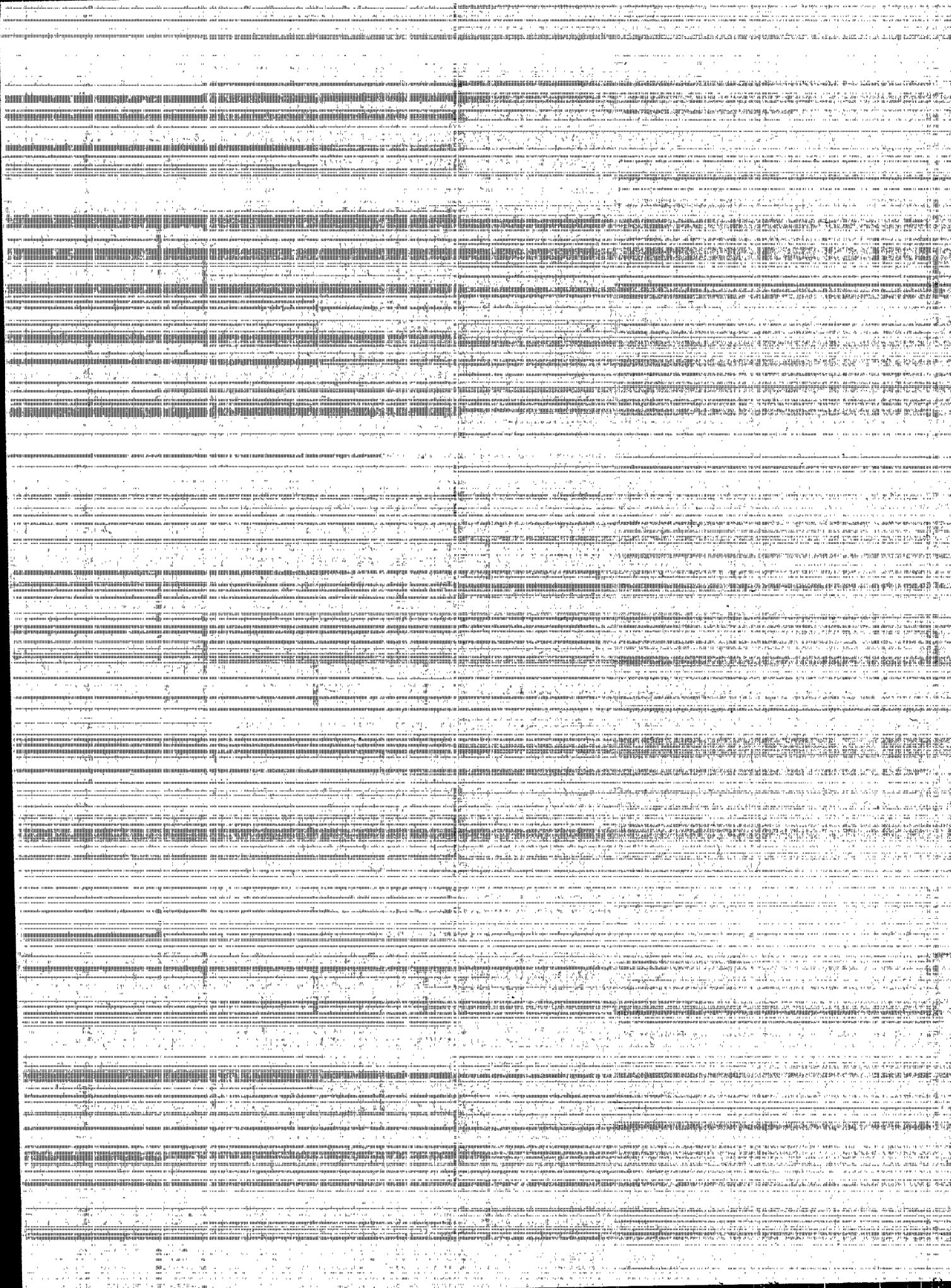




# Office Of Wastewater Management Primer

[illegible]



---

# Office of Wastewater Management **PRIMER**

November 1994

Office of Wastewater Management  
Office of Water  
U.S. Environmental Protection Agency  
Washington, DC

---

*Additional copies of this document, as well as other information about the Office's programs,  
are available from EPA's Water Resource Center, (202) 260-7786.  
Please refer to page 27 for details.*

## TABLE OF CONTENTS

Introduction	1
The Problem: Water Pollution	3
The Solution: OWM Programs	5
Regulatory Programs	5
National Pollutant Discharge Elimination System (NPDES) Permit Program	5
NPDES Watershed Strategy (inset)	6
Storm Water	7
Combined Sewer Overflows (CSOs)	7
Sanitary Sewer Overflows (SSOs)	8
Pretreatment	8
Sewage Sludge/Biosolids	9
Types of Regulated Pollutants (inset)	9
Financial Flexibility and Support	10
Construction Grants Programs	10
State Revolving Funds	10
Public-Private Partnerships (P3)	11
Section 106 Water Pollution Control Program Grants	11
Section 104(b)(3) Water Quality Cooperative Agreements	12

Pollution Prevention Initiatives	13
Municipal Water Pollution Prevention (MWPP) Program	13
Water Alliances for Voluntary Efficiency (WAVE) Program	13
Outreach and Training	14
Small Community Outreach and Education (SCORE) Program	14
Youth and the Environment Program	14
State Environmental Training Centers	15
Wastewater Operator Training Program	15
Environmental Justice	16
Indian Grants Management	16
EPA Activities on the U.S.-Mexico Border (inset)	17
Technological Assistance Programs	18
Municipal Technologies	18
Environmental Technology Initiative	18
Innovative and Alternative Technologies	19
How Wastewater Treatment Works.... The Basics	21
Office of Wastewater Management Organizational Chart	25
Information Resources	27

---

## OFFICE OF WASTEWATER MANAGEMENT PRIMER

The U.S. Environmental Protection Agency's (EPA) *Office of Wastewater Management* (OWM) oversees a range of programs contributing to the well-being of our nation's waters and watersheds. Through its programs and initiatives, OWM promotes compliance with the requirements of the Federal Water Pollution Control Act, commonly referred to as the *Clean Water Act*. Activities include:

- Direction of the National Pollutant Discharge Elimination System (NPDES) Permit Program, including storm water management, and control of combined sewer and sanitary sewer overflows.
- Oversight of a pretreatment program, emphasizing control and prevention of water pollution from industrial facilities.
- Management of the sludge (biosolids) permitting program, including promotion of the beneficial use of biosolids.
- Administration of the State Revolving Fund (SRF) and the Clean Water Act Section 106 and 104(b)(3) grant programs for environmental infrastructure investment.
- Completion and closeout of the wastewater Construction Grants Program.
- Provision of technical advice and training to industries and municipalities, in an effort to improve compliance with wastewater regulatory requirements.
- Support of the North American Free Trade Agreement (NAFTA) environmental infrastructure program in the U.S.-Mexico border area.

