

Section 1

Background

This section details the reasons for developing the Tookany/Tacony-Frankford Integrated Watershed Management Plan, or TTFIWMP, and the purposes the plan is intended to serve. It provides an orientation to various facets of the TTF Watershed itself (geographical, ecological, historical, cultural, etc.), and it describes the TTF Partnership, which was involved throughout the plan's development and will be instrumental to its implementation. Finally, the overall watershed planning and regulatory framework is outlined in Sections 1.4 – 1.7.

The Tookany/Tacony-Frankford Integrated Watershed Management Plan (TTFIWMP) is based on a carefully developed approach to meet the challenges of watershed management in an urban setting. It is designed to meet the goals and objectives of numerous water resources related regulations and programs, and it utilizes adaptive management approaches to prescribe implementation recommendations. Its focus is on attaining priority environmental goals in a phased approach, making use of the consolidated goals of the numerous existing programs that directly or indirectly require watershed planning.

1.1 What Is a Watershed and Why a Plan?

Consider this vision, as presented by the Tacony-Frankford River Conservation Plan:

"Welcome to our world – a world that includes a Tacony Creek that is beautiful and full of life. A world that boasts a Tacony Creek Park and a host of community green spaces that make the heart leap at the beauty of nature. A world that offers the residents of the watershed opportunities to bike, run and play at its recreation centers and parks. A world that recognizes that a community that values and protects its natural spaces is a community that will economically and culturally thrive."

A watershed is a natural formation including land and communities connected by the drainage area of a water body (Figure 1.1). Simply said, the health of a stream depends on the quality of the land surrounding it, which in turn relies on the people charged with the care for that land. How do we care for an urban watershed? By addressing practices of the past, including paving the land and piping the stormwater, which took place as the area was urbanized. These practices were deemed an important step in development at the time, but they have had a devastating impact on the natural environment. As scientific knowledge and values have changed over time, we have realized that we can have both a vibrant community and healthy natural resources, and that the two can reinforce one another.

