaminants following resuspension and redeposition during dredging of contaminated sediments. Documented remediation methods and data are vital to developing new cost-effective methods for managing high-cost decisions at controversial, extensively contaminated sites.

Continuing work that the BOSC evaluation found is “being developed in a timely way to characterize contaminated sediments accurately and quickly... [and is] sought actively by clients to achieve contaminant cleanups quickly,” FY 2010 resources will be used to integrate exposure models, ecological effects and remediation research in order to improve the understanding of best management practices related to Superfund sites. Consistent with the National Research Council’s report, “Sediment Dredging at Superfund Megsites: Assessing the Effectiveness,”²³ EPA will continue the development of alternative sediment remedies that have the potential to be more effective than conventional dredging.

The program will continue research to develop and apply several technologies to address complex treatment issues. Permeable reactive barriers (PRBs) are a cost-effective technology to replace pump and treat methods, and the application of this technology to sites for treatment of chlorinated organic compounds has demonstrated success. Research will address the application of PRBs to treat inorganic compounds. The program also is addressing the fundamental mechanisms involved in oxidation and reduction transformations during in-situ chemical oxidation and this technology will continue to be applied to treat chromium contamination at Superfund sites providing a cost-effective treatment to reduce health risks.

Recent accomplishment in ground water remediation research includes the use of Permeable Reactive Barrier (PRBs) over traditional pump & treat methods, which has resulted in significant operations and maintenance savings at two Superfund sites in EPA Regions 4 and 8. Another technology, in-situ chemical reduction, produced an innovative technology for remediating chromium in ground water. Application of this patented technology has provided additional cost

²² BOSC Land Restoration and Preservation Research Mid-Cycle Subcommittee Report. For more information, see <http://www.epa.gov/osp/bosc/pdf/landmc0901rpt.pdf>.

²³ For more information, see <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=11968>

savings at Superfund sites in EPA Region 4. EPA also developed a new application of PRBs to treat arsenic contaminated mine drainage at a mining site in East Helena, Montana.

Research efforts also will address monitored natural attenuation, specifically in metal contaminated ground water. Key synthesis and state-of-the-science documents will provide EPA program offices, regions, and states with remediation technologies and long-term stewardship for treatment of dense non-aqueous phase liquids, like trichloroethylene, in ground water. The transport of contaminants in ground water and the subsequent intrusion of contaminant vapors into buildings is a critical research issue for EPA's Superfund remediation programs. Work is ongoing to develop reliable soil gas sampling methodologies and to improve vapor intrusion modeling capability.

Multi-media research under the Land research program includes the development of analytical methods, field sampling guidance, statistical software, monitoring and remediation technologies for mining sites and technical support infrastructure needed to move the products of these research and development activities from the lab and into the hands of site managers and other decision makers. Full-scale treatment of mine drainage is underway and the program will continue activities in mining research to demonstrate and apply methods to treat acid mine drainage in a cost-effective manner. Bioavailability of metals in media is a new area which will provide data to support site specific risk assessments. EPA will continue to provide support to Superfund project managers via technical support centers (TSCs) and two modeling assistance web sites. These resources provide site-specific technical support to more than 100 cleanup program sites by responding to scientific questions (e.g., engineering and ground water issues) and technology transfer products to EPA program offices and other stakeholders. TSCs provide information based on research results to increase the speed and quality of Superfund cleanups and reduce associated cleanup costs.

Contaminated sediment researchers worked to evaluate the amount of sediment contaminants in post-dredging residuals in the Ashtabula River. These results, coupled with ongoing polychlorinated biphenyl (PCB) bioavailability studies will improve risk assessments and decision making at sediment sites.

The Land research program also conducts research with an increased emphasis on asbestos health effects in order to develop data to support dosimetric and toxicologic assessment of amphibole asbestos fiber-containing material from Libby, Montana. This effort will address key data gaps and provide tools for quantitative characterization, including a comparative analysis of the toxicity of amphibole asbestos-contaminated vermiculite from Libby, Montana, relative to other asbestos fibers and asbestos-like mineral occurrences.

To improve performance management, the program established a process by which the BOSC rates each program long-term performance as part of its reviews. In addition, the National Academy of Sciences (NAS) completed a study commissioned by EPA's Research and Development program. According to the NAS study, efficiency in federal research and development programs is best assessed by using an external expert-review panel to evaluate the relevance, quality, and performance of the research. Considering these findings, the program is engaging the BOSC to better evaluate investment efficiency and the extent to which the program

is “doing the right research and doing it well.” The program is also exploring a measure that tracks the percentage of its budget allocated to direct science activities.

Performance Targets:

Work under this program supports EPA’s Strategic Plan Objective 3.3: Enhance Science and Research. Specifically, the program provides and applies sound science for protecting and restoring land by conducting leading-edge research, which, through collaboration, leads to preferred environmental outcomes.

In FY 2010, the program plans to accomplish its goals of completing and delivering 100 percent of its planned outputs. Additionally, the program plans to meet its efficiency goal of reducing its average technical response time to 27 days, which is the average time for technical support centers to process and respond to requests for technical document review, statistical analysis, and the evaluation of characterization and treatability study plans. These measures address the increasing utility of EPA research tools and technologies as well as the reduction of uncertainty due to utilization of research and development methodologies, models, and statistical designs. In achieving the performance targets, the program will contribute to EPA’s goal of applying sound science in the protection and restoration of land.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$405.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$25.0) These resources will fund land restoration activities such as contaminated sediment research.
- (+\$66.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

Statutory Authority:

SWDA; HSWA; SARA; CERCLA; RCRA; OPA; BRERA.

Research: Land Protection and Restoration

Program Area: Research: Land Protection

Goal: Land Preservation and Restoration

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$11,212.5	\$13,586.0	\$13,782.0	\$196.0
<i>Leaking Underground Storage Tanks</i>	<i>\$567.7</i>	<i>\$475.0</i>	<i>\$484.0</i>	<i>\$9.0</i>
Oil Spill Response	\$794.6	\$720.0	\$737.0	\$17.0
Hazardous Substance Superfund	\$19,392.9	\$20,905.0	\$21,401.0	\$496.0
Total Budget Authority / Obligations	\$31,967.7	\$35,686.0	\$36,404.0	\$718.0
Total Workyears	132.9	154.7	154.7	0.0

Program Project Description:

Leaking underground storage tanks (LUSTs) research focuses on the assessment and cleanup of leaks for fuels and various fuel additives, including methyl tertiary butyl ether (MTBE). EPA's Land Research Program provides the scientific foundation for the Agency's actions to protect America's land. The purpose of the Land Protection LUST research program is the prevention and control of pollution at LUST sites. Specific activities include the development of source term and transport modeling modules for use by state project managers and the development of multiple remediation approaches applicable to spilled fuels, with or without oxygenates.

These research efforts are guided by the Land Multi-Year Plan (MYP)³, developed with input from across the Agency, which outlines steps for meeting the needs of Agency programs and for evaluating progress through annual performance goals and measures. To enhance communication with customers, EPA developed a Land Research Program web site.⁴ The site includes a description of the program; fact sheets (science issues, program research, and impacts); research publications and accomplishments; and links to tools and models.

FY 2010 Activities and Performance Plan:

In FY 2010, resources will continue to be utilized to address prevention and control. This goal is best achieved by proper characterization of both fuels and release sites, as well as the development of effective risk management approaches. The expected increase in the use of various biofuels that may not be compatible with existing fuel storage infrastructure makes this research even more important. Research activities will include:

- Fuels analysis, including understanding current and future shifts in supply.

³ EPA, Office of Research and Development, *Land Research Program MYP*. Washington, D.C.: EPA. For more information, see <http://www.epa.gov/ord/htm/multi-yearplans.htm#land>

⁴ For more information, see www.epa.gov/ord/landscience.

- Understanding fate and transport of MTBE, ethanol, and other fuel oxygenates in the subsurface using models that incorporate defining characteristics of releases.
- Working with the public and private sectors, analysis of infrastructure to determine vulnerabilities in the tank storage system to prevent water quality impairment.
- Development of treatment options, including a patented Biomass Concentrator Reactor for cost-effective treatment of ground water to remove contamination due to oxygenates, fuels, and fuel blends. Use of this reactor ensures that treated ground water meets established drinking water standards.
- Treatment options anticipating fuel composition changes and the nature of sites where releases will occur.
- Determining the role of vapor release of gasoline from underground storage tanks on fuel constituent contamination in ground water both in the field and in laboratory settings.
- Technical support to regulators in various states including California, Michigan, New York, Rhode Island, Utah, Virginia, West Virginia, and Wisconsin. Examples of this support include fate and transport studies at Long Island, New York, sites and presentation of a course on Modeling and Transport for a state of West Virginia Agency.

This research will complement biofuels research conducted in the global change and air programs.

Performance Targets:

Work under this program supports EPA’s Strategic Plan Objective 3.3: Enhance Science and Research. Specifically, the program provides and applies sound science for protecting and restoring land by conducting leading-edge research, which, through collaboration, leads to preferred environmental outcomes. Performance measures for LUST research activities are included under the Superfund Land Protection and Restoration program.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$9.0) This reflects an increase for payroll and cost of living for existing FTE.

Statutory Authority:

BRERA; CERCLA; ERDDA; HSWA; OPA; RCRA; SARA; SWDA.

Research: Land Protection and Restoration

Program Area: Research: Land Protection

Goal: Land Preservation and Restoration

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
Science & Technology	\$11,212.5	\$13,586.0	\$13,782.0	\$196.0
Leaking Underground Storage Tanks	\$567.7	\$475.0	\$484.0	\$9.0
<i>Oil Spill Response</i>	<i>\$794.6</i>	<i>\$720.0</i>	<i>\$737.0</i>	<i>\$17.0</i>
Hazardous Substance Superfund	\$19,392.9	\$20,905.0	\$21,401.0	\$496.0
Total Budget Authority / Obligations	\$31,967.7	\$35,686.0	\$36,404.0	\$718.0
Total Workyears	132.9	154.7	154.7	0.0

Program Project Description:

Oil spills research focuses on three aspects: test protocol development, fate and transport modeling, and remediation. EPA's Land Research Program provides the scientific foundation for the Agency's actions to protect America's land. EPA develops and uses these protocols for testing various spill response product classes to pre-qualify products as required by the preparedness and response requirements of the Oil Pollution Act of 1990. Testing products ensures that they work as claimed and provides access to effective means to reduce damage when an oil spill occurs.

These research efforts are guided by the Land Multi-Year Plan (MYP)², developed with input from across the Agency, which outlines steps for meeting the needs of Agency programs and for evaluating progress through annual performance goals and measures. To enhance communication with customers, EPA developed a Land Research Program web site.³ The site includes a description of the program, fact sheets (science issues, program research, and impacts), research publications and accomplishments, and links to tools and models.

FY 2010 Activities and Performance Plan:

In FY 2010, the Land Research program will continue remediation research into advances associated with physical, chemical, and biological risk management methods for petroleum and non-petroleum oil spills in freshwater and marine environments as well as development of a protocol for testing solidifiers and treating oil. The program also will develop testing guidelines that address environment, type of oil (e.g. petroleum-based, vegetable), and agent for remediation. Additionally, the program will model the composition and properties of spilled oil, natural dispersion, emulsification, weathering, and effectiveness of control strategies. Research

² EPA, Office of Research and Development, *Land Research Program MYP*. Washington, DC: EPA. For more information, see <http://www.epa.gov/ord/htm/multi-yearplans.htm#land>.

³ For more information, see www.epa.gov/ord/landscience.

products are presented at meetings and posted or linked on EPA's oil spills web site for use by oil spill managers.

Performance Targets:

Work under this program supports EPA's Strategic Plan Objective 3.3: Enhance Science and Research. Specifically, the program provides and applies sound science for protecting and restoring land by conducting leading-edge research, which, through collaboration, leads to preferred environmental outcomes. Performance measures for research activities in this program are included under the Superfund Land Protection and Restoration program.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$17.0) This reflects an increase for payroll and cost of living for existing FTE.

Statutory Authority:

SWDA; HSWA; SARA; CERCLA; RCRA; OPA; BRERA.

