

# THE CSO LONG TERM CONTROL PLAN

GREEN CITIES  
CLEAN WATERS

## History and Background The City of Philadelphia

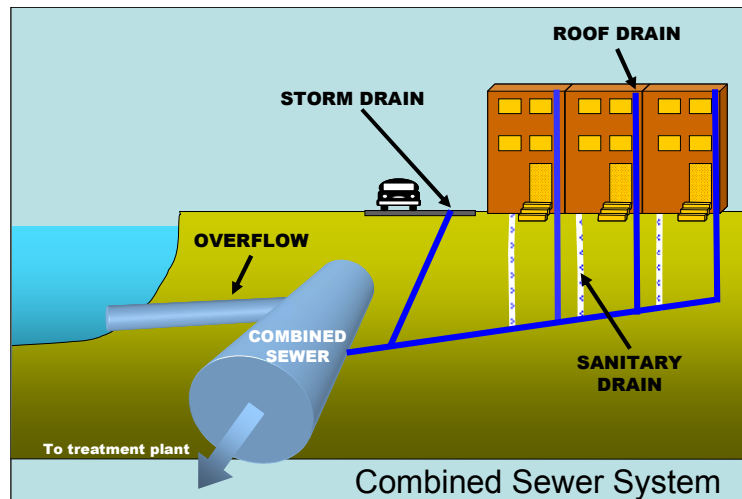


### INTRODUCTION

*Philadelphia is blessed with an abundance of creeks, open space, parkland and beautiful rivers. The Schuylkill and Delaware Rivers are not only scenic; they are the drinking water source for Philadelphia residents. These waterways, however, suffer from pollution from various sources, both within and outside the City limits. One such pollution source: Combined Sewer Overflows (CSOs)\*.*

#### What are Combined Sewer Overflows?

A combined sewer system is a wastewater collection system owned by a municipality which transports wastewater\* from homes, businesses and industry, stormwater\* from storm drains on our city streets and property roof leaders through a single-pipe system to a Water Pollution Control Plant (WPCP).

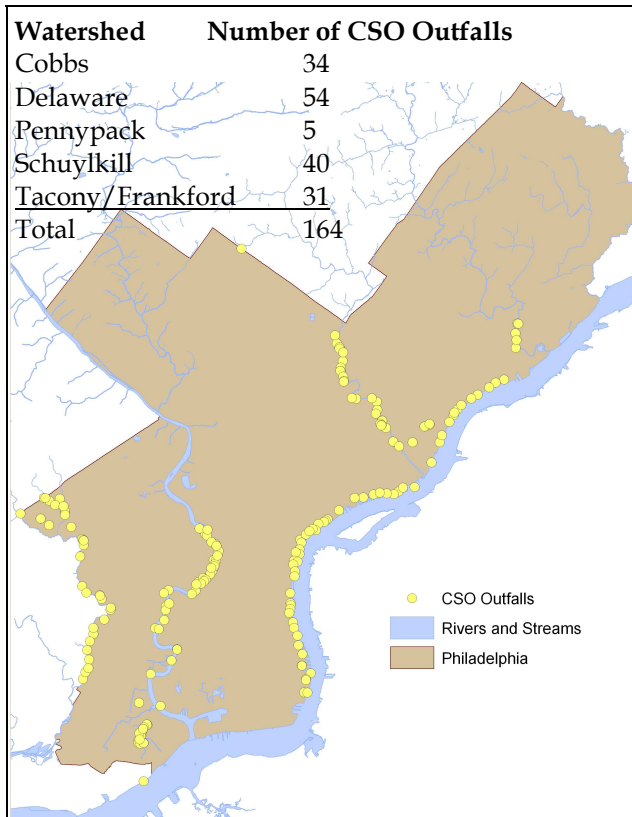


In the City of Philadelphia, during dry weather conditions (when it is not raining) and during very small storm events, combined sewers\* can adequately transport this mixture of sanitary wastewater and stormwater to one of the City's three WPCPs for treatment.

Under heavier rainfall conditions, however, the flow in combined sewers may exceed the capacity of the pipe or treatment facility. As a result, a portion of the wastewater and stormwater may be diverted directly

to a nearby stream or river to prevent the flooding of homes and streets. This is what is known as a Combined Sewer Overflow (CSO). During heavy rainfalls or sudden snowmelts, Philadelphia may experience these overflows in various locations throughout the city from any of its 164 permitted combined sewer outfalls. Overflows from combined sewers may exceed water quality standards (WQS)\*, threaten aquatic life and habitat, and impair the use and enjoyment of the water body.

The definitions of words with an asterisk\* can be found in the glossary at the end of this publication.