The Office's mission is to promote  
"clean water... a better  
environment."

**CLEAN WATER...  
A BETTER ENVIRONMENT**





---

## THE PROBLEM: WATER POLLUTION

Cleaning and protecting the nation's water is an enormous task. Under authority of the Clean Water Act, the Office of Wastewater Management works in partnership with EPA Regions and the States to regulate discharges into *surface waters* such as wetlands, lakes, rivers, estuaries, bays, and oceans. Specifically, OWM focuses on control of *wastewater* that is collected in discrete conveyances (also called *point sources*), including pipes, ditches, and sanitary or storm sewers.

Traditionally, the Agency has addressed point sources and *nonpoint sources* (which include agricultural runoff, erosion, and other sources not directly linked to a specific source of pollution) as separate programs. Now, however, as we adopt a more holistic strategy, OWM is working with other EPA offices and with our stakeholders to apply a *watershed approach* to water management. As part of this approach, EPA seeks to promote integrated solutions to address all sources of pollution to surface water, ground water, and habitats on a watershed basis.

A watershed may be affected by discharges from municipal and/or industrial facilities, as well as pollutants from other sources that are not as easily identified, and therefore harder to control.

*Municipal wastewater* consists primarily of domestic wastes from households and industrial wastewater from manufacturing and commercial activities. Both of these types of wastewater are collected in sanitary sewers, and are usually treated at a municipal wastewater treatment plant. After treatment, the wastewater is discharged into its *receiving water*, e.g., a river, an estuary, or an ocean.

Wastewater entering a treatment plant may include organic pollutants (including raw sewage), metals, nutrients, sediment, bacteria, and viruses. Toxic substances used in the home, including motor oil, paint, household cleaners, and pesticides, or substances released by industries, also make their way into sanitary sewers.

Water used in *industrial processes*, such as steel or chemical manufacturing, produces billions of gallons of wastewater daily. Some industrial pollutants are similar to those in municipal sewage, but often are more concentrated. Other pollutants are more exotic and include a variety of heavy metals and synthetic organic compounds. In sufficient dosages, these pollutants may present serious hazards to human health and aquatic organisms.

---

Unlike municipal or industrial sources of pollution, which come from a single discrete facility, other sources are usually more diffuse in nature. For example, rain water or snow melt washing over farmlands may carry topsoil and fertilizer residues into nearby streams. This type of runoff, called *storm water*, may carry oil and gasoline, agricultural chemicals, nutrients, heavy metals, and other toxic substances, as well as bacteria, viruses, and oxygen-demanding compounds.

A recent EPA study indicated that roughly one third of identified cases of water quality impairment nationwide are attributable to storm water, whether from farmland, streets, parking lots, construction sites, or other sources.

*Combined sewer overflows* (CSOs) are mixtures of sewage, industrial wastewater, and storm water discharged prior to entry into a treatment plant. CSOs, which can cause beach closings, shell fishing bans, and a range of public health problems, occur in about 1100 communities that have antiquated water infrastructure.

*Sanitary sewer overflows* (SSOs) are raw sewage overflows from separate sanitary sewer collection systems. Over the years, many sanitary sewer collection systems have experienced deterioration due to inadequate preventive maintenance programs and insufficient rehabilitation and replacement. SSOs can discharge to surface waters, flood basements, and overflow from manholes into streets and across private property. Cracked and leaking sanitary sewers can also discharge raw sewage during dry weather periods. Sanitary sewer overflows can result in health risks, property damage, and water quality impacts.

*Sewage sludge*, often referred to as *biosolids*, is a semi-solid residue from wastewater treatment processes. Sludge can be viewed as both a waste product and, potentially, a valuable resource. Treated properly, it can be recycled as fertilizer and soil conditioner; if handled improperly, however, sludge (which may contain high concentrations of toxic pollutants and pathogens) can threaten air, surface water, ground water, and agricultural products.

The ultimate goal of the wastewater program is to improve water quality through compliance with environmental regulations.

---

## THE SOLUTION: OWM PROGRAMS

The Office of Wastewater Management, in cooperation with States, EPA Offices, and other stakeholders, strives to improve the quality of our nation's watersheds. To that end, OWM manages programs to ensure the highest possible degree of compliance with environmental regulations. The following are descriptions of the Office's programs.

- **REGULATORY PROGRAMS**

This section of the *Primer* deals with OWM's regulatory programs, which operate under authority of the Clean Water Act.

### **National Pollutant Discharge Elimination System (NPDES) Permit Program**

The Clean Water Act prohibits discharges of water pollutants, except in compliance with the provisions of *permits*. Dischargers must have a permit establishing permit limits, and specifying monitoring and reporting requirements.

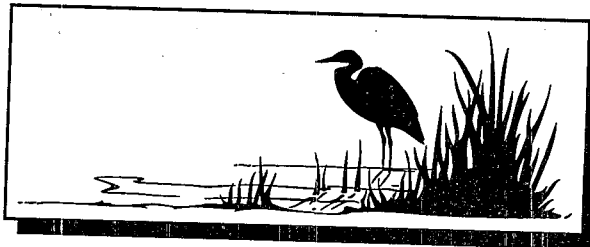
*National Pollutant Discharge Elimination System (NPDES)* permits regulate household and industrial wastes that are collected in sewers and treated at municipal wastewater treatment plants. Permits also regulate industrial point sources and concentrated animal feeding operations that discharge into other wastewater collection systems, or that discharge directly into receiving waters. More than 200,000 sources are regulated by NPDES permits nationwide.