ORD Nanotechnology Research by Program/Project

EPA Program/Project	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted ¹		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE	\$M	FTE								
Research: Human Health and Ecosystems	\$4.0	0.0	\$5.0	0.0	\$3.9	0.0	\$8.2	3.6	\$8.4	3.6	\$13.3	7.6	\$13.9	7.6	\$0.6	0.0
Research: Sustainability	\$0.6	3.0	\$0.6	3.0	\$0.6	3.0	\$0.2	1.0	\$0.2	1.0	\$0.2	1.0	\$0.2	1.0	\$0.0	0.0
Research: Clean Air							\$0.2	1.0	\$0.2	1.0	\$0.2	1.0	\$0.2	1.0	\$0.0	0.0
Research: Land Protection and Restoration									\$1.6	16.0	\$2.7	23.2	\$3.4	23.2	\$0.7	0.0
Total	\$4.6	3.0	\$5.6	3.0	\$4.5	3.0	\$8.6	5.6	\$10.4	21.6	\$16.4	32.8	\$17.8	32.8	\$1.4	0.0

Note: Nanotechnology research cuts across ORD's budget structure; the resources in this table are included in other programs' budget trend tables. Includes estimates of workforce support costs. Totals may not add due to rounding.

Research: Fellowships by Research Area

(Dollars in Millions)

ORD Long-Term Goal	FY 2004 Enacted		FY 2005 Enacted		FY 2006 Enacted		FY 2007 Enacted		FY 2008 Enacted		FY 2009 Enacted		FY 2010 President's Budget		FY 2010 vs. FY 2009 Enacted	
	\$M	FTE	\$M	FTE	\$M	FTE										
Other Fellowships ¹	\$1.6	0.0	\$1.6	0.3	\$1.6	0.4	\$1.6	0.4	\$1.5	0.4	\$2.0	0.5	\$2.1	0.5	\$0.1	0.0
STAR Fellowships	\$9.5	0.0	\$10.4	2.2	\$10.1	2.4	\$8.5	2.4	\$8.1	2.3	\$7.7	2.1	\$8.8	2.1	\$1.1	0.0
Total	\$11.1	0.0	\$12.0	2.5	\$11.7	2.8	\$10.1	2.8	\$9.7	2.7	\$9.7	2.6	\$10.9	2.6	\$1.2	0.0

Note: Includes estimates of workforce support costs, totals may not add due to rounding.

¹ Includes Greater Research Opportunities (GRO), American Association for the Advancement of Science (AAAS), Association of Schools of Public Health (ASPH), and Marshall Scholarship programs.

Research: Fellowships

Program Area: Research: Human Health and Ecosystems

Goal: Healthy Communities and Ecosystems

Objective(s): Enhance Science and Research

(Dollars in Thousands)

	FY 2008 Actuals	FY 2009 Enacted	FY 2010 Pres Bud	FY 2010 Pres Bud v. FY 2009 Enacted
<i>Science & Technology</i>	\$9,721.8	\$9,651.0	\$10,894.0	\$1,243.0
Total Budget Authority / Obligations	\$9,721.8	\$9,651.0	\$10,894.0	\$1,243.0
Total Workyears	5.6	2.6	2.6	0.0

Program Project Description:

EPA places a high priority on ensuring that our nation has a large and well-trained scientific and engineering workforce that can address complex environmental issues. To help achieve excellence in science and technology education, EPA offers five programs that encourage promising students to obtain advanced degrees and pursue careers in environmentally related fields. According to a July 2004 publication by the National Science and Technology Council titled *Science for the 21st Century*, beginning in 1998, the U.S. experienced a significant decline in science and engineering doctorates. EPA's fellowships programs help address this decline by educating new academic researchers, government scientists, science teachers, and environmental engineers. They also play a key role in developing a talent pool from which EPA can recruit and hire scientists. EPA fellowships programs are:

*Science to Achieve Results (STAR) Fellowship Program:*⁶⁵ EPA's STAR Fellowship program supports master's and doctoral candidates in environmental studies. Students in the U.S. compete for STAR fellowships through a rigorous review process. The review process is merit based and takes into consideration whether the proposed area of the applicant's research and study will:

- Strengthen the scientific basis for environmental management decisions and practices;
- Produce data, methods, or practices to help the scientific or regulated community to better understand and/or manage complex environmental problems; or
- Provide a focus for future research and technology development in science, engineering, or modeling approaches for assessing and managing environmental risks.

On average, approximately 10 percent of STAR program applicants receive a fellowship. Students can pursue degrees in traditionally recognized environmental disciplines, as well as other fields such as social anthropology, urban and regional planning, and decision sciences. To support these advanced degree-seeking students, EPA provides assistance for up to three years in the form of a stipend (\$20,000/year), a research budget (\$5,000/year) and tuition assistance (up to \$12,000/year). The program has provided new environmental research in physical, biological,

⁶⁵ For more information, see <http://es.epa.gov/ncer/fellow>.

health and social sciences, and engineering. At least one student from each of the fifty states, the District of Columbia, and Puerto Rico has received an EPA STAR Fellowship.

*Greater Research Opportunities (GRO) Fellowship Program:*¹ EPA's GRO Fellowship program helps build capacity in universities that receive limited funding for research and development by awarding fellowships to undergraduate students in environmental fields. These institutions receive less than \$35 million annually in Federal science and engineering funds. Eligible students receive support for their junior and senior years of undergraduate study and complete an internship at an EPA facility during the summer between their junior and senior years. EPA provides up to \$19,250 a year for academic support and \$8,000 of support for the three-month summer internship with EPA. In addition to conducting quality environmental research, fellows agree to maintain contact with EPA for at least five years after graduation. EPA uses the information gathered from its fellows to track their success in pursuing advanced degrees in environmental studies and finding a career in science and engineering. Of the fellows who received fellowships between FY 2003 and FY 2006 and reported information to EPA, 78 percent reported that they were working or studying in an environmentally-related field.

*Environmental Science and Technology Policy Fellowship Program:*⁶⁶ In conjunction with the American Association for the Advancement of Science, EPA places qualified technical professionals with a Ph.D. degree or equivalent in EPA headquarters for up to two years to design and work on projects at the interface of science and policy. In this way, fellows develop a better understanding of the needs of policy-makers and how to make their research more meaningful to those who depend on it. EPA's interests are wide ranging, and fellows can work on any environmentally relevant issue within EPA's jurisdiction. Fellows are awarded annual stipends ranging between \$70,000 and \$95,000. Since the program began in 2005, EPA has hosted 263 fellows, and these fellows have been placed in every program office within EPA. Currently, EPA hosts roughly a dozen fellows each year.

*Environmental Public Health Fellowship Program:*⁶⁷ To enhance the training of highly qualified and motivated public health professionals, EPA, in conjunction with the Association of Schools of Public Health, offers professional development opportunities to graduates of accredited U.S. schools of public health who have received at least a Master of Public Health or equivalent degree within the last five years. The goal of the program is to provide real-world experience in environmental public health issues to complement participants' academic training. These fellows are placed in EPA laboratory, regional, program or research management offices across the country. Fellows are awarded annual stipends of up to \$50,000 and funding to defray health insurance costs and a travel and professional development budget. EPA's goal is to place 32 fellows in EPA headquarters, regional offices, and laboratories each year.

*EPA Marshall Scholarship Program:*⁶⁸ In FY 2005, EPA began a partnership with the government of the United Kingdom under the auspices of the highly regarded Marshall Scholarship program. Since 1953, the Marshall Scholarship program has provided opportunities for highly motivated students to receive support for two years of graduate study in Great Britain,

66 For more information, see http://fellowships.aas.org/01_About/01_Partners.shtml#EPA.

67 For more information, see http://www.asph.org/document.cfm?page=751&JobProg_ID=1.

68 For more information, see <http://www.marshallscholarship.org/applications/epa>.

culminating in a Master's Degree. The EPA Marshall Scholarship program extends that opportunity for students who are interested in environmental careers, particularly those fields that address environmental problems of a global nature or benefit multi-lateral efforts. Under this program, eligible students who successfully complete the first two years as a Marshall Scholar may receive up to three more years of support towards the award of a doctoral degree in an environmentally related technical discipline. Marshall Scholars receive approximately \$40,000 a year to cover university tuition and fees, a stipend, program-related expenses, and travel to and from the United States.

These five fellowship programs represent a long-term investment aimed at:

- enhancing environmental research and development,
- improving the nation's promotion of green principles, and
- increasing the nation's environmental workforce, post secondary environmentally-related educational opportunities, and environmental literacy.

A subcommittee of EPA's Board of Scientific Counselors (BOSC)—a Federal advisory committee comprised of qualified, independent scientists and engineers—conducted a review of the STAR and GRO fellowship programs in March 2006. The subcommittee reported that “the fellows funded by the STAR and GRO programs have made excellent contributions in environmental science and engineering, and a number of them continue to be employed in the environmental field...the EPA programs clearly are of value to the Agency and the nation in helping to educate the next generation of environmental scientists and engineers.”⁶⁹

FY 2010 Activities and Performance Plan:

The Agency proposes \$10.9 million for the Fellowships program in FY 2010 which will allow EPA to award approximately 131 new fellowships. It also will provide support for approximately 48 current fellows who received awards in earlier fiscal years. Fellowship recipients will complete progress and exit reports, and the Agency will maintain contact information and follow-up data on former fellows. The program also will select and arrange hosting for AAAS and ASPH recipients and support a portion of eligible Marshall Scholarship recipients.

EPA has incorporated “Broader Impact Criteria” into its GRO Undergraduate Fellowship program. Broader Impact Criteria also will be incorporated into the next solicitation under the STAR Fellowship program. Broader Impact Criteria require the applicant to address issues other than the intellectual merit of their research proposal. These criteria require an applicant to address, among other things, what broader impacts the applicant may have as a fellow, such as furthering environmental awareness, stewardship, equity, and broadening participation of underrepresented groups in science, technology, engineering, and mathematics (STEM). Incorporating Broader Impact Criteria into EPA's fellowship programs not only strives to enhance the diversity found in the country's scientific community, but also supports EPA's immediate human capital goal to attract and retain a diverse and talented workforce by nurturing the “pipeline” of diverse persons going into environmentally-related fields.

⁶⁹ EPA, Board of Scientific Counselors, *Review of the Office of Research and Development's Science To Achieve Results (STAR) and Greater Research Opportunities (GRO) Fellowship Programs at the U.S. Environmental Protection Agency*. Washington, D.C.: EPA (2006), 1–2. See <http://epa.gov/osp/bosc/pdf/star0609rpt.pdf>.

Performance Targets:

Work under this program supports EPA's Objective 5.4: Enhance Science and Research. Currently, there are no OMB assessment performance measures for this specific program project, as the program has not been subject to OMB assessment review. However, EPA's Research and Development program will begin an external evaluation of the Fellowships program in FY 2009.

FY 2010 Change from FY 2009 Enacted Budget (Dollars in Thousands):

- (+\$1,114.0) This reflects an increase to the STAR Fellowships and other research fellowships. The increase will enable EPA to award approximately 20 additional STAR fellowships to students performing environmental research in physical, biological, health and social sciences, and engineering, which will serve to increase the nation's environmental work force and environmental literacy.
- (+\$7.0) This reflects an increase for payroll and cost of living for existing FTE.
- (+\$122.0) This represents a restoration of resources transferred in FY 2009 to the Research: Sustainability Program to support the Small Business Innovation Research Program (SBIR). For that program, EPA is required to set aside 2.5 percent of funding for contracts to small businesses to develop and commercialize new environmental technologies. After the FY 2010 budget is enacted, when the exact amount of the mandated requirement is known, FY 2010 funds will be transferred to the SBIR program.

Statutory Authority:

CAA; CWA; FIFRA; NCA; RCRA; SDWA; TSCA; ERDDA.