CSO outfalls in the City of Philadelphia

### What is the Combined Sewer Overflow Program?

The fundamental goal of the Philadelphia Water Department's (PWD) combined sewer overflow program is to improve and preserve the water environment in the Philadelphia area and to fulfill the PWD's obligations under the Clean Water Act and the Pennsylvania Clean Streams Law by implementing technically viable, cost-effective improvements and operational changes.

The PWD's strategy to attain these goals has three primary phases: the first involves the aggressive implementation of a comprehensive program for Nine Minimum Controls (NMCs); second, planning, design and construction of numerous capital projects that would further enhance system performance and

reduce CSO volume and frequency. The third involves the commitment of significant dollars for services and resources toward comprehensive watershed based planning and analyses that would identify additional priority actions to further improve water quality in Philadelphia area water bodies.

These three phases successively provide comprehensive programs that follow the direction of the EPA CSO Policy and its guidance documents and are consistent with the requirements of the Clean Water Act. The NMCs and the capital improvement program have resulted in implementation of cost-effective, technology-based improvements. They have provided a reduction in CSO volume and frequency and a greater percentage of combined sewer flow transported and treated at the PWD's three wastewater treatment plants.



Combined Sewer Overflow at Crescentville in Philadelphia

### Nine Minimum Controls (NMCs) System "Tune-Up"

In the first phase of the PWD's CSO strategy, and in compliance with its National Pollutant Discharge Elimination System (NPDES)\* permits, the PWD submitted to the Pennsylvania

Department of Environmental Protection (PADEP) on September 27, 1995, CSO Documentation: Implementation of Nine Minimum Controls (NMCs). The NMCs are low-cost actions or measures that can reduce CSO discharges and their effect on receiving waters\*, do not require significant engineering studies or major construction, and can be implemented in a relatively short time frame. This program ensures that our existing sewer system is operating to the best of its ability, providing a "tune-up" to the existing infrastructure.

To provide information needed for the development of the NMCs program, the PWD instituted a \$6.5 million initiative aimed at upgrading its comprehensive system flow monitoring network. This program provides information necessary to identify and eliminate dry weather overflows, monitor system performance and operation, and configure and calibrate computer hydraulic models needed to develop the NMCs and long-term CSO control plans.

Extensive data from the PWD's Geographic Information System (GIS), flow monitoring system, the U.S. Army Corps of Engineer's Storage, Treatment, Overflow, Runoff Model (STORM), and the EXTRAN and RUNOFF blocks of the U.S. EPA Stormwater Management Model (SWMM) were used to support each phase of the CSO program. These tools were developed to support concept engineering through implementation and post-construction monitoring. The monitoring system, models, and GIS have and will serve as the basis for planning improvements and enhancing operation of the sewerage system over the long-term.

For more details on the NMCs, please visit the U.S.EPA on-line at: [http://cfpub.epa.gov/npdes/home.cfm?program\\_id=5](http://cfpub.epa.gov/npdes/home.cfm?program_id=5).

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### **Capital Projects**

#### **Design and Build New Combined Sewer System Components**

The second phase of the PWD's CSO strategy has been focused on technology-based capital improvements to the City's sewerage system that have and will further increase its ability to store and treat combined sewer flow, reduce inflow to the system, eliminate flooding due to system surcharging, decrease CSO volumes and improve receiving water quality. The recommended capital improvement program is the result of a detailed analysis of a broad range of technology-based control alternatives. The capital improvement plan encompasses the three major areas of the City that are affected by CSOs: the Northeast, Southeast and Southwest drainage districts. Capital projects were selected by the PWD to provide significant CSO load reduction.

The total estimated cost of the selected capital improvement projects as of 1997 was in excess of \$48 million. However, to date, current expenditures and future estimates bring this number to over \$100 million. Hydraulic and hydrologic model simulations indicate that annual CSO volumes will be reduced by over two billion gallons system-wide in a typical hydrologic (average rainfall) year, upon completion of all these projects.

These significant, technology-based projects may not, in and of themselves,

bring receiving waters into compliance with all water quality standards. Additional management plans, actions and projects needed to attain water quality standards will be defined through the process of watershed planning, as discussed below. However, these projects will not only reduce overall loadings, but will hopefully encourage other point\* and non-point source\* dischargers to implement similar technologies, over and above what their current permit mandates, while the development of a comprehensive watershed management plan proceeds.