Permits regulate discharges with the goals of 1) protecting public health and aquatic life, and 2) assuring that every facility treats -- or prevents the discharge of -- wastewater. When and if regulated facilities fail to comply with the provisions of their permits, they may be subject to enforcement actions. EPA uses a variety of techniques to monitor permittees' compliance status, including on-site inspections and review of data submitted by permittees.

A *NPDES Watershed Strategy* has been developed to ensure that the NPDES Program protects watersheds as effectively as possible (see box).

## NPDES WATERSHED STRATEGY

OWM developed the NPDES Watershed Strategy with input from States and EPA Regions. The final strategy reflects a first step towards the Office of Water's goal of fully integrating the NPDES permitting program into the Agency's broader Water Protection Approach.



The Watershed Strategy identifies six areas that must be addressed to improve water quality on a watershed basis nationwide, including:

- Statewide coordination: Support the development of State-wide basin management frameworks, and coordinate interstate basin efforts to facilitate implementation of the Watershed Protection Approach.
- NPDES Permits: Streamline the process for NPDES permit development, issuance, and review, and develop innovative approaches to permitting on a watershed basis where feasible.
- Monitoring and assessment: Develop a State-wide monitoring strategy, and establish point-source ambient monitoring requirements.
- Programmatic measures and environmental indicators: Revise existing national accountability measures to facilitate implementation of the Watershed Protection Approach.
- Public participation: Utilize existing NPDES public participation process in development of watershed protection plans, and seek broad public participation in identifying local environmental goals.
- Enforcement: Include emphasis on facilities that discharge to priority basins.

Implementation of the Watershed Strategy is now underway, and will include the completion of assessments of each State's watershed protection activities and needs. OWM will coordinate with other EPA Offices and States to ensure that ongoing program activities take watershed planning into consideration.

---

One of the NPDES Program's key priorities is the effective implementation of EPA's *wet-weather strategies*, including storm water management and the control of combined sewer and sanitary sewer overflows.

### **NPDES Program: Storm Water**

Storm water discharges from many sources are largely uncontrolled. For this reason, the mandate of the *Storm Water Program* is particularly challenging. Amendments to the Clean Water Act established a two-phased approach to addressing storm water discharges. Phase I, currently being implemented, requires permits for separate storm water systems serving large- and medium-sized communities (those with over 100,000 inhabitants), for storm water discharges associated with construction activity involving at least five acres, and for industrial activity.

To address the large number of industrial dischargers of storm water--at over 100,000 facilities--EPA has developed a strategy with a tiered framework to control the administrative burden while emphasizing reduction in risk to human health and ecosystems. The Agency works with its partners to issue *general* and *multisector permits*, which facilitate ecosystem protection without placing an undue burden on permittees.

Phase II of the Storm Water Program, which is currently under development, will address remaining storm water discharges. Ultimately, millions of potential permittees will be covered, including urban areas with populations under 100,000, smaller construction sites, and retail, commercial, and residential activities.

### **NPDES Program: Combined Sewer Overflows (CSOs)**

In April 1994, EPA issued a policy for the control of combined sewer overflows. The policy calls for communities with CSOs to take immediate and long-term actions to address these overflow problems. Measures specified in the policy include proper operation and regular maintenance of sewer systems and CSOs, as well as public notification in the event of overflows, to ensure adequate public awareness of the impact of this health and environmental hazard.

Despite its rigorous approach to controlling combined sewer overflows, the CSO Control Policy provides communities with the flexibility to develop a workable, cost-effective solution to a major environmental problem. With significant input from key stakeholders, OWM is currently developing guidances to assist communities in the effective implementation of measures for the control of CSOs.

---

## NPDES Program: Sanitary Sewer Overflows (SSOs)

EPA is currently in the process of evaluating the extent of sanitary sewer overflows. The Agency will work with the public and with constituent groups across the country to identify and evaluate issues associated with these overflows to protect human health, property, and water quality.

### Pretreatment

Using proven pollution control technologies, practices that promote reuse and recycling of material, and wastewater treatment, industrial plants can eliminate pollutants from wastewater before discharging into municipal sewage treatment systems. This pollution prevention practice is known as *pretreatment*.

The *National Pretreatment Program* is a cooperative effort of Federal, State, and local officials that promotes pretreatment nationwide. Program objectives are:

- To prevent industrial facilities' pollutant discharges from passing untreated through municipal wastewater treatment plants;
- To protect treatment plants from the threat posed by untreated industrial wastewater, including explosion, fire, and interference with the treatment process; and
- To improve the quality of effluents and sludges so that they can be used for beneficial purposes.

There are more than 1500 municipal wastewater treatment plants covered by pretreatment programs administered by EPA and by authorized States. EPA also authorizes cities to establish pretreatment requirements to deal with local pollution problems. By reducing the level of pollutants discharged by industry into municipal sewage systems, the program ensures the protection of America's multi-billion dollar public investment in treatment infrastructure.

## Sewage Sludge/Biosolids

OWM's *National Sewage Sludge Program* regulates sewage sludge that is used or disposed of through land application, surface disposal, incineration, or placement in a municipal solid waste landfill. Practically speaking, anyone who works with sewage sludge is probably regulated under this program.

As mandated by the Clean Water Act, EPA has issued national standards regulating the use or disposal of sewage sludge. These standards, in conjunction with NPDES permitting requirements, make up the framework of the National Program.

EPA also offers guidance and technical assistance for the beneficial use of biosolids as soil amendments and fertilizer. By helping the public understand the benefits of using products derived from sludge, EPA enhances pollution prevention by promoting recycling through *beneficial use*.

## TYPES OF REGULATED POLLUTANTS

**CONVENTIONAL POLLUTANTS** are contained in the sanitary wastes of households, businesses, and industries. These pollutants include human wastes, ground-up food from sink disposals, and laundry and bath waters. Other types of conventional pollutants include:

**Fecal Coliform** - These bacteria are found in the digestive tracts of humans and animals; their presence in water indicates the potential presence of disease-causing organisms.

**Oil and Grease** - These organic substances may include hydrocarbons, fats, oils, waxes, and fatty acids. Oil and grease may produce sludge solids that are difficult to process.

**TOXIC POLLUTANTS** are a group of 126 pollutants that are particularly harmful to animal or plant life. They are primarily grouped into organics (including pesticides, solvents, polychlorinated biphenyls (PCBs), and dioxins) and metals (including lead, silver, mercury, copper, chromium, zinc, nickel, and cadmium).