COORDINATION WITH OTHER FEDERAL AGENCIES

Environmental Programs

Goal 1- Clean Air and Global Climate Change

Objective: Healthier Outdoor Air

The Environmental Protection Agency (EPA) cooperates with other Federal, state, Tribal, and local agencies in achieving goals related to ground level ozone and particulate matter (PM). EPA continues to work closely with the Department of Agriculture and the Forest Service in developing its burning policy and reviewing practices that can reduce emissions. EPA, the Department of Transportation (DOT), and the Army Corps of Engineers (COE) work with state and local agencies to integrate transportation and air quality plans, reduce traffic congestion, and promote livable communities. EPA continues to work with the Department of the Interior (DOI), National Park Service (NPS), in developing its regional haze program and deploying the Interagency Monitoring of Protected Visual Environments (IMPROVE) visibility monitoring network. The operation and analysis of data produced by the PM monitoring system is an example of the close coordination of effort between the EPA and state and Tribal governments.

For pollution assessments and transport, EPA is working with the National Aeronautics and Space Administration (NASA) on technology transfer using satellite imagery. EPA will be working to further distribute NASA satellite products and NOAA air quality forecast products to Regions, states, local agencies, and Tribes to provide better understanding of air quality on a day-to-day basis and to assist with PM forecasting. EPA also will work with NASA to develop a better understanding of PM formation using satellite data. EPA works with the Department of the Army, Department of Defense (DoD) on advancing emission measurement technology and with the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce for meteorological support for our modeling and monitoring efforts.

To better understand the magnitude, sources, and causes of mobile source pollution, EPA works with the Department of Energy (DOE) and DOT to fund research projects. A program to characterize the exhaust emissions from light-duty gasoline vehicles is being co-funded by DOE and DOT. Other DOT mobile source projects include TRANSIMS (TRansportation ANalysis and SIMulation System) and other transportation modeling projects; DOE is funding these projects through the National Renewable Energy Laboratory. EPA also works closely with DOE on refinery cost modeling analyses and the development of clean fuel programs. For mobile sources program outreach, the Agency is participating in a collaborative effort with DOT's Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) designed to educate the public about the impacts of transportation choices on traffic congestion, air quality, and human health. This community-based public education initiative also includes the Centers for Disease Control (CDC). In addition, EPA is working with DOE to identify opportunities in the Clean Cities program. EPA also works with other Federal agencies, such as the U.S. Coast Guard (USCG), on air emission issues. Other programs targeted to reduce air toxics from mobile sources are coordinated with DOT. These partnerships can involve policy assessments and toxic emission reduction strategies in different regions of the country. EPA also is working with the National Highway Transportation Administration and the Department of

Agriculture on the greenhouse gas transportation rules. EPA is working with DOE and DOT and other agencies, as needed, on the requirements of the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007.

To develop air pollutant emission factors and emission estimation algorithms for aircraft, ground equipment and military vehicles, EPA has partnered with the DoD. This partnership will provide for the joint undertaking of air-monitoring/emission factor research and the successful regulatory implementation of results nationwide.

To reduce air toxic emissions that do not inadvertently increase worker exposures, EPA is continuing to work closely with the Department of Labor's Occupational Safety and Health Administration (OSHA) to coordinate the development of EPA and OSHA standards. EPA also works closely with other health agencies such as the CDC, the National Institute of Environmental Health Sciences (NIEHS), and the National Institute for Occupational Safety and Health on health risk characterization for both toxic and criteria air pollutants. To assess atmospheric deposition and characterize ecological effects, EPA works with NOAA and the Department of the Interior's U.S. Fish and Wildlife Service (USFWS) and National Park Service, and the Department of Agriculture.

The Agency has worked extensively with the Department of Health and Human Services (HHS) on the National Health and Nutritional Evaluation Study to identify mercury accumulations in humans. EPA also has worked with DOE on the 'Fate of Mercury' study to characterize mercury transport and traceability in Lake Superior.

To determine the extent to which agricultural activities contribute to air pollution, EPA will continue to work closely with the USDA through the joint USDA/EPA Agricultural Air Quality Task Force (AAQTF). The AAQTF is a workgroup, set up by Congress, to oversee agricultural air quality-related issues and to develop cost-effective ways in which the agricultural community can improve air quality. In addition, the AAQTF coordinates research on agricultural air quality issues to avoid duplication and ensure data quality and sound interpretation of data.

In developing Regional and international air quality programs and projects and working on regional agreements, EPA works primarily with the Department of State, the Agency for International Development (USAID), and the DOE as well as with Regional organizations. EPA's international air quality management program will complement EPA's programs on children's health, Trade and the Environment, and trans-boundary air pollution. In addition, EPA will partner with others worldwide, including international organizations such as the United Nations Environment Programme, the European Union, the Organization for Economic Development and Co-operation (OECD), the North American Commission for Environmental Cooperation (CEC), the World Bank, the Asian Development Bank, and our colleagues in Canada, Mexico, Europe, and Japan.

EPA is working with DOE and USTR under the CEC to promote renewable energy markets in North America.

Objective: Healthier Indoor Air

EPA works closely, through a variety of mechanisms, with a broad range of Federal, state, Tribal, and local government agencies, industry, non-profit organizations, and individuals, as well as other nations, to promote more effective approaches to identifying and solving indoor air quality problems. At the Federal level, EPA works closely with several departments or agencies:

- Department of Health and Human Services (HHS) to develop and coordinate programs aimed at reducing children's exposure to known indoor triggers of asthma, including secondhand smoke;
- Department of Housing and Urban Development (HUD) on home health and safety issues including radon;
- Consumer Product Safety Commission (CPSC) to identify and mitigate the health hazards of consumer products designed for indoor use;
- Department of Education (DoEd) to encourage construction and operation of schools with good indoor air quality; and
- Department of Agriculture (USDA) to encourage USDA Extension Agents to conduct local projects designed to reduce risks from indoor air quality. EPA plays a leadership role on the President's Task Force on Environmental Health Risks and Safety Risks to Children, particularly with respect to asthma and school environmental health issues.

As Co-chair of the interagency Committee on Indoor Air Quality (CIAQ), EPA works with the CPSC, DOE, the National Institute for Occupational Safety and Health, and OSHA to review EPA draft publications, arrange the distribution of EPA publications, and coordinate the efforts of Federal agencies with those of state and local agencies concerned with indoor air issues.

Objective: Protect the Ozone Layer

EPA leads a task force with the Department of Justice (DOJ), Department of Homeland Security (DHS), Department of Treasury, and other agencies to curb the illegal importation of ozone-depleting substances (ODS). Illegal import of ODS has the potential to prevent the United States from meeting the goals of the Montreal Protocol to restore the ozone layer.

EPA works very closely with the Department of State and other Federal agencies, as appropriate, in international negotiations among Parties to the Protocol and in developing the implementing regulations. EPA works with the Office of the United States Trade Representative to analyze potential trade implications in stratospheric protection regulations that affect imports and exports.

EPA is working with USDA and the Department of State to facilitate research, development, and adoption of alternatives to methyl bromide. EPA collaborates with these agencies to prepare U.S. requests for critical use exemptions of methyl bromide. EPA is providing input to USDA on rulemakings for methyl bromide related programs.

EPA consults with the USDA on the potential for domestic methyl bromide needs.

EPA also coordinates closely with FDA to ensure that sufficient supplies of chlorofluorocarbons (CFCs) are available for the production of life-saving metered-dose inhalers for the treatment of

asthma and other lung diseases. This partnership between EPA and FDA combines the critical goals of protecting public health and limiting damage to the stratospheric ozone layer.

EPA works with the CDC and the National Weather Service (NWS) to coordinate the UV Index and the health messages that accompany UV Index reports.

EPA coordinates with NASA and NOAA to monitor the state of the stratospheric ozone layer and to collect and analyze UV data. EPA works with NASA on assessing essential uses and other exemptions for critical shuttle and rocket needs, as well as effects of direct emissions of high-speed aircraft flying in the stratosphere.

EPA coordinates with the Small Business Administration (SBA) to ensure that proposed rules are developed in accordance with the Small Business Regulatory Flexibility Act.

Objective: Radiation

EPA works primarily with the Nuclear Regulatory Commission (NRC), Department of Energy (DOE), and Department of Homeland Security (DHS) on multiple radiation protection issues, such as the prevention of radioactive contaminated metals and products from entering the U.S. EPA also works with NRC and DOE on the development of state-of-the-art tracking systems for radioactive sources in U.S. commerce. EPA has ongoing planning and guidance discussions with DHS on Protective Action Guidance and general emergency response activities, including exercises responding to nuclear related incidents. As the regulator of DOE's Waste Isolation Pilot Plant (WIPP) facility, EPA has to continually coordinate oversight activities with DOE to keep the facility operating in compliance with our regulations. EPA also works with the Department of Transportation (DOT) on initiatives to promote use of non-nuclear density gauges for highway paving.

For emergency preparedness purposes, EPA coordinates closely with other Federal agencies, through the Federal Radiological Preparedness Coordinating Committee, and other coordinating bodies. EPA participates in planning and implementing table-top and field exercises including radiological anti-terrorism activities, with the NRC, DOE, Department of Defense (DOD), Department of Health and Human Services (DHHS), and DHS.

With regard to international assistance, EPA serves as an expert member of the International Atomic Energy Agency (IAEA) on its Environmental Modeling for Radiation Safety, Naturally Occurring Radioactive Materials Working Group. Additionally, EPA remains an active contributor to the Organization for Economic Cooperation and Development's (OECD) Nuclear Energy Agency (NEA). EPA serves on both the NEA Radioactive Waste Management Committee (RWMC) and the Committee on Radiation Protection and Public Health (CRPPH). Through the RWMC, EPA is able to exchange information with other NEA Member Countries on the management and disposal of high-level and transuranic waste. Through participation on the CRPPH and its working groups, EPA has been successful in bringing a U.S. perspective to international radiation protection policy.

Objective: Reduce Greenhouse Gas Intensity

Voluntary climate protection programs government-wide stimulate the development and use of renewable energy technologies and energy efficient products that will help reduce greenhouse gas emissions. The effort is led by EPA and DOE with significant involvement from USDA, HUD, and the National Institute of Standards and Technology (NIST).

Agencies throughout the government make significant contributions to the climate protection programs. For example, DOE will pursue actions such as promoting the research, development, and deployment of advanced technologies (for example, renewable energy sources). The Department of Treasury will administer proposed tax incentives for specific investments that will reduce emissions. EPA is working with DOE to demonstrate technologies that oxidize ventilation air methane from coal mines. EPA is broadening its public information transportation choices campaign as a joint effort with DOT. EPA coordinates with each of the above-mentioned agencies to ensure that our programs are complementary and in no way duplicative.

This coordination is evident in work recently completed by an interagency task force, including representatives from the Department of State, EPA, DOE, USDA, DOT, Office of Management and Budget (OMB), Department of Commerce, USGCRP, NOAA, NASA, and the DoD, to prepare the Third National Communication to the Secretariat as required under the Framework Convention on Climate Change (FCCC). The FCCC was ratified by the United States Senate in 1992. A portion of the Third National Communication describes policies and measures (such as ENERGY STAR and EPA's Clean Automotive Technology initiative) undertaken by the U.S. to reduce greenhouse gas emissions, implementation status of the policies and measures, and their actual and projected benefits. One result of this interagency review process has been a refinement of future goals for these policies and measures which were communicated to the Secretariat of the FCCC in 2002. The "U.S. Climate Action Report 2002: Third National Communication of the United States of America under the United Nations Framework Convention on Climate Change" is available at: <http://unfccc.int/resource/docs/natc/usnc3.pdf>.

EPA works primarily with the Department of State, USAID and DOE, as well as with Regional organizations, in implementing climate-related programs and projects. In addition, EPA partners with others worldwide, including international organizations such as the United Nations Environment Programme, the United Nations Development Programme, the International Energy Agency, the OECD, the World Bank, the Asian Development Bank, and our colleagues in Canada, Mexico, Europe and Japan.

Objective: Enhance Science and Research

EPA coordinates its air quality research with other Federal agencies through the Subcommittee on Air Quality Research¹ of the NSTC Committee on Environment and Natural Resources (CENR). The Agency and NIEHS co-chaired the subcommittee's Particulate Matter Research Coordination Working Group, which produced a strategic plan² for Federal research on the health and environmental effects, exposures, atmospheric processes, source characterization and control of fine airborne particulate matter. The Agency also is a charter member of NARSTO,³

¹ For more information, see <<http://www.al.noaa.gov/AQRS/>>.