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### **Watershed Management & Watershed Partnerships - Integrated, Regional Watershed Planning & Implementation**

The third component of the City's CSO strategy involves a substantial commitment by the City to conduct watershed planning to identify long term improvements throughout the watershed, including possibly additional CSO controls that will result in further improvements in water quality, and ultimately, the attainment of water quality standards. The need for this watershed initiative is rooted in the fact that insufficient physical, chemical and biological information currently exists on the nature and causes of water quality impairments, sources of pollution, and appropriate remedial measures. In addition, Philadelphia is downstream, meaning that the headwaters, some tributaries, and upper segments of our rivers and streams reside in municipalities north of Philadelphia. We do not always know the source, nor can we control stormwater runoff\* or other pollutants\* flowing into our streams above

the city's boundaries. This creates a unique challenge in our goal to attain water quality standards, especially with respect to the effects of wet weather discharges and receiving water dynamics. These watershed realities have led to a broader, national recognition of the need for regional, watershed-based planning and management to properly define water quality standards and goals. Therefore, the PWD has adopted a holistic approach - a watershed management approach to control pollution to rivers and streams. This approach evaluates the impacts of both point and non-point pollution sources and aims to find regional, watershed solutions to restore water quality. Because watersheds are defined by natural features and do not adhere to

*A watershed refers to the land that drains stormwater (rain or melting snow) to a specific body of water, such as a river or stream.*

political boundaries, the PWD believes that watershed management is the most practical and effective way to manage pollution and improve water quality.

Through PWD's watershed management plans, water quality impairments are identified and addressed via comprehensive watershed based planning, stream water quality analysis, baseline water quality monitoring and the assessment of watershed-wide pollutants.

Consequently, the major sources of the impairments are explored, modeled, and defined to understand how to attain regulatory water quality standards and establish programs that will continue to monitor and ensure permanent improvements in water quality. The PWD forms partnerships with its suburban neighbors, businesses and industries, community and non-profit groups and all other watershed stakeholders to evaluate our regional watersheds and to develop an effective watershed management plan. To be successful, watershed management plans must be adopted and implemented by all participating stakeholders and their constituents.

To date, the PWD has initiated the formation of watershed partnerships in all of the City's watersheds. The combined sewer watersheds include the Darby-Cobbs Watershed Partnership, Tookany/Tacony - Frankford Watershed Partnership and Pennypack Watershed Partnership, while the separate sewer watersheds include the Poquessing Watershed Partnership and the Wissahickon Watershed Partnership. The Schuylkill Watershed is represented by the Schuylkill Action Network (SAN), a partnership of the City of Philadelphia, federal and state agencies, and local watershed groups protecting the drinking water supply in the Schuylkill River watershed.

This fall, the remaining watershed partnership will be formed - the Delaware Direct Watershed Partnership.



Tacony Creek

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## *Glossary\**

*Definitions are from the U.S. EPA Glossary unless marked with † symbol. Non-EPA definitions are cited.*

### **Combined Sewer Overflow (CSO)**

Discharge of a mixture of storm water and domestic waste when the flow capacity of a sewer system is exceeded during rainstorms.

### **Combined Sewer System (CSS)**

A sewer system that carries both sewage and storm-water runoff. Normally, its entire flow goes to a waste treatment plant, but during a heavy storm, the volume of water may be so great as to cause overflows of untreated mixtures of storm water and sewage into receiving waters. Storm-water runoff may also carry toxic chemicals from industrial areas or streets into the sewer system.

### **Indirect Discharge**

Introduction of pollutants from a non-domestic source into a publicly owned waste-treatment system. Indirect dischargers can be commercial or industrial facilities whose waste enter local sewers.

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

A provision of the Clean Water Act which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.

### **Non-Point Source**

Diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. In Philadelphia, examples include stream bank erosion and construction.

### **Point Source**

A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution; e.g. a pipe, ditch, ship, ore pit, factory smokestack. Municipal sewer systems are regulated as point sources.

### **Pollutant**

Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

### **Receiving Waters**

A river, lake, ocean, stream or other watercourse into which wastewater or treated effluent is discharged.

### **Run-off**

That part of precipitation, snow melt, or irrigation water that runs off the land into streams or other surface-water.

### **Sanitary Sewer**

Underground pipes that carry only domestic or industrial waste, not storm water.

### **Sanitary Sewer Overflow (SSO)<sup>†</sup>**

Untreated or partially treated sewage overflows from a sanitary sewer collection system. *Definition from Philadelphia Water Department, Office of Watersheds.*

### **Stormwater<sup>†</sup>**

The water that runs off surfaces such as rooftops, paved streets, highways and parking lots. It can also come from hard grassy surfaces like lawns, play fields, and from graveled roads and parking lots. *Definition from King County, Water and Land Resources Division.*

### **Wastewater**

The spent or used water from a home, community, farm, or industry that contains dissolved or suspended matter. **Water Pollution:** The presence in water of enough harmful or objectionable material to damage the water's quality.

### **Water Quality Standards (WQS)**

Water quality standards are provisions of state or federal law which consist of a designated use or uses for the waters of the United States, water quality criteria to protect the most sensitive uses for such waters, and an antidegradation policy and implementation procedures to protect water quality. Water quality standards are established to protect the public health or welfare, enhance the quality of water and serve the purposes of the CWA.