**NONCONVENTIONAL POLLUTANTS** are any additional substances that are not conventional or toxic that may require regulation. These pollutants include nutrients such as nitrogen and phosphorus.

---

- **FINANCIAL SUPPORT AND FLEXIBILITY**

As a leader in wastewater control, OWM is involved in many activities that promote improved wastewater treatment. The Office provides direction and assistance to national, State, and local programs for the abatement and prevention of municipal water pollution. The following pages provide an overview of some of these assistance efforts.

### **Construction Grants Program**

During the 1970s and 1980s, the *Construction Grants Program* was a major source of Federal funds, providing more than \$60 billion for the construction of public wastewater treatment projects. These projects, which constituted a significant contribution to the nation's water infrastructure, included sewage treatment plants, pumping stations, and collection and intercept sewers; rehabilitation of sewer systems; and the control of combined sewer overflows. EPA's effective management of construction grants led to the improvement of water quality in thousands of municipalities nationwide.

With the 1987 amendments to the Clean Water Act, Congress set 1990 as the last year that grants funds would be appropriated. By phasing out the construction grants program, EPA shifted the method of municipal financial assistance from grants to loans provided by *State revolving funds* (see below).

### **State Revolving Funds**

State revolving funds (SRFs) are permanent, self-sustaining funds that provide assistance for the construction of wastewater treatment works and to implement nonpoint source and estuarine conservation management programs.

Each year, Congress appropriates funds to EPA to capitalize the SRFs, which are matched by contributions from the States. Low-interest loans are in turn made by the States, primarily to municipalities, for appropriate projects. Loan repayments are used, in part, to provide additional loanable funds for subsequent projects. By the end of FY 1994, EPA had awarded over \$9 billion in Federal funds to help capitalize the SRFs.



---

## Public-Private Partnerships (P3)

EPA's *Public-Private Partnerships (P3)* initiative seeks opportunities for municipalities to work with the private sector in financing public wastewater treatment operations. Local officials are in the best position to develop capital financing options that meet their particular needs. EPA is committed to supporting these communities and allowing them flexibility in financing the wastewater treatment infrastructure needed to achieve the highest possible level of public health and environmental protection.

In 1992 EPA identified three wastewater systems as pilot projects for our P3 initiative: the City of Indianapolis, the City of Silverton, Oregon, and the Miami Conservancy District near Dayton, Ohio. OWM is working with local officials and private companies to assess and develop effective models for greater private-sector investment and management of wastewater facilities. These projects will provide valuable information that EPA will share with local partners throughout the country.

## Section 106 Water Pollution Control Program Grants

Section 106 of the Clean Water Act authorizes EPA to provide Federal assistance to States (including territories, the District of Columbia, and Indian Tribes) and interstate agencies to establish and implement ongoing water pollution control programs.

Prevention and control measures supported by State Water Quality Management programs include permitting; pollution control activities; surveillance, monitoring, and enforcement; advice and assistance to local agencies; and the provision of training and public information.

Increasingly, EPA and States are working together to develop *basin-wide approaches* to water quality management. The Section 106 program is helping to foster a watershed protection approach at the State level by looking at States' water quality problems holistically, and targeting the use of limited finances available for effective program management. In the near term, the program is seeking ways to streamline the grants process to ease the administrative burden on States.

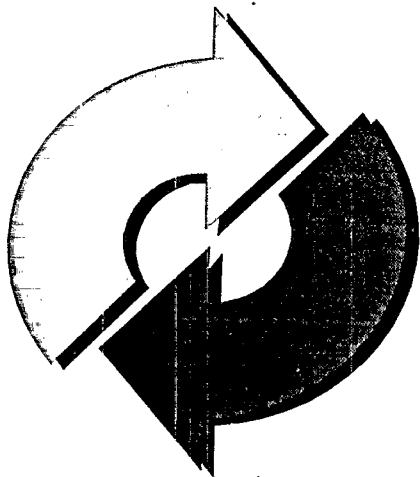
---

## Section 104(b)(3) Water Quality Cooperative Agreements

Under authority of Section 104(b)(3) of the Clean Water Act, EPA makes grants to State water pollution control agencies, interstate agencies, and other nonprofit institutions, organizations, and individuals to promote the coordination of environmentally beneficial activities. These activities include storm water control, sludge management, and pretreatment.

Among the efforts that are eligible for funding under the Section 104(b)(3) program are research, investigations, experiments, training, environmental technology demonstrations, surveys, and studies related to the causes, effects, extent, and prevention of pollution.

EPA's Regional Offices select grant proposals that are most likely to advance the States' and EPA's ability to deal with water pollution problems. Headquarters also manages grants that address concerns of a national scope. Unlike the Section 106 program, Section 104(b)(3) grants may not be used to fund ongoing programs or administrative activity.



**EPA and its partners...  
working together for  
cleaner water**

---

- **POLLUTION PREVENTION INITIATIVES**

EPA recognizes the dramatic environmental improvements achieved by pollution prevention programs. EPA works with the public to prevent pollution at its source, rather than relying solely on more expensive clean-up efforts.

### **Municipal Water Pollution Prevention (MWPP) Program**

Federal, State, and local investment in municipal wastewater treatment facilities since 1972 exceeds \$75 billion. To help protect this significant investment, EPA manages the *Municipal Water Pollution Prevention (MWPP) Program*. Its goals are to:

- Protect the quality of municipal wastewater works;
- Ensure the maintenance of wastewater facilities;
- Encourage reduction and elimination of water pollution; and
- Maintain high municipal compliance with environmental regulations.

MWPP works with EPA Regions and States to implement programs for wise water use, water source reduction, and facility self-assessments.

### **Water Alliances for Voluntary Efficiency (WAVE) Program**

In 1992, EPA established the *Water Alliances for Voluntary Efficiency (WAVE) Program* to help businesses reduce water pollution. WAVE is a voluntary efficiency program whose goal is to minimize pollution while conserving water and energy. At present, WAVE is focused on improving water efficiency in the lodging industry. Hotel/Motel Partners commit to surveying their facilities for opportunities to upgrade water-using devices, and to the improvement of their operating practices.