² For more information, see <<http://www.al.noaa.gov/AQRS/reports/srppm.html>>.

³ For more information, see <<http://www.narsto.org/>>.

an international public-private partnership, established in 1995, to improve management of air quality across North America. EPA coordinates specific research projects with other Federal agencies (one notable example at the present time is the near road air toxics program coordinated with Federal Highways) where appropriate. In addition, the research program supports, in collaboration with other federal agencies such as the National Institutes of Health, air-related research at universities and nonprofit organizations through its Science to Achieve Results (STAR) research grants program.

Goal 2- Clean and Safe Water

The 1996 Safe Drinking Water Act (SDWA) amendments mandate joint EPA/CDC study of waterborne diseases in public water supplies. Through an Interagency Agreement (IA), EPA and CDC have collaborated on the completion of these studies and on improving identification and investigation of waterborne diseases from drinking water. EPA and CDC are building state capacity by directly assisting state health departments develop skills and tools to improve waterborne disease investigation and prevention. The two agencies are also investigating the health risks associated with contaminant problems in the drinking water distribution system. Additionally, EPA and CDC also share expertise and information exchange on drinking water related health effects, risk factors, and research needs on a regular basis.

Source Water Preservation and Protection for Public Water Systems (PWS)

In implementing its source water preservation and protection efforts, the Agency coordinates with other Federal agencies that own or operate public water systems (e.g., USDA, USFS, DOD, DOE, DOI/NPS).. EPA's coordination focuses on ensuring that they cooperate with the states in which their systems are located, and that they are accounted for in the states' source water assessment programs as mandated in the 1996 amendments to the SDWA.

Data Availability, Outreach and Technical Assistance

EPA coordinates with USGS, USDA (Forest Service, Natural Resources Conservation Service, Cooperative State Research, Education, and Extension Service (CSREES), Rural Utilities Service); CDC, DOT, DoD, DOE, DOI (NPS and Bureau of Indian Affairs (BIA), Land Management, and Reclamation); HHS (Indian Health Service) and the Tennessee Valley Authority (TVA).

Tribal Access Coordination

In 2003 EPA and its Federal partners in USDA, HUD, HHS, and BOI set a very ambitious goal to reduce the number of homes without access to safe drinking water by 50% by 2015. EPA leads the Tribal Access Subgroup, which developed a strategy document that identified the goal's challenges and recommended approaches to overcome them. This goal remains ambitious due to the logistical challenges and capital and operation and maintenance costs involved in providing access. EPA is working with its Federal partners to coordinate spending and address some of the challenges to access on Tribal lands, and we are hopeful that we can make measureable progress on the access issue. Specific actions currently underway by the Tribal Access Subgroup are developing a map of homes without access to safe drinking water on the Navajo Nation and a strategy to coordinate technical assistance services to tribes.

Collaboration with USGS

EPA and USGS have established an IA to coordinate activities and information exchange in the areas of unregulated contaminants occurrence, the environmental relationships affecting contaminant occurrence, protection area delineation methodology, and analytical methods. This collaborative effort has improved the quality of information to support risk management decision-making at all levels of government, generated valuable new data, and eliminated potential redundancies.

Collaboration with Public and Private Partners on Critical Water Infrastructure Protection

EPA coordinates with other Federal agencies, primarily DHS, CDC, FDA and DoD on biological, chemical, and radiological contaminants of high concern, and how to detect and respond to their presence in drinking water and wastewater systems. A close linkage with the FBI and the Intelligence Analysis Directorate in DHS, particularly with respect to ensuring the timely dissemination of threat information through existing communication networks, will be continued. The Agency is strengthening its working relationships with the Water Research Foundation, the Water Environment Research Federation and other research institutions to increase our knowledge on technologies to detect contaminants, monitoring protocols and techniques, and treatment effectiveness.

Collaboration with FDA

EPA and FDA have issued joint national fish consumption advisories to protect the public from exposure to mercury in commercially and recreationally caught fish, as well as fish caught for subsistence. EPA's advisory covers the recreational and subsistence fisheries in fresh waters where states and tribes have not assessed the waters for the need for an advisory. *ibid.* <http://map1.epa.gov/html/federaladv> FDA's advisory covers commercially caught fish, and fish caught in marine waters. *Ibid.* <http://map1.epa.gov/html/federaladv> EPA works closely with FDA to distribute the advisory to the public. In addition, EPA works with FDA to investigate the need for advisories for other contaminants and to ensure that these federal advisories support and augment advisories issued by states and tribes.

Beach Monitoring and Public Notification

The BEACH Act requires that all Federal agencies with jurisdiction over coastal and Great Lakes recreation waters adjacent to beaches used by the public implement beach monitoring and public notification programs. These programs must be consistent with guidance published by EPA. *ibid.* "National Beach Guidance and Required Performance Criteria for Grants." EPA will continue to work with the USGS and other Federal agencies to ensure that their beach water quality monitoring and notification programs are technically sound and consistent with program performance criteria published by EPA.

Objective: Protect Water Quality

Watersheds

Protecting and restoring watersheds will depend largely on the direct involvement of many Federal agencies and state, Tribal and local governments who manage the multitude of programs necessary to address water quality on a watershed basis. Federal agency involvement will include USDA (Natural Resources Conservation Service, Forest Service, Agriculture Research Service), DOI (Bureau of Land Management, Office of Surface Mining, USGS, USFWS, and the Bureau of Indian Affairs), NOAA, DOT, and DoD (Navy and COE). At the state level, agencies involved in watershed management typically include departments of natural resources or the environment, public health agencies, and forestry and recreation agencies. Locally, numerous agencies are involved, including Regional planning entities such as councils of governments, as well as local departments of environment, health and recreation who frequently have strong interests in watershed projects.

National Pollutant Discharge Elimination System Program (NPDES).

Since inception of the NPDES program under Section 402 of the CWA, EPA and the authorized states have developed expanded relationships with various Federal agencies to implement pollution controls for point sources. EPA works closely with USFWS and the National Marine Fisheries Service on consultation for protection of endangered species through a Memorandum of Agreement. EPA works with the Advisory Council on Historic Preservation on National Historic Preservation Act implementation. EPA and the states rely on monitoring data from USGS to help confirm pollution control decisions. The Agency also works closely with SBA and the Office of Management and Budget (OMB) to ensure that regulatory programs are fair and reasonable. The Agency coordinates with the NOAA on efforts to ensure that NPDES programs support coastal and national estuary efforts; and with the DOI on mining issues.

Joint Strategy for Animal Feeding Operations

The Agency is working closely with the USDA to implement the Unified National Strategy for Animal Feeding Operations finalized on March 9, 1999. The Strategy sets forth a framework of actions that USDA and EPA will take to minimize water quality and public health impacts from improperly managed animal wastes in a manner designed to preserve and enhance the long-term sustainability of livestock production. EPA's recent revisions to the CAFO Regulations (effluent guidelines and NPDES permit regulations) will be a key element of EPA and USDA's plan to address water pollution from CAFOs. EPA and USDA senior management meet routinely to ensure effective coordination across the two agencies.

Clean Water State Revolving Fund (CWSRF)

Representatives from EPA's SRF program, HUD's Community Development Block Grant program, and USDA's Rural Utility Service have signed a MOU committing to assisting state or Federal implementers in: (1) coordination of the funding cycles of the three Federal agencies; (2) consolidation of plans of action (operating plans, intended use plans, strategic plans, etc.); and (3) preparation of one environmental review document, when possible, to satisfy the

requirements of all participating Federal agencies. A coordination group at the Federal level has been formed to further these efforts and maintain lines of communication. In many states, coordination committees have been established with representatives from the three programs.

In implementation of the Indian set-aside grant program under Title VI of the CWA, EPA works closely with the Indian Health Service to administer grant funds to the various Indian Tribes, including determination of the priority ranking system for the various wastewater needs in Indian Country. In 1998, EPA and the Rural Utilities Service of the USDA formalized a partnership between the two agencies to provide coordinated financial and technical assistance to tribes.

Federal Agency Partnerships on Impaired Waters Restoration Planning

The Federal government owns about 671.8 million acres, which is about 29.6% of the 2.27 billion acres of land in the United States. Four agencies administer about 93.5% of these federal lands, including the Forest Service (28.7% of federal total), Fish and Wildlife Service (14.2%), National Park Service (11.8%), and Bureau of Land Management (38.9%). EPA has increased its coordination with these Federal land management agencies at the national level to enhance watershed protection and assess restoration needs on federal lands. Increased collaboration will mutually aid each agency's statutory programs, strategic plans, and shared mission to protect aquatic resources. As part of these coordination efforts, EPA is initially working with Federal land management agencies to determine the extent and type of impaired waters on federal lands.

Nonpoint Sources

EPA will continue to work closely with its Federal partners to achieve our goals for reducing pollutant discharges from nonpoint sources, including reduction targets for sediments, nitrogen and phosphorous. Most significantly, EPA will continue to work with the USDA, which has a key role in reducing sediment loadings through its continued implementation of the Environmental Quality Incentives Program, Conservation Reserve Program, and other conservation programs. USDA also plays a major role in reducing nutrient discharges through these same programs and through activities related to the AFO Strategy. EPA will also continue to work closely with the Forest Service and Bureau of Land Management especially on the vast public lands that comprise 29 percent of all land in the United States. EPA will work with these agencies, USGS, and the states to document improvements in land management and water quality.

EPA will also work with other Federal agencies to advance a watershed approach to Federal land and resource management to help ensure that Federal land management agencies serve as a model for water quality stewardship in the prevention of water pollution and the restoration of degraded water resources. Implementation of a watershed approach will require coordination among Federal agencies at a watershed scale and collaboration with states, tribes and other interested stakeholders.

Vessel Discharges

Regarding vessel discharges, EPA will continue working closely with the U.S. Coast Guard on addressing ballast water discharges domestically, and with the interagency work group and U.S.

delegation to Marine Environmental Protection Committee (MEPC) on international controls. EPA will continue to work closely with the U.S. Coast Guard, Alaska and other states, and the International Council of Cruise Lines regarding regulatory and non-regulatory approaches to managing wastewater discharges from cruise ships. Also, EPA will continue to work with the U.S. Coast Guard in the development of Best Management Practices and discharge standards under the Clean Boating Act. Additionally, EPA will work with the U.S. Coast Guard on vessel sewage standards. Regarding dredged material management, EPA will continue to work closely with the COE on standards for permit review, as well as site selection/designation and monitoring.

OIA also serves as the primary point-of-contact and liaison with USAID. Specially drawing on expertise from throughout EPA, OIA administers a number of interagency agreements for environmental assistance.

EPA works closely with a number of other Federal agencies with environmental, health, or safety mandates. These include (among others) the DOL, DOT, USDA, DOI, HHS and FDA.

EPA works with the Department of State, NOAA, USCG, Navy, and other Federal agencies in developing the technical basis and policy decisions necessary for negotiating global treaties concerning marine antifouling systems, invasive species, and air pollution from ships. EPA also works with the same Agencies in addressing land-based sources of marine pollution in the Gulf of Mexico and Wider Caribbean Basin.

EPA chairs the intergovernmental Mississippi River/Gulf of Mexico Watershed Nutrient Task Force (Gulf Hypoxia Task Force) and is responsible for overseeing implementation of the 2008 Gulf Hypoxia Hypoxia Action Plan. Also, EPA is a member of the Committee on Environment and Natural Resources (CENR) which coordinates the research activities among Federal agencies to assess the impacts of nutrients and hypoxia in the Gulf of Mexico.

Objective: Enhance Science and Research

EPA's Clean Water Research Programs are in accordance with the Administration's policy of scientific integrity.⁴ While EPA is the Federal agency mandated to ensure safe drinking water, other Federal and non-Federal entities are conducting research that complements EPA's drinking water research program. For example, the CDC and NIEHS conduct health effects and exposure research, the USGS is actively involved in monitoring sources of drinking water for chemicals and emerging contaminants. FDA also performs research on children's health risks. The DOE and USGS are actively involved in research that relates to underground sources of drinking water, with increasing efforts focused on geologic sequestration of carbon dioxide. The Bureau of Reclamation is also involved in research on water resources and water purification with an emphasis on recovering water from saline or impaired sources.

The private sector, particularly water utilities and industries that develop and support treatment and monitoring technologies, is actively involved in research activities on analytical methods, treatment technologies, water infrastructure rehabilitation, repair, and replacement, and water resources protection. Recently there has been increasing interest in research to support water

⁴ http://www.whitehouse.gov/the_press_office/Memorandum-for-the-Heads-of-Executive-Departments-and-Agencies-3-9-09/

efficiency, reduce the energy dependencies of water systems, and implementation of alternative “green” technologies for treatment and distribution of water. There has also been increasing interest in linking the quality of water with its intended use to preserve high quality water for potable purposes and substitute alternative sources for nonpotable applications (e.g. toilet flushing, irrigation, etc.). Cooperative research efforts have been ongoing with the Water Research Foundation and other stakeholders to coordinate drinking water research on emerging contaminants water infrastructure, and other topics. In 2009 EPA and the Water Research Foundation formed the Distribution System Research and Information Collection Partnership (RICP) to coordinate and collaborate on decision-relevant distribution system research.

EPA has active collaborations with several federal agencies through a variety of efforts. EPA actively participates in the interagency Committee on Environment and Natural Resources (CENR) Subcommittee on Water Availability and Quality (SWAQ). The CENR is also coordinating the research efforts among Federal agencies to assess the impacts of nutrients and hypoxia in the Gulf of Mexico. In addition, EPA is working directly with CDC in coordinating research on waterborne disease outbreaks, pathogens, algal toxins, and water distribution systems, EPA is also working with USGS on monitoring pharmaceuticals, personal care products, and other emerging contaminants, evaluating newly developed methods for microbial monitoring, and interpreting water data from the Ambient Water Quality Assessment (NAWQA) program. This effort has helped demonstrate that pesticide levels in urban watersheds can exceed levels in agricultural dominated streams and follow-on collaborations will be integrated into the Geographic Information System (GIS) database system. EPA has also developed joint research initiatives with NOAA and USGS for linking monitoring data and field study information with available toxicity data and assessment models for developing sediment criteria.

Goal 3-Land Preservation and Restoration

Objective: Preserve Land

Pollution prevention activities entail coordination with other Federal departments and agencies. EPA coordinates with the General Services Administration (GSA) on the use of safer products for indoor painting and cleaning, with the Department of Defense (DoD) on the use of safer paving materials for parking lots, and with the Defense Logistics Agency on safer solvents. The program also works with the National Institute of Standards and Technology and other groups to develop standards for Environmental Management Systems.

In addition to business, industry, and other non-governmental organizations, EPA works with Federal, state, Tribal, and local governments to encourage reduced generation and safe recycling of wastes. Partners in this effort include the Environmental Council of States and the Association of State and Territorial Solid Waste Management Officials.

The Federal government is the single largest potential source for “green” procurement in the country, for office products as well as products for industrial use. EPA works with the Office of Federal Environmental Executive and other Federal agencies and departments in advancing the purchase and use of recycled-content and other “green” products. In particular, the Agency is currently engaged with other organizations within the Executive Branch to foster compliance with Executive Order 13423 and in tracking and reporting purchases of products made with

recycled contents, in promoting electronic stewardship and achieving waste reduction and recycling goals.

In addition, the Agency is currently engaged with the DoD, the Department of Education, the Department of Energy (DOE), the U.S. Postal Service, and other agencies to foster proper management of surplus electronics equipment, with a preference for reuse and recycling. With these agencies, and in cooperation with the electronics industry, EPA and the Office of the Federal Environmental Executive launched the Federal Electronics Challenge which will lead to increased reuse and recycling of an array of computers and other electronics hardware used by civilian and military agencies.

Objective: Restore Land

Superfund Remedial Program

The Superfund Remedial program coordinates with several other Federal agencies, such as ATSDR or NIEHS, in providing numerous Superfund related services in order to accomplish the program's mission. In FY 2010, EPA will have active interagency agreements with the National Oceanic and Atmospheric Administration (NOAA) and the Department of the Interior (DOI).

The U.S. Army Corps of Engineers also substantially contributes to the cleanup of Superfund sites by providing technical support for the design and construction of many fund-financed remediation projects through site-specific interagency agreements. This Federal partner has the technical design and construction expertise and contracting capability needed to assist EPA regions in implementing most of Superfund's remedial action projects. This agency also provides technical on-site support to Regions in the enforcement oversight of numerous construction projects performed by private Potentially Responsible Parties (PRPs).

Superfund Federal Facilities Program

The Superfund Federal Facilities Program coordinates with Federal agencies, states, Tribes and state associations and others to implement its statutory responsibilities to ensure cleanup and property reuse. The Program provides technical and regulatory oversight at Federal facilities to ensure human health and the environment are protected.

EPA has entered into Interagency Agreements (IAGs) with DoD and DOE to expedite the cleanup and transfer of Federal properties, and was recently approached by the U.S. Coast Guard for oversight assistance as they focus on downsizing their lighthouse inventory. A Memorandum of Understanding has been negotiated with DoD to continue the Agency's oversight support through September 30, 2011 for the acceleration of cleanup and property transfer at Base Realignment and Closure (BRAC) installations affected by the first four rounds of BRAC. In addition, EPA has signed an IAG with DOE for technical input regarding innovative and flexible regulatory approaches, streamlining of documentation, integration of projects, deletion of sites from the National Priorities List (NPL), field assessments, and development of management documents and processes. The joint EPA/DOE IAG has received recognition as a model for potential use at other DOE field offices.

Resource Conservation and Recovery Act

The RCRA Permitting and Corrective Action Programs coordinate closely with other Federal agencies, primarily the DoD and DOE, which have many sites in the corrective action and permitting universe. Encouraging Federal facilities to meet the RCRA Corrective Action and permitting program's goals remains a top priority.

RCRA Programs also coordinate with the Department of Commerce and the Department of State to ensure the safe movement of domestic and international shipments of hazardous waste.

Leaking Underground Storage Tanks

EPA, with very few exceptions, does not perform the cleanup of leaking underground storage tanks (LUST). States and territories use the LUST Trust Fund to administer their corrective action programs, oversee cleanups by responsible parties, undertake necessary enforcement actions, and pay for cleanups in cases where a responsible party cannot be found or is unwilling or unable to pay for a cleanup.

States are key to achieving the objectives and long-term strategic goals. Except in Indian Country, EPA relies on state agencies to implement the LUST Program, including overseeing cleanups by responsible parties and responding to emergency LUST releases. LUST cooperative agreements awarded by EPA are directly given to the states to assist them in implementing their oversight and programmatic role.

Emergency 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. EPA implements the Emergency Preparedness program coordination with the Department of Homeland Security and other Federal agencies to deliver Federal assistance to state, local, and Tribal governments during natural disasters and other major environmental incidents. This requires continuous coordination with many Federal, state and local agencies. The Agency participates with other Federal agencies to develop national planning and implementation policies at the operational level.

The National Response Plan (NRP), under the direction of the Department of Homeland Security (DHS), provides for the delivery of Federal assistance to states to help them deal with the consequences of terrorist events as well as natural and other significant disasters. EPA maintains the lead responsibility for the NRP's Emergency Support Function covering inland hazardous materials and petroleum releases and participates in the Federal Emergency Support Function Leaders Group which addresses NRP planning and implementation at the operational level.

EPA coordinates its preparedness activities with DHS, FEMA, the Federal Bureau of Investigation, and other Federal agencies, states and local governments. EPA will continue to clarify its roles and responsibilities to ensure that Agency security programs are consistent with the national homeland security strategy.

Superfund Enforcement

As required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Executive Order (EO) 12580, OSRE coordinates with other federal agencies in their use of CERCLA enforcement authority. This includes the coordinated use of CERCLA enforcement authority at individual hazardous waste sites that are located on both nonfederal land (EPA jurisdiction) and federal lands (other agency jurisdiction). As required by EO13016, the Agency also coordinates the use of CERCLA section 106 administrative order authority by other Departments and agencies.

EPA also coordinates with the Departments of Interior, Agriculture, and Commerce to ensure that appropriate and timely notices required under CERCLA are sent to the Natural Resource Trustees. The Department of Justice also provides assistance to EPA with judicial referrals seeking recovery of response costs incurred by the U.S., injunctive relief to implement response actions, or enforcement of other CERCLA requirements.

Superfund Federal Facilities Enforcement Program

The Superfund Federal Facilities Enforcement program ensures that 1) all Federal facility sites on the National Priority List have interagency agreements (IAGs), which provide enforceable schedules for the progression of the entire cleanup; 2) these IAGs are monitored for compliance; and 3) Federal sites that are transferred to new owners are transferred in an environmentally responsible manner. After years of service and operation, some Federal facilities contain environmental contamination, such as hazardous wastes, unexploded ordnance, radioactive wastes or other toxic substances. To enable the cleanup and reuse of such sites, the Federal Facilities Enforcement program coordinates creative solutions that protect both human health and the environment. These enforcement solutions help restore facilities so they can once again serve an important role in the economy and welfare of local communities and our country.

Oil Spills

Under the Oil Spill Program, EPA works with other Federal agencies such as U.S. Fish and Wildlife Service, the U.S. Coast Guard (USCG), NOAA, FEMA, DOI, DOT, DOE, and other Federal agencies and states, as well as with local government authorities to develop Area Contingency Plans. The Department of Justice also provides assistance to agencies with judicial referrals when enforcement of violations becomes necessary. In FY 2010, EPA will have an active interagency agreement with the USCG. EPA and the USCG work in coordination with other Federal authorities to implement the National Preparedness for Response Program.

Objective: Enhance Science and Research

EPA expends substantial effort coordinating its research with other Federal agencies, including work with DoD in its Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program, DOE and its Office of Health and Environmental Research. EPA also conducts collaborative laboratory research with DoD, DOE, DOI (particularly the USGS), and NASA to improve characterization and risk management options for dealing with subsurface contamination.

The Agency is also working with NIEHS, which manages a large basic research program focusing on Superfund issues, to advance fundamental Superfund research. The Agency for Toxic Substances and Disease Registry (ATSDR) also provides critical health-based information to assist EPA in making effective cleanup decisions. EPA works with these agencies on collaborative projects, information exchange, and identification of research issues and has a MOU with each agency. EPA, Army Corps of Engineers, and Navy recently signed a MOU to increase collaboration and coordination in contaminated sediments research. Additionally, the Interstate Technology Regulatory Council (ITRC) has proved an effective forum for coordinating Federal and state activities and for defining continuing research needs through its teams on topics including permeable reactive barriers, radionuclides, and Brownfields EPA has developed an MOU⁵ with several other agencies [DOE, DoD, NRC, USGS, NOAA, and USDA] for multimedia modeling research and development.

Other research efforts involving coordination include the unique controlled-spill field research facility designed in cooperation with the Bureau of Reclamation. Geophysical research experiments and development of software for subsurface characterization and detection of contaminants are being conducted with the USGS and DOE's Lawrence Berkeley National Laboratory.

Goal 4-Healthy Communities and Ecosystems

Coordination with state lead agencies and with the USDA provides added impetus to the implementation of the Certification and Training program. States also provide essential activities in developing and implementing the Endangered Species and Worker Protection programs and are involved in numerous special projects and investigations, including emergency response efforts. The Regions provide technical guidance and assistance to the states and Tribes in the implementation of all pesticide program activities.

EPA uses a range of outreach and coordination approaches for pesticide users, agencies implementing various pesticide programs and projects, and the general public. Outreach and coordination activities are essential to effective implementation of regulatory decisions. In addition coordination activities protect workers and endangered species, provide training for pesticide applicators, promote integrated pest management and environmental stewardship, and support for compliance through EPA's Regional programs and those of the states and Tribes.

In addition to the training that EPA provides to farm workers and restricted use pesticide applicators, EPA works with the State Cooperative Extension Services designing and providing specialized training for various groups. Such training includes instructing private applicators on the proper use of personal protective equipment and application equipment calibration, handling spill and injury situations, farm family safety, preventing pesticide spray drift, and pesticide and container disposal. Other specialized training is provided to public works employees on grounds maintenance, to pesticide control operators on proper insect identification, and on weed control for agribusiness.