To assist Partners, EPA established a WAVE Supporter program with equipment manufacturers and distributors, water management companies, utilities, State and local governments, and others. Supporters promote the benefits of water efficiency, and provide information to water conservation professionals and equipment manufacturers.

EPA assists Partners and Supporters by publicly recognizing the environmental efforts of participants, and by providing materials that they can use to educate their customers and employees about water efficiency. As the WAVE program develops, it may be expanded to additional business sectors, institutional buildings, multi-family housing, and other candidates for improved water efficiency.

---

- **OUTREACH AND TRAINING**

One of the best ways to prevent pollution, and to protect the environment and human health, is through education and training of environmental professionals and others. Below are some of OWM's efforts to improve awareness of and compliance with wastewater regulations and operations.

### **Small Community Outreach and Education (SCORE) Program**

SCORE provides information and technical assistance for small wastewater systems to State and local officials. The program's goal is to help smaller communities build and maintain self-sufficient wastewater facilities that comply with the Clean Water Act. Through a variety of outreach services, SCORE stresses appropriate use of technologies, sound financial management, proper operation and maintenance, pollution prevention, and public education.

SCORE supports a national clearinghouse on technologies for small systems and an environmental training center for providers of services to small communities. The program also enlists expertise and resources from participating States, Federal agencies, public-interest and advocacy groups, and educational institutions to help deliver EPA's message about wastewater.

### **Youth and the Environment Program**

Introduced in 1990, the *Youth and the Environment Program* gives economically disadvantaged urban and rural youth the chance to explore career opportunities in the environmental field.

By combining summer employment with academic training and hands-on experience, this program exposes students to many environmental career options. Areas in which students have worked include water supply management, wastewater treatment, recycling, energy, marine environments, hazardous waste, and natural resources protection.

Besides providing valuable work experience for disadvantaged teenagers, Youth and the Environment fosters a sense of stewardship among the participants.

---

## State Environmental Training Centers

The Clean Water Act authorized grant provisions to set up *State Environmental Training Centers*, which are now operating in 39 States. Grant funds were used to help construct training sites, including demonstration wastewater treatment facilities, laboratories, and classrooms. Audiovisual equipment, training materials, and salaries for special instructors were also made available through this program.

Besides offering instruction about wastewater and other areas of the environment, including air, ground water, and hazardous waste, Centers often provide on-site technical assistance and training at wastewater treatment plants under the *Wastewater Operator Training Program* (see below).

Training programs offered by the Centers have resulted in significantly improved compliance rates and better plant operation and maintenance, which prolongs the service life of facilities.

## Wastewater Operator Training Program

For more than a decade, EPA has worked with States to provide hands-on training and technical assistance for operators of small wastewater treatment plants (those plants that treat under 5 million gallons per day) with compliance problems.

Assistance is provided primarily by State water pollution control agencies or State Training Centers, although some EPA Regional offices also provide assistance. The benefits of operator training include:

- Identification of plant deficiencies;
- Improvement of preventive maintenance, which prolongs the life of the facility;
- Potential reduction in energy and chemical costs;
- Improvement in budgeting and user-charge systems; and
- Enhancement of local awareness and support of treatment.

---

## ● ENVIRONMENTAL JUSTICE EFFORTS

The Office of Wastewater Management fully supports the Agency's efforts to provide equal access to clean water and a safe environment -- for all Americans.

Working with an outside partner, the Agency has launched a set of *environmental justice pilot projects* to provide technical assistance to a number of low-income, minority communities around the country. The projects, which are designed to empower and assist underserved minority populations in securing safe drinking water supplies or wastewater treatment, are located in nine States and in Puerto Rico.

Following evaluation of these pilots, water-related environmental justice projects with external partners will continue to provide technical and financial assistance to minorities. Among EPA's continuing programs to improve environmental justice are the grants for Native Americans (see below) and support for activities along the U.S.-Mexico border (see box).

### Indian Grants Management

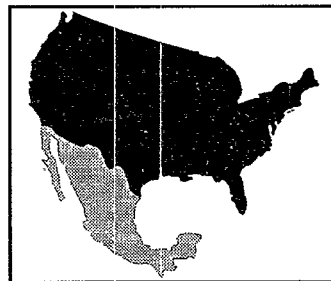
EPA manages the *Indian Grants Set-Aside Program*, the goal of which is to increase Indian Tribes' ability to plan, design, construct, operate, and maintain wastewater treatment systems. Millions of dollars in grant funds have been earmarked for wastewater projects on Indian lands and in Alaska Native Villages.

Tribal communities and Alaska Native Villages face significant human health and environmental problems because of the lack of adequate wastewater treatment. This lack of infrastructure is the result of many factors, including local economic conditions, disperse populations, and political and cultural barriers.

The Indian Set-Aside Grant program was created to help alleviate these problems and to focus attention on the needs of Native populations. EPA will continue to work with Tribes and other Federal agencies to assure that future funding will be available to help Native Americans and Alaskan Villagers preserve their environments and public health.

## EPA ACTIVITIES ON THE U.S.-MEXICO BORDER

The United States and Mexico share more than 2000 miles of common border. More than nine million people live in the border area, mostly in fifteen "sister city" pairs. The rapid increase in population and industrialization in the border cities has overwhelmed existing wastewater treatment, drinking water supply, and solid waste disposal facilities. Untreated and industrial sewage often flows north into the U.S. from Tijuana, Mexicali, and Nogales, and into the Rio Grande.



Some 300,000 people on the U.S. side of the border also lack safe drinking water, wastewater collection and treatment systems, and adequate solid waste disposal facilities. They live in unincorporated areas called *colonias*.

As part of the Administration's efforts to implement the North American Free Trade Agreement (NAFTA), EPA is working with other Federal, State, and local agencies to help find and fix environmental problems on the border. Some \$8 billion in a mix from Federal, State, local, and private-sector funding will be required to adequately protect public health and the border ecosystem.

OWM's border development activities include:

- Identification of border communities' needs, and help in meeting those needs;
- Grants for funding of wastewater treatment construction in the colonias and elsewhere on the border;
- Helping improve environmental information collection on the border; and
- Providing technical assistance and training to officials and border residents.