⁵ For more information please go to: Interagency Steering Committee on Multimedia Environmental Models MOU, <http://www.iscmem.org/Memorandum.htm>

EPA coordinates with and uses information from a variety of Federal, state and international organizations and agencies in our efforts to protect the safety of America's health and environment from hazardous or higher risk pesticides. In May 1991, the USDA implemented the Pesticide Data Program (PDP) to collect objective and statistically reliable data on pesticide residues on food commodities. This action was in response to public concern about the effects of pesticides on human health and environmental quality. EPA uses PDP data to improve dietary risk assessment to support the registration of pesticides for minor crop uses.

PDP is critical to implementing the Food Quality Protection Act (FQPA). The system provides improved data collection of pesticide residues, standardized analytical and reporting methods, and sampling of foods most likely consumed by infants and children. PDP sampling, residue, testing and data reporting are coordinated by the Agricultural Marketing Service using cooperative agreements with ten participating states representing all regions of the country. PDP serves as a showcase for Federal-state cooperation on pesticide and food safety issues.

FQPA requires EPA to consult with other government agencies on major decisions. EPA, USDA and FDA work closely together using both a MOU and working committees to deal with a variety of issues that affect the involved agencies' missions. For example, agencies work together on residue testing programs and on enforcement actions that involve pesticide residues on food, and we coordinate our review of antimicrobial pesticides. The Agency coordinates with USDA/ARS in promotion and communication of resistance management strategies. Additionally, we participate actively in the Federal Interagency Committee on Invasive Animals and Pathogens (ITAP) which includes members from USDA, DOL, DoD, DHS and CDC to coordinate planning and technical advice among Federal entities involved in invasive species research, control and management.

While EPA is responsible for making registration and tolerance decisions, the Agency relies on others to carry out some of the enforcement activities. Registration-related requirements under FIFRA are enforced by the states. The HSS/FDA enforces tolerances for most foods and the USDA/Food Safety and Inspection Service enforces tolerances for meat, poultry and some egg products.

Internationally, the Agency collaborates with the Intergovernmental Forum on Chemical Safety (IFCS), the CODEX Alimentarius Commission, the North American Commission on Environmental Cooperation (CEC), the Organization for Economic Cooperation and Development (OECD) and NAFTA Commission. These activities serve to coordinate policies, harmonize guidelines, share information, correct deficiencies, build other nations' capacity to reduce risk, develop strategies to deal with potentially harmful pesticides and develop greater confidence in the safety of the food supply.

One of the Agency's most valuable partners on pesticide issues is the Pesticide Program Dialogue Committee (PPDC), which brings together a broad cross-section of knowledgeable individuals from organizations representing divergent views to discuss pesticide regulatory, policy and implementation issues. The PPDC consists of members from industry/trade associations, pesticide user and commodity groups, consumer and environmental/public interest groups and others.

The PPDC provides a structured environment for meaningful information exchanges and consensus building discussions, keeping the public involved in decisions that affect them. Dialogue with outside groups is essential if the Agency is to remain responsive to the needs of the affected public, growers and industry organizations.

EPA works closely with Federal agencies to improve the health of children and older adults. Working with the CDC, the Environmental Council of the States (ECOS), and the Association of State and Territorial Health Officials (ASTHO), a national action agenda to reduce environmental triggers of childhood asthma was developed and implemented.

The Agency continues to work with other Federal agencies in the development of children's environmental health indicators used to monitor the outcomes of children's health efforts. The Agency collaborates with the CDC, National Center for Health Statistics and obtains approval from the Federal Interagency Forum on Child and Family Statistics (www.childstats.gov) on the reporting of appropriate children's health indicators and data. EPA also participates in the development of the annual report entitled "America's Children: Key National Indicators of Well-Being."

As a member of the Interagency Forum on Aging Related Statistics, EPA helps to assure that key indicators associated with important aspects of older Americans' lives are considered in reports such as "Older Americans 2004: Key Indicators of Well-Being."

EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) support the Pediatric Environmental Health Specialty Units (PEHSUs) which provide education and consultation services on children's environmental health issues to health professionals, public health officials, and the public.

EPA works closely with other Federal agencies to improve children's health in schools. For example, EPA has incorporated into the new Healthy School Environments Assessment Tool (HealthySEAT), a number of recommendations and requirements from the Department of Education, the CDC, DOT, DOE, CPSC and OSHA.

EPA relies on data from HHS to help assess the risk of pesticides to children. Other collaborative efforts that go beyond our reliance on the data they collect include developing and validating methods to analyze domestic and imported food samples for organophosphates, carcinogens, neurotoxins and other chemicals of concern. These joint efforts protect Americans from unhealthful pesticide residue levels.

EPA's chemical testing data provides information for the OSHA worker protection programs, NIOSH for research, and the Consumer Product Safety Commission (CPSC) for informing consumers about products through labeling. EPA frequently consults with these Agencies on project design, progress and the results of chemical testing projects.

The Agency works with a full range of stakeholders on homeland security issues: USDA, CDC, other Federal agencies, industry and the scientific community. Review of the agents that may be effective against anthrax has involved GSA, State Department, Research Institute for Infectious Disease, FDA, EOSA, USPS, and others, and this effort will build on this network.

The Acute Exposure Guidelines (AEGl) program is a collaborative effort that includes ten Federal agencies (EPA, DHS, DOE, DoD, DOT, NIOSH, OSHA, CDC, ATSDR, and FDA), numerous state agencies, private industry, academia, emergency medical associations, unions, and other organizations in the private sector. The program also has been supported internationally by the OECD and includes active participation by the Netherlands, Germany and France.

The success of EPA's lead program is due in part to effective coordination with other Federal agencies, states and Indian Tribes through the President's Task Force on Environmental Health Risks and Safety Risks to Children. EPA will continue to coordinate with HUD to clarify how new rules may affect existing EPA and HUD regulatory programs, and with the FHWA and OSHA on worker protection issues. EPA will continue to work closely with state and Federally recognized Tribes to ensure that authorized state and Tribal programs continue to comply with requirements established under TSCA, that the ongoing Federal accreditation certification and training program for lead professionals is administered effectively, and states and Tribes adopt the Renovation and Remodeling and the Buildings and Structures Rules when these rules become effective.

EPA has a MOU with HUD on coordination of efforts on lead-based paint issues. As a result of the MOU, EPA and HUD have co-chaired the President's Task Force since 1997. There are fourteen other Federal agencies including CDC and DoD on the Task Force. HUD and EPA also maintain the National Lead Information Center and share enforcement of the Disclosure Rule.

Mitigation of existing risk is a common interest for other Federal agencies addressing issues of asbestos and PCBs. EPA will continue to coordinate interagency strategies for assessing and managing potential risks from asbestos and other fibers. Coordination on safe PCB disposal is an area of ongoing emphasis with the DoD, and particularly with the U.S. Navy, which has special concerns regarding PCBs encountered during ship scrapping. Mercury storage and safe disposal are also important issues requiring coordination with the Department of Energy and DoD as they develop alternatives and explore better technologies for storing and disposing high risk chemicals.

To effectively participate in the international agreements on POPs, heavy metals and PIC substances, EPA must continue to coordinate with other Federal agencies and external stakeholders, such as Congressional staff, industry, and environmental groups. For example, EPA has an interest in ensuring that the listing of chemicals, including the application of criteria and processes for evaluating future chemicals for possible international controls, is based on sound science. Similarly, the Agency typically coordinates with FDA's National Toxicology Program, the CDC/ATSDR, NIEHS and/or the Consumer Product Safety Commission (CPSC) on matters relating to OECD test guideline harmonization.

EPA's objective is to promote improved health and environmental protection, both domestically and worldwide. The success of this objective is dependent on successful coordination not only with other countries, but also with various international organizations such as the Intergovernmental Forum on Chemical Safety (IFCS), the North American Commission on Environmental Cooperation (CEC), OECD, the United Nations Environment Program (UNEP)

and the CODEX Alimentarius Commission. NAFTA and cooperation with Canada and Mexico play an integral part in the harmonization of data requirements.

EPA is a leader in global discussions on mercury and was instrumental in the launch of UNEP's Global Mercury Program, and we will continue to work with developing countries and with other developed countries in the context of that program. In addition, we have developed a strong network of domestic partners interested in working on this issue, including the DOE and the USGS.

EPA has developed cooperative efforts on persistent organic pollutants (POPs) with key international organizations and bodies, such as the United Nations Food and Agricultural Organization, the United Nations Environment Program, the Arctic Council, and the World Bank. EPA is partnering with domestic and international industry groups and foreign governments to develop successful programs.

Objective: Communities

The Governments of Mexico and the United States agreed, in November 1993, to assist communities on both sides of the border in coordinating and carrying out environmental infrastructure projects. The agreement between Mexico and the United States furthers the goals of the North American Free Trade Agreement and the North American Agreement on Environmental Cooperation. To this purpose, the governments established two international institutions, the Border Environment Cooperation Commission (BECC) and the North American Development Bank (NADBank), which manages the Border Environment Infrastructure Fund (BEIF), to support the financing and construction of much needed environmental infrastructure.

The BECC, with headquarters in Ciudad Juarez, Chihuahua, Mexico, assists local communities and other sponsors in developing and implementing environmental infrastructure projects. The BECC also certifies projects as eligible for NADBank financing. The NADBank, with headquarters in San Antonio, Texas, is capitalized in equal shares by the United States and Mexico. NADBank provides new financing to supplement existing sources of funds and foster the expanded participation of private capital.

A significant number of residents along the U.S.-Mexico border area are without basic services such as potable water and wastewater treatment and the problem has become progressively worse in the last few decades. Over the last several years, EPA has continued to work with the U.S. and Mexican Sections of the International Boundary and Water Commission and Mexico's national water commission, Comisión Nacional del Agua (CONAGUA), to further efforts to improve drinking water and wastewater services to communities within 100 km on the U.S. and 300 km on the Mexico side of the U.S.-Mexico border.

Brownfields

EPA continues to lead the Brownfields Federal Partnership. The Partnership includes more than 20 federal agencies dedicated to the cleanup and redevelopment of brownfields properties. Partner agencies work together to prevent, assess, safely clean up, and redevelop brownfields. The Brownfields Federal Partnership's on-going efforts include promoting the Portfields and

Mine-Scarred Lands projects and looking for additional opportunities to jointly promote community revitalization by participating in multi-agency collaborative projects, holding regular meetings with federal partners, and supporting regional efforts to coordinate federal revitalization support to state and local agencies.

Environmental Justice

Through the Federal Interagency Working Group on Environmental Justice (IWG), EPA is working in partnership with ten other federal agencies to address the environmental and public health issues facing communities with environmental justice concerns. In 2009, the IWG will continue its efforts to work collaboratively and constructively with all levels of government, and throughout the public and private sectors. The issues range from lead exposure, asthma, safe drinking water and sanitation systems to hazardous waste clean-up, renewable energy/wind power development, and sustainable environmentally-sound economies. The IWG is utilizing EPA's collaborative problem-solving model, based on the experiences of federal collaborative partnerships, to improve the federal government's effectiveness in addressing the environmental and public health concerns facing communities. As the lead agency, EPA shares its knowledge, experience and offers assistance to other federal agencies as they enhance their strategies to integrate environmental justice into their programs, policies and activities.

Objective: Ecosystems

National Estuary Program

Effectively implementing successful comprehensive management plans for the estuaries in the NEP depends on the cooperation, involvement, and commitment of Federal and state agency partners that have some role in protecting and/or managing those estuaries. Common Federal partners include NOAA, USFWS, COE, and USDA. Other partners include state and local government agencies, universities, industry, non-governmental organizations (NGO), and members of the public.

Wetlands

Several Federal agencies share the goal of increasing wetland acreage in the U.S. as well as better understanding and protecting wetland functions and values. EPA, USFWS, COE, NOAA, USGS, USDA, and FHWA currently coordinate on a range of wetlands activities. These activities include: studying and reporting on wetlands trends in the U.S., diagnosing causes of coastal wetland loss, updating and standardizing the digital map of the nation's wetlands, statistically surveying the condition of the Nation's wetlands, and developing methods for better protecting wetland function. In addition to that, EPA and the ACOE work very closely together in implementing the wetlands regulatory program under Clean Water Act Section 404. Under the regulatory program the agencies coordinate closely on overall implementation of the permitting decisions made annually under Section 404 of the Clean Water Act, through the headquarters offices as well as the ten EPA Regional Offices and 38 ACOE District Offices. The agencies also coordinate closely on policy development and litigation. EPA and ACOE are committed to achieving the goal of no net loss of wetlands under the Section 404 program.