EPA will continue working to improve environmental conditions along the border. In 1994-1995, the Agency expects to open offices in El Paso and San Diego to learn more about the needs of people on both sides of the border. EPA will also support the work of the Border Environment Cooperation Commission and the North American Development Bank, as well as other initiatives to improve the border environment and the health of its residents.

---

- **TECHNOLOGICAL ASSISTANCE PROGRAMS**

EPA provides technological assistance to other EPA offices, Regions, State agencies, other Federal agencies, municipalities, and a range of other constituents.

### **Municipal Technologies**

The Agency provides both direct and indirect assistance in the area of *municipal wastewater treatment technologies*. Direct assistance includes one-on-one discussions about design, operation and maintenance of systems, and the identification and solution of problems. Indirect assistance includes support for the development of regulations; technical information; guidance, assessments, evaluation, and cost estimates for the design, construction, and operation and maintenance of municipal wastewater treatment facilities. Areas of expertise include:

- conventional correction systems
- combined sewer overflow treatment and control
- storm water treatment and management
- fixed film and suspended growth biological processes
- physical/chemical treatment processes
- advanced treatment processes
- conventional sludge treatment and disposal procedures
- biosolids technologies
- disinfection and odor control
- operation and maintenance
- safety.

### **Environmental Technology Initiative**

In his State of the Union Address to Congress in January 1994, the President announced the *Environmental Technology Initiative (ETI)*. This program allows EPA to expand the development and use of innovative technologies, to protect the domestic and global environment while creating sustainable high-wage jobs in the U.S.

EPA's Administrator later announced the Agency's strategy for this Initiative, and identified specific projects that the Agency will fund in the coming years. Under this strategy, EPA will use a mix of direct funding and technical assistance to spur other government agencies and private companies to meet the need for innovative technological solutions to pollution problems.



---

The ETI strategy, now being implemented, is comprised of four focus areas:

- Adapt EPA's policy, regulatory, and compliance framework to promote innovation;
- Strengthen the capacity of technology developers and users to succeed in environmental technology innovation;
- Invest EPA funds in the development and marketing of promising new technologies; and
- Accelerate the diffusion of innovative technologies here and abroad.

### **Innovative and Alternative Technologies**

EPA also provides technical assistance for the development of *innovative and alternative treatment technologies*. Among the areas of expertise provided are the following:

- alternative collection systems
- on-site treatment systems
- land application of effluent
- innovative and alternative treatment technologies
- biosolids technologies
- land application of sewage sludge
- constructed wetlands
- composting technologies
- alternative disinfection technologies
- odor control
- operation and maintenance.



---

## HOW WASTEWATER TREATMENT WORKS.... THE BASICS

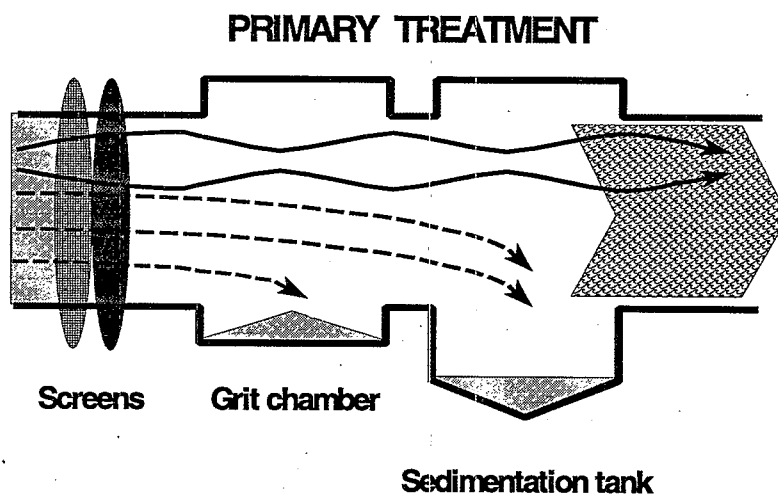
One of the most common forms of pollution control in the United States is *wastewater treatment*. The U.S. has a vast system of collection sewers, pumping stations, and treatment plants. Sewers collect the wastewater from homes, businesses, and many industries, and deliver it to plants for treatment. Most treatment plants were built to make wastewater fit for discharge into streams or other receiving waters, or for reuse.

Years ago, when sewage was dumped into waterways, the natural process of purification began. First, the sheer volume of clean water in the stream diluted wastes. Bacteria and other small organisms in the water consumed the sewage and other organic matter, turning it into new bacterial cells, carbon dioxide, and other products. Today's higher populations and greater volume of domestic and industrial wastewater require that communities provide treatment to give nature a hand.

A waste treatment works' basic function is to speed up the natural processes by which water is purified. There are two basic stages in the treatment of wastes, *primary* and *secondary*, which are outlined here. In the primary stage, solids are allowed to settle and are removed from wastewater. The secondary stage uses biological processes to further purify wastewater. Sometimes, these stages are combined into one operation.

### Primary Treatment

As sewage enters a plant for treatment, it flows through a *screen*, which removes large floating objects such as rags and sticks that may clog pipes or damage equipment. After sewage has been screened, it passes into a *grit chamber*, where cinders, sand, and small stones may settle to the bottom. A grit chamber is particularly important in communities with combined sewer systems where sand or gravel may wash into sewers along with other elements of storm water.



---

After screening is completed and grit has been removed, sewage still contains organic and inorganic matter along with other suspended solids. These solids are minute particles that can be removed from sewage by treatment in a *sedimentation tank*. When the speed of the flow of sewage through one of these tanks is reduced, the suspended solids will gradually sink to the bottom, where they form a mass of solids called *raw primary sludge*.

Sludge is usually removed from tanks by pumping, after which it may be further treated for use as a fertilizer, or disposed of through incineration if necessary. To complete primary treatment, effluent from the sedimentation tank is usually *disinfected* with chlorine before being discharged into receiving waters. Chlorine is fed into the water to kill pathogenic bacteria, and to reduce unpleasant odors.

Over the years, primary treatment alone has been unable to meet many communities' demands for higher water quality. To meet higher requirements, cities and industries often treat to a *secondary treatment* level, and in some cases, also use advanced treatment to remove nutrients and other contaminants.

### Secondary Treatment

The *secondary stage* of treatment removes about 85 percent of the organic matter in sewage by making use of the bacteria in it. The two principal techniques used in secondary treatment are *trickling filters* and the *activated sludge process*.