Coastal America

In efforts to better leverage our collaborative authorities to address coastal communities' environmental issues (e.g., coastal habitat losses, nonpoint source pollution, endangered species, invasive species, etc.), EPA, by memorandum of agreement in 2002 entered into an agreement with Multi-agency signatories. November 2002. *Coastal America 2002 Memorandum of Understanding*. Available online at <http://www.coastalamerica.gov/text/mou02.htm>

Great Lakes

EPA is leading the member Federal agencies of the Interagency Task Force⁶ in the development and implementation of a new Great Lakes Restoration Initiative. As the Initiative progresses, EPA will work with its partners to develop the management and coordinative structures required for this effort, including Interagency Agreements with all appropriate Federal agency participants. Participating agencies will focus their activities to support outcome-oriented performance goals and measures to direct their Great Lakes protection and restoration activities. This effort builds upon previous coordination and collaboration by the Great Lakes National Program Office (GLNPO) pursuant to the mandate in Section 118 of the Clean Water Act to “coordinate action of the Agency with the actions of other Federal agencies and state and local authorities...” pursuant to which GLNPO was already engaged in extensive coordination efforts with state, Tribal, and other Federal agencies, as well as with our counterparts in Canada pursuant to the Great Lakes Water Quality Agreement (GLWQA). The Federal Interagency Task Force, created by EO 13340, is charged with increasing and improving collaboration and integration among Federal programs involved in Great Lakes environmental activities. The Great Lakes task force brings together eleven Cabinet department and Federal agency heads to coordinate restoration of the Great Lakes, focusing on outcomes, such as cleaner water and sustainable fisheries, and targeting measurable results. In December 2005, the Great Lakes Regional Collaboration issued a Great Lakes Regional Collaboration Strategy. The Interagency Task Force has been able to use that work to guide development of the Great Lakes Restoration Initiative. Coordination by GLNPO supports the GLWQA and other efforts to improve the Great Lakes and will now lead to implementation of priority actions for Great Lakes restoration by the Federal agencies and their partners. Coordinative activities that will continue as part of the implementation of the Initiative are expected to include: extensive coordination among state, Federal, and provincial partners, both in terms of implementing the monitoring program, and in utilizing results from the monitoring to manage environmental programs: sediments program work with the states and the Corps regarding dredging issues; implementation of the Binational Toxics Strategy via extensive coordination with Great Lakes States; habitat protection and restoration with states, tribes, FWS, and NRCS; and coordination with these partners regarding development and implementation of Lakewide Management Plans for each of the Great Lakes and for Remedial Action Plans for the 30 remaining U.S./binational Areas of Concern.

⁶ The Interagency Task Force includes eleven agency and cabinet organizations: EPA, State, Interior, Agriculture, Commerce, Housing and Urban Development, Transportation, Homeland Security, Army, Council on Environmental Quality, and Health and Human Services.

Chesapeake Bay

The Chesapeake Bay Program's former Federal Agencies Committee has been replaced by a higher level group of the nine principal Federal agencies involved in Chesapeake Bay restoration and protection work. This group of Federal Office Directors (FOD), chaired by EPA, meets monthly, and includes:

- U.S. Environmental Protection Agency
- National Oceanic and Atmospheric Administration
- Natural Resources Conservation Service
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- U.S. Geological Survey
- U.S. Forest Service
- National Park Service
- U.S. Navy (representing Department of Defense)

The new group has been meeting regularly and provides a forum for Federal agencies to coordinate and to devise unified Federal positions on various policy options. EPA is the lead Federal agency which represents the Federal government on the Chesapeake Executive Council, and the FOD provides the opportunity for EPA to coordinate Federal positions. In addition to the Administrator of EPA, the Chesapeake Executive Council consists of the governors of the Bay states, the mayor of the District of Columbia, the chair of the Chesapeake Bay Commission, and for the past few years, the Secretary of Agriculture.

Through the FODs and the Chesapeake Executive Council, several Federal agencies have become "champions" of specific issues:

- EPA – Funding to promote innovation and implementation; No Runoff Challenge; promoting the use of "green infrastructure", such as through the DC stormwater permit
- NRCS – Promoting and encouraging use of best conservation practices on watershed farms
- U.S. Forest Service – Working to ensure that the 2012 forest protection goals are met in the Bay watershed
- U.S. Navy – Promoting and incorporating low impact and no impact development on Navy properties throughout the Chesapeake Bay watershed.

Gulf of Mexico

Key to the continued progress of the Gulf of Mexico Program is a broad multi-organizational Gulf states-led partnership comprised of regional; business and industry; agriculture; state and local government; citizens; environmental and fishery interests; and, numerous Federal departments and agencies. This Gulf partnership is comprised of members of the Gulf Program's Policy Review Board, subcommittees, and workgroups. Established in 1988, the Gulf of Mexico Program is designed to assist the Gulf States and stakeholders in developing a regional, ecosystem-based framework for restoring and protecting the Gulf of Mexico through coordinated Gulf-wide as well as priority area-specific efforts. The Gulf States strategically

identify the key environmental issues and work at the regional, state, and local level to define, recommend, and voluntarily implement the supporting solutions. To achieve the Program's environmental objectives, the partnership must target specific Federal, state, local, and private programs, processes, and financial authorities in order to leverage the resources needed to support state and community actions.

Objective: Enhance Science and Research

Research in human health is coordinated with several Federal agencies that also sponsor research on variability and susceptibility in health risks from exposure to environmental contaminants. EPA collaborates with a number of the Institutes within the NIH and CDC. For example, the National Institute of Environmental Health Sciences (NIEHS) conducts multi-disciplinary biomedical research programs, prevention and intervention efforts, and communication strategies. The NIEHS program includes an effort to study the effects of chemicals, including pesticides and other toxics, on children's health. EPA collaborates with NIEHS in supporting the Centers for Children's Environmental Health and Disease Prevention, which study whether and how environmental factors play a role in children's health.⁷ EPA coordinates research on identification and management of health risks of mold with the Federal Interagency Committee on Indoor Air Quality. EPA coordinates with ATSDR through a memo of understanding on the development of toxicological reviews and toxicology profiles, respectively. EPA also has strong working collaborations with CDC including 1) an MOU and projects directed at linking the CDC Public Health Tracking Network Program with EPA's environmental monitoring data and the indicators efforts tied to EPA's Report on the Environment; 2) an MOU and projects linking EPA's Community Action for Renewed Environments with CDC's community-based environmental health programs, a collaboration that already has addressed environmental public health issues along the U.S.-Mexico border under the Binational Border 2012 Program.. EPA and CDC are also collaborating in the areas of asthma, biomonitoring, and global health. EPA also works collaboratively with CDC on the development of indicators of exposure and health effects generating data included in EPA's Report on the Environment and assisting CDC in its Public health Surveillance efforts.

Goal 5-Compliance and Environmental Stewardship

Objective: Improve Compliance

The Enforcement and Compliance Assurance Program coordinates closely with DOJ on all enforcement matters. In addition, the program coordinates with other agencies on specific environmental issues as described herein.

The Office of Enforcement and Compliance Assurance (OECA) coordinates with the Chemical Safety and Accident Investigation Board, OSHA, and Agency for Toxic Substances and Disease Registry in preventing and responding to accidental releases and endangerment situations, with the BIA on Tribal issues relative to compliance with environmental laws on Tribal Lands, and with the SBA on the implementation of the Small Business Regulatory Enforcement Fairness Act (SBREFA). OECA also shares information with the IRS on cases which require defendants to pay civil penalties, thereby assisting the IRS in assuring compliance with tax laws. In addition, it coordinates with the SBA and a number of other Federal agencies in implementing

⁷ For more information, see <<http://es.epa.gov/ncer/childrenscnters/>>

the Business Gateway initiative, an “E-Government” project in support of the President’s Regulatory Management Agenda. OECA also works with a variety of Federal agencies including the DOL and the IRS to organize a Federal Compliance Assistance Roundtable to address cross cutting compliance assistance issues. Coordination also occurs with the COE on wetlands.

Due to changes in the Food Security Act, the USDA/NRCS has a major role in determining whether areas on agricultural lands meet the definition of wetlands and are therefore regulated under the CWA. Civil Enforcement coordinates with USDA/NRCS on these issues also. The program coordinates closely with the USDA on the implementation of the Unified National Strategy for Animal Feedlot Operations. EPA’s Enforcement and Compliance Assurance Program also coordinates with USDA on food safety issues arising from the misuse of pesticides, and shares joint jurisdiction with Federal Trade Commission (FTC) on pesticide labeling and advertising. Coordination also occurs with Customs and Border Protection on implementing the secure International Trade Data System across all Federal agencies, and on pesticide imports. EPA and the FDA share jurisdiction over general-purpose disinfectants used on non-critical surfaces and some dental and medical equipment surfaces (e.g., wheelchairs). The Agency has entered into a MOU with HUD concerning lead poisoning.

The Criminal Enforcement Program coordinates with other Federal law enforcement agencies (i.e., FBI, Customs, DOL, U.S. Treasury, USCG, DOI and DOJ) and with state and local law enforcement organizations in the investigation and prosecution of environmental crimes. EPA also actively works with DOJ to establish task forces that bring together Federal, state and local law enforcement organizations to address environmental crimes. In addition, the program has an Interagency Agreement with the DHS to provide specialized criminal environmental training to Federal, state, local, and Tribal law enforcement personnel at the Federal Law Enforcement Training Center (FLETC) in Glynco, GA. The Homeland Security and Forensics Support Programs also coordinate with other Federal law enforcement agencies and with state and local law enforcement organizations to support counter-terrorism efforts.

Under Executive Order 12088, EPA is directed to provide technical assistance to other Federal agencies to help ensure their compliance with all environmental laws. The Federal Facility Enforcement Program coordinates with other Federal agencies, states, local, and Tribal governments to ensure compliance by Federal agencies with all environmental laws. In FY 2009, EPA will also continue working with other Federal agencies to support the Federal Facilities Stewardship and Compliance Assistance Center (www.fedcenter.gov).

OECA collaborates with the states and Tribes. States perform the vast majority of inspections, direct compliance assistance, and enforcement actions. Most EPA statutes envision a partnership between EPA and the states under which EPA develops national standards and policies and the states implement the program under authority delegated by EPA. If a state does not seek approval of a program, EPA must implement that program in the state. Historically, the level of state approvals has increased as programs mature and state capacity expands, with many of the key environmental programs approaching approval in nearly all states. EPA will increase its effort to coordinate with states on training, compliance assistance, capacity building and enforcement. EPA will continue to enhance the network of state and Tribal compliance assistance providers.

The Office of Enforcement and Compliance Assurance chairs the Interagency Environmental Leadership Workgroup established by Executive Order 13148. The Workgroup consists of over 100 representatives from most Federal departments and agencies. Its mission is to assist all Federal agencies with meeting the mandates of the Executive Order, including implementation of environmental management systems and environmental compliance auditing programs, reducing both releases and uses of toxic chemicals, and compliance with pollution prevention and pollution reporting requirements. In FY 2009, the OECA will work directly with a number of other Federal agencies to improve CWA compliance at Federal facilities. OECA and other agencies will jointly investigate the underlying causes of persistent CWA violations and design and implement fixes to the problems to keep facilities in compliance over the long term. OECA anticipates that FY 2009 will see the completion of a multiple-year partnership with the Veterans Health Administration (VHA), a part of the Department of Veterans Affairs (VA). OECA and the VHA formed the partnership in 2002 to improve compliance at VHA medical centers across the nation. Since then, EPA and VHA have jointly designed and begun implementing environmental management systems at all VHA medical centers, completed multi-day onsite reviews at more than 20 medical centers to assess the strengths and weaknesses of their environmental programs and to guide the VHA in making program improvements at all its medical centers, and delivered multiple environmental compliance courses for VHA staff and managers.

EPA works directly with Canada and Mexico bilaterally and in the trilateral Commission for Environmental Cooperation (CEC). EPA's border activities require close coordination with the Bureau of Customs and Border Protection, the Fish and Wildlife Service, the Department of Justice, and the States of Arizona, California, New Mexico, and Texas. EPA is the lead agency and coordinates U.S. participation in the CEC. EPA works with NOAA, the Fish and Wildlife Service and the U.S. Geological Survey on CEC projects to promote biodiversity cooperation, and with the Office of the U.S. Trade Representative to reduce potential trade and environmental impacts such as invasive species.

The Agency is required to review environmental impact statements and other major actions impacting the environment and public health proposed by all Federal agencies, and make recommendations to the proposing Federal agency on how to remedy/mitigate those impacts. Although EPA is required under § 309 of the Clean Air Act (CAA) to review and comment on proposed Federal actions, neither the National Environmental Policy Act nor § 309 CAA require a Federal agency to modify its proposal to accommodate EPA's concerns. EPA does have authority under these statutes to refer major disagreements with other Federal agencies to the Council on Environmental Quality. Accordingly, many of the beneficial environmental changes or mitigation that EPA recommends must be negotiated with the other Federal agency. The majority of the actions EPA reviews are proposed by the Forest Service, Department of Transportation (including the Federal Highway Administration and Federal Aviation Administration), U.S. Army Corps of Engineers, Department of Interior (including Bureau of Land Management, Minerals Management Service and National Parks Service), Department of Energy (including Federal Regulatory Commission), and Department of Defense.

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Objective: Improve Environmental Performance through Pollution Prevention and Innovation

EPA is involved in a broad range of pollution prevention (P2) activities which can yield reductions in waste generation and energy consumption in the public and private sectors. For example, the Environmental Performance through Pollution Prevention and Innovation (EPP) initiative, which implements Executive Orders 12873 and 13101, promotes the use of cleaner products by federal agencies. This is aimed at stimulating demand for the development of such products by industry.

This effort includes a number of demonstration projects with other federal Departments and agencies, such as the National Park Service (NPS) (to use Green Purchasing as a tool to achieve the sustainability goals of the parks), the Department of Defense (DoD) (use of environmentally preferable construction materials), and Defense Logistics Agency (identification of environmental attributes for products in its purchasing system). The program is also working within EPA to “green” its own operations. The program also works with the Department of Commerce’s National Institute of Science and Technology (NIST) to develop a life-cycle based decision support tool for purchasers.

Under the Suppliers’ Partnership for the Environment program and its umbrella program, the Green Suppliers’ Network (GSN), EPA’s P2 Program is working closely with NIST and its Manufacturing Extension Partnership Program to provide technical assistance to the process of “greening” industry supply chains. The EPA is also working with the Department of Energy’s (DOE) Industrial Technologies Program to provide energy audits and technical assistance to these supply chains.

EPA is working with DOE and the U.S. Department of Agriculture (USDA) to develop a "Biofuels Posture Plan," the first step in implementing a Biofuels Initiative to support the goals of the Advanced Energy Initiative. The Biofuels Posture Plan will be designed to promote the development of a biofuels industry in the U.S. to help shift the country towards clean, domestic energy production and away from dependence on foreign sources of energy (mostly petroleum). EPA is investigating the use of municipal and industrial solid and hazardous wastes as sources of biomass that can be used to produce clean biofuels. EPA is promoting specific waste-to-energy technologies through policy development, research, and, where feasible, regulatory change.

EPA and DOI are coordinating an Interagency Tribal Information Steering Committee that includes the Bureau of Reclamation, DOE, Housing and Urban Department, U.S. Geological Service, Federal Geographic Data Committee, Bureau of Indian Affairs, the Indian Health Service, Department of the Treasury, and the Department of Justice. This Interagency effort is aimed to coordinate the exchange of selected sets of environmental, resource, and programmatic information pertaining to Indian Country, among federal agencies in a “dynamic” information

management system that is continuously and automatically updated and refreshed, and to be shared equally among partners and other constituents.

Under a two-party interagency agreement, EPA works extensively with the Indian Health Service to cooperatively address the drinking water and wastewater infrastructure needs of Indian Tribes. EPA is developing protocols with the Indian Health Service Sanitation Facilities Construction Program for integration of databases of the two agencies, within the framework of the Tribal Enterprise Architecture.

EPA has organized a Tribal Data Working Group under the Federal Geographic Data Committee, and, along with BIA, is the co-chair of this group. EPA will play a lead role in establishing common geographic data and metadata standards for Tribal data, and in establishing protocols for exchange of information among federal, non-federal and Tribal cooperating partners.

EPA is developing protocols with the Bureau of Reclamation, Native American Program, for integration of databases of the two agencies, within the framework of the Tribal Enterprise Architecture. EPA is also developing agreements to share information with the Alaska District of the COE.

The Sector Strategies Program promotes optimal environmental protection, energy efficiency, and resource management in high-impact industries and fuel production sectors. The program engages with many diverse stakeholder groups, including other Federal programs, for policy dialogue and strategic planning. Engagement tends to be informal and issue-specific, as opposed to formal inter-agency partnerships. At the program-wide level, Sector Strategies works on various issues with the Council on Environmental Quality; with industry-oriented programs in the Department of Energy's Office of Energy Efficiency and Renewable Energy; with manufacturing programs at the Department of Commerce; and with the North American Commission on Environmental Cooperation on trade issues related to climate policy. Examples of sector-specific interactions include Agribusiness Sector work with USDA programs; Oil & Gas Sector work with the Bureau of Land Management at the Department of the Interior; work on Port Sector issues with the Coast Guard and the Committee on the Marine Transportation System at the Department of Transportation; work on industrial material recycling issues with the DOT's Federal Highway Administration; and work with the Department of the Navy on Shipbuilding Sector initiatives.

The Smart Growth program has a number of key Federal partnerships. Under an MOU with NOAA the program is - developing a joint publication on smart growth guidelines for coastal communities, offering introductory smart growth training through NOAA's Coastal Services Center, and providing technical support to state Sea Grant programs. Along with the Federal Highway Administration, the program is co-sponsoring a publication on Designing Walkable Urban Streets and participating in an Interagency Working Group on Land Use, Vehicle Travel and Greenhouse Gas Emissions. Through an interagency agreement with FEMA, EPA is providing recovery and redevelopment assistance to five Iowa communities impacted by recent flooding. Also through an interagency agreement, the program is working with the Centers for Disease Control to develop Active Community Design indicators for regional Metropolitan Listing Services (MLS) that will provide home buyers with information on neighborhood

walkability. Finally, the program has continued to work with the Forest Service's Urban and Community Forestry and Cooperative Forestry program to promote smart growth in both urban and rural areas.

EPA is a member of the Interagency Network of Enterprise Assistance Providers (INEAP), an interagency collaboration that also includes the departments of Commerce, Transportation working to leverage program effectiveness through partnership. The collaboration is focusing specifically on ways to promote competitiveness and work toward sustainability.

EPA is also a member and plays a leadership role in the federal Program Evaluators Network which is a cross-agency collaboration working on improving program evaluation tools and improving capacity for more effective performance management.

Information on regulations and other issues that may have an adverse impact on small businesses is shared regularly with the Small Business Administration's Office of Advocacy. An ongoing activity includes the coordination of interactions among the Office of Air and Radiation, the State Small Business Assistance Program's National Steering Committee, and the Office of Advocacy in the development of the proposed 55 area source Maximum Achievable Control Technology (MACT) rules that will impact small businesses and state programs.

Activities associated with the Environmental Education Program are coordinated with other Federal agencies in a variety of ways:

EPA currently funds approximately \$1.5M for eight interagency agreements with four Federal agencies. Current projects are focused on helping these agencies to better coordinate their environmental education efforts (see www.handsontheland.org) and improving capacity to measure environmental education program outcomes. All of the activities are funded jointly by the cooperating Federal agency and a third non-profit partner. Detailed information about the interagency agreements is available at <http://www.epa.gov/enviroed/iag.html>.

EPA chairs the Task Force on Environmental Education which meets periodically to share information. The current focus involves sharing information on linking environmental education programs to the strategic planning initiatives of Federal agencies and developing program impact measures.

EPA, in partnership with Department of Education, the Agency for Toxic Substances and Disease Registry, the Department of Interior, the Bureau of Indian Affairs, the Consumer Product Safety Commission, and the Centers for Disease Control, is implementing a national Schools Chemical Cleanout Campaign (SC3). SC3 is building a national public/private network that will facilitate the removal of dangerous and inappropriate chemicals from K - 12 schools; encourage responsible chemical management practices to prevent future chemical accidents and accumulations; and raise issue awareness.

As a participant on the following interagency workgroups, EPA remains informed of related efforts across the government and provides coordination assistance as necessary: The Interagency Committee on Education (Chair: Department of Education); Partners in Resource Education (Chair: National Environmental Education and Training Foundation); the Federal

Interagency Committee on Interpretation (Chair: National Park Service); Ocean Education Task Force (workgroup of the U.S. Ocean Commission); and the Afterschool.gov (Chair: General Services Administration).

EPA coordinates U.S. participation in the activities of the North American Commission on Environmental Cooperation (CEC) on green purchasing, supply chains, and buildings.

EPA's web portal of all Federal environmental education program web sites is: <http://www.epa.gov/enviroed/FTFmemws.html>.

Objective: Improve Human Health and the Environment in Indian Country

EPA completed two important Tribal infrastructure Memoranda of Understanding (MOU) amongst five federal agencies. EPA, the Department of the Interior, Department of Health and Human Services, Department of Agriculture, and the Department of Housing and Urban Development will work as partners to improve infrastructure on Tribal lands and focus efforts on providing access to safe drinking water and basic wastewater facilities to tribes.

The first, or umbrella MOU, promotes coordination between federal Tribal infrastructure programs, including financial services, while allowing federal programs to retain their unique advantages. It is fully expected that the efficiencies and partnerships resulting from this collaboration will directly assist tribes with their infrastructure needs. Under the umbrella MOU, for the first time, five Federal departments joined together and agreed to work across traditional program boundaries on Tribal infrastructure issues. The second MOU, addressing a specific infrastructure issue was created under the umbrella authority and addresses the issue of access to safe drinking water and wastewater facilities on Tribal lands. Currently, the five Federal agencies are working together to develop solutions for specific geographic areas of concern (Alaska, Southwest), engaging in coordination of ARAR funding, and promoting cross-agency efficiency. These activities are completed in coordination with federally recognized tribes.

For more information, please see the web link: <http://www.epa.gov/tribalportal/mous.htm>.

Objective: Enhance Science and Research

EPA is coordinating with DoD's Strategic Environmental Research and Development Program (SERDP) in an ongoing partnership, especially in the areas of sustainability research and of incorporating materials lifecycle analysis into the manufacturing process for weapons and military equipment. EPA is continuing its partnerships with NSF, NIEHS, and NIOSH on jointly issued grant solicitations for nanotechnology, and its coordination through the NSET with all agencies that are part of the NNI. In addition, in response to a Congressional request to collaborate internationally, EPA is partnering with sister agencies in the United Kingdom and will jointly fund consortia between U.S. and United Kingdom research institutions.

EPA will continue work under the MOA with the USCG and the State of Massachusetts on ballast water treatment technologies and mercury continuous emission monitors. The agency also coordinates technology verifications with NOAA (multiparameter water quality probes); DOE (mercury continuous emission monitors); DoD (explosives monitors, PCB detectors, dust suppressants); USDA (ambient ammonia monitors); Alaska and Pennsylvania (arsenic removal);

Georgia, Kentucky, and Michigan (storm water treatment); and Colorado and New York (waste-to-energy technologies).

The statutorily mandated Biomass Research and Development Board (chaired by DOE and USDA) provides overall federal coordination of biofuel research activities. EPA's Office of Research and Development (ORD) represents the Agency on this Board and co-chairs two of its seven working groups. The two working groups chaired by EPA's ORD are the Sustainability and Environment, Health and Safety workgroups. ORD works to ensure that all relevant EPA offices are aware of and involved in EPA-related Board activities.