After effluent leaves the sedimentation tank in the primary stage of treatment, it flows or is pumped to a facility using one or the other of these processes. A trickling filter is simply a bed of stones from three to six feet deep through which the sewage passes. More recently, interlocking pieces of corrugated plastic or other synthetic media have also been used in trickling beds. Bacteria gather and multiply on these stones until they can consume most of the organic matter in the sewage. The cleaner water trickles out through pipes for further treatment.

From a trickling filter, the sewage flows to another sedimentation tank to remove excess bacteria. Disinfection of the effluent with chlorine is generally used to complete the secondary stage of basic treatment.

The trend today is towards the use of the activated sludge process instead of trickling filters. The activated sludge process speeds up the work of the bacteria by bringing air and sludge heavily laden with bacteria into close contact with sewage. After the sewage leaves the settling tank in the primary stage, it is pumped into an *aeration tank*, where it is mixed with air and sludge loaded with bacteria and allowed to

remain for several hours. During this time, the bacteria break down the organic matter into harmless by-products.

The sludge, now activated with additional millions of bacteria and other tiny organisms, can be used again by returning it to the aeration tank for mixing with new sewage and ample amounts of air.

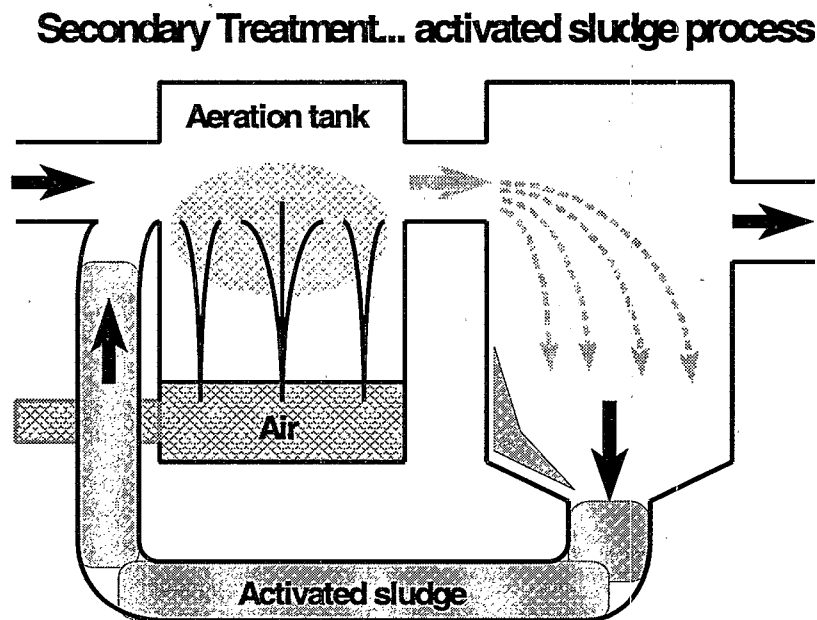
From the aeration tank, the sewage flows to another sedimentation tank to remove excess bacteria.

As with trickling, the final step is generally the addition of chlorine to the effluent. If done properly, chlorination will kill more than 99 percent of the harmful bacteria in an effluent. Some

municipalities are now manufacturing chlorine solution on site to avoid the necessity of transporting and storing large amounts of chlorine, sometimes in a gaseous form. Many States now require the removal of excess chlorine before discharge to surface waters. Alternatives to chlorine disinfection, such as ultraviolet light or ozone, are also being used in situations where chlorine in sewage effluents can be harmful to fish and other aquatic life.

### Other Treatment Options

New pollution problems have placed additional burdens on wastewater treatment systems. Today's pollutants may be more difficult to remove from water. Increased demands on the water supply only aggravate the problem. These challenges are being met through better and more complete methods of removing pollutants at treatment plants, or through prevention of pollution at the source. Pretreatment of industrial waste, for example, removes many troublesome pollutants at the beginning, rather than at the end, of the pipeline.



---

The increasing need to reuse water calls for increasingly improved wastewater treatment. Every use of water -- whether at home, in the factory, or on a farm -- results in some change in its quality. To return water of more usable quality to receiving lakes and streams, new methods for removing pollutants are being developed.

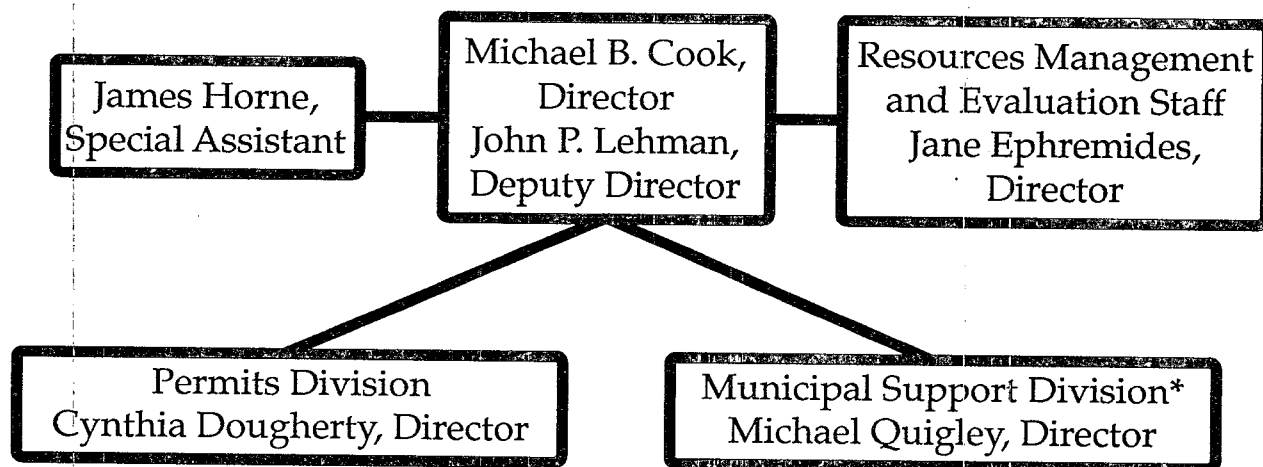
*Advanced waste treatment techniques* in use or under development range from biological treatment capable of removing nitrogen and phosphorus to physical-chemical separation techniques such as *filtration, carbon adsorption, distillation, and reverse osmosis.*

These wastewater treatment processes, alone or in combination, can achieve almost any degree of pollution control desired. As waste effluents are purified to higher degrees by such treatment, the effluent water can be used for industrial, agricultural, or recreational purposes, or even to supplement drinking water supplies.



---

## Office of Wastewater Management ORGANIZATIONAL CHART



- NPDES Program Branch
- Pretreatment and Multi-media Branch
- Water Quality and Industrial Permits Branch
- Construction Grants Branch
- Municipal Assistance Branch
- Municipal Technology Branch
- Program Management Branch
- State Revolving Funds Branch

\* Organization of the Municipal Support Division may change to reflect consolidation and streamlining.





---

- **INFORMATION RESOURCES**

The Office of Wastewater Management provides public access to information about its programs. Please contact the following for additional information about wastewater and other EPA issues.

**FOR DOCUMENTS AND GENERAL INFORMATION ABOUT WATER:**

- Water Resource Center  
U.S. EPA, Mailcode RC-4100  
401 M Street, SW  
Washington, DC 20460  
  
Telephone: 202 260-7786  
Fax: 202 260-0386  
INTERNET: [waterpubs@epamail.epa.gov](mailto:waterpubs@epamail.epa.gov)
- National Small Flows  
Clearinghouse  
West Virginia University  
Post Office Box 6064  
Morgantown, WV 26506  
  
Telephone: 800 624-8301

**FOR SPECIFIC INFORMATION ABOUT WASTEWATER PROGRAMS:**

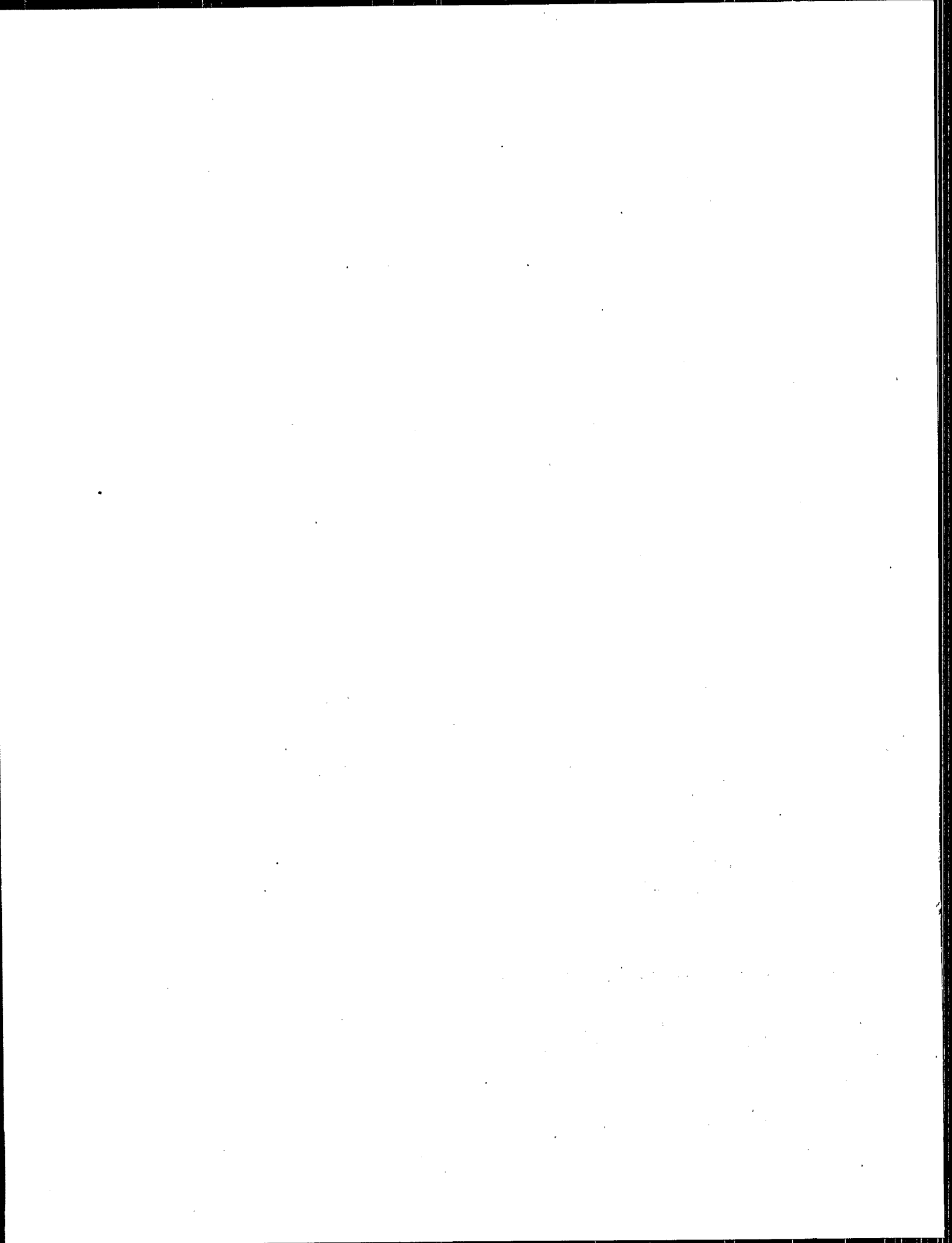
- Resources Management and Evaluation Staff  
Office of Wastewater Management (OWM)  
U.S. EPA, Mailcode 4201  
401 M Street, SW  
Washington, DC 20460  
  
Telephone: 202 260-5835      Fax: 202 260-1156

**FOR GENERAL INFORMATION ABOUT THE U.S. EPA:**

- EPA Public Information Center  
U.S. EPA, Mailcode 3404  
401 M Street, SW  
Washington, DC 20460  
  
Telephone: 202 260-2080      Fax: 202 260-6257

**INFORMATION ABOUT EPA VIA INTERNET:**

- gopher access: [gopher to gopher.epa.gov](gopher:gopher.epa.gov)
- file transfer access: [ftp to ftp.epa.gov](ftp:ftp.epa.gov)





United States  
Environmental Protection Agency  
(4201)  
Washington, DC 20460

Official Business  
Penalty for Private Use  
\$300