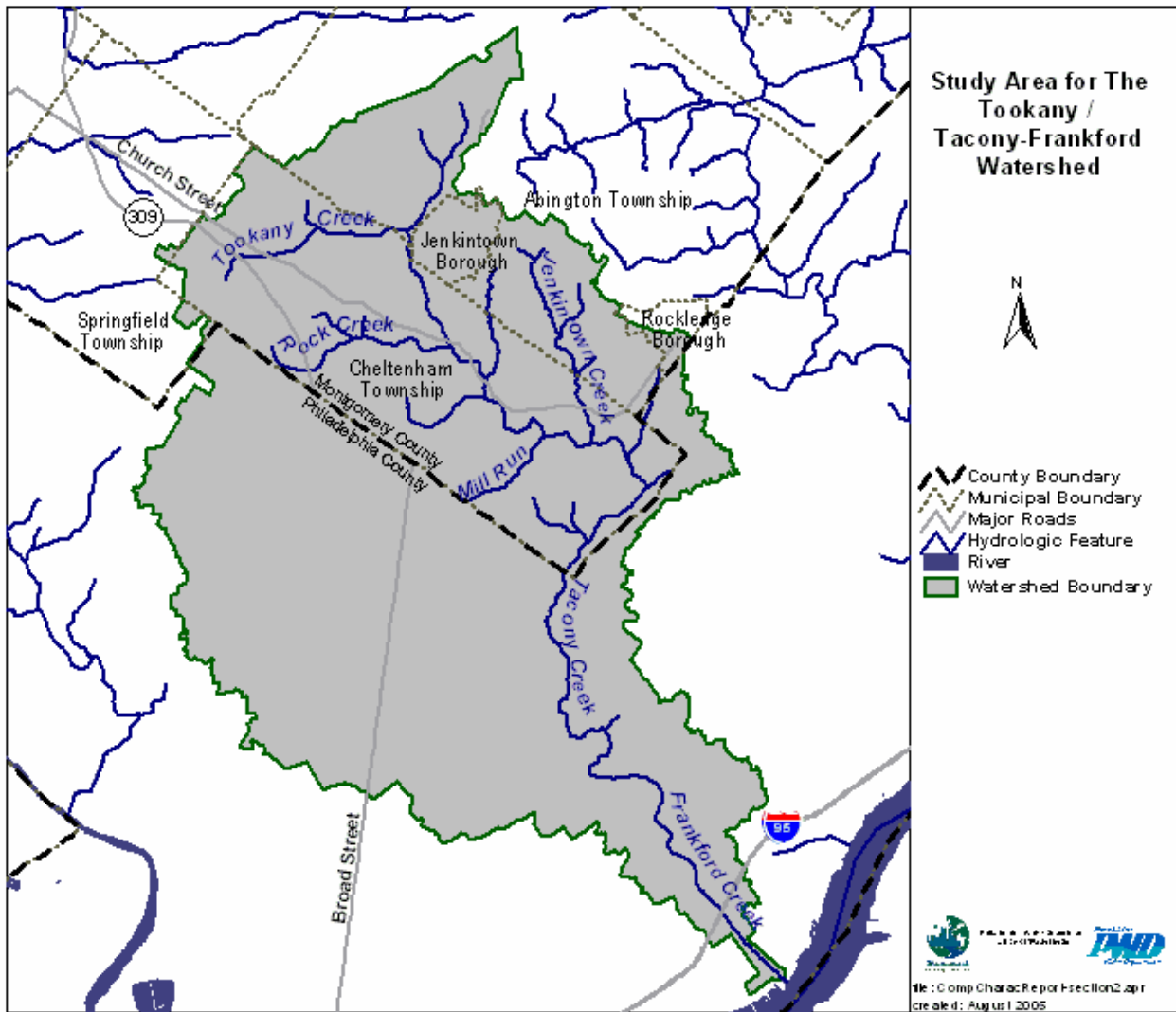


Figure 1.1 Tookany/Tacony-Frankford Watershed Study Area

An integrated watershed management plan is a long-term road map designed to achieve these twin goals of a healthy community and healthy natural resources. An integrated plan embraces the laws designed to save our streams, preserves the streams’ ecology, and enhances the parkland and riparian buffers that shelter these streams. The plan also reaches out to include the best of municipal and conservation planning that strives to ensure that growth within the watershed occurs with particular care to the environment. Most importantly, the plan incorporates a diversity of people who live, work, and dream in all areas of the watershed. People provide the catalyst for change, the energy to create the plan, and the vigilance to sustain the plan. These people, the stakeholders, become the watershed’s guardians – the keepers of the integrated plan.

The Tookany/Tacony-Frankford Partnership has provided a forum for stakeholders to work together to develop strategies that embrace our dual focus of improving stream water quality as well as the quality of life in our communities. Stakeholders care with their minds, hearts, and hands. TTF stakeholders include various government agencies – regulatory agencies, whose jobs empower them to guard the quality of our rivers and streams, as well as counties and

municipalities, separate political entities bound together by nature. Stakeholders also include all those groups – nonprofit groups, neighborhood groups, religious groups, and schools – who define themselves as environmental advocates. Finally, stakeholders include concerned citizens who care about the state of their natural environment and their own quality of life.

Stakeholders have come together to discuss visions for the watershed. They shared thoughts of what they would like to see in our streams, parks, and neighborhoods. They are passionate about the possibilities – of revived aquatic and plant life, of streams that flow naturally, of parks that appear lush and inviting, of wetlands, and of meadows and woods that abound with wildlife. Together, we decide that our visions must become a reality.

The TTF Partnership discussed priorities and the actions necessary to make our initiative a successful one. These actions have become our strategy, and they address our desire to improve our water and land environment through a number of avenues. The TTFIWMP is built upon the foundation of environmental regulations, already in place and providing the impetus for stakeholders to work together to meet watershed goals. The plan's framework includes a number of elements – innovative land use controls and best management practices, improvements to piping and other conveyance systems, restoration of damaged stream corridors, and education and public awareness. These components, like good building materials, can result in a solid, sustainable structure, a plan that will result in a healthier and greener environment.

Stakeholders are committed to implementing the plan while canvassing for funds to nurture and sustain it, and they look to our governments and to stakeholders to contribute the dollars, expertise, and people to make their vision a reality. We will review our plan on a regular basis to ensure that it remains vital and to measure incremental successes that place us on the path of achieving our long-term goals. We share our plan with the residents of the watershed, showing how it works, and how each of them plays a part in its success. We empower them to share in our vision of a vital, dynamic watershed.

We look for solutions on the land where rainfall drains to our waterways, in the underground infrastructure that carries rainwater and wastewater away, and in and along our streams where natural ecosystems should thrive. As champions of our water resources, we believe this approach benefits not only our water environment, but also the region's physical, social, and economic environment.

1.2 Brief History of the Tookany/Tacony-Frankford Watershed

As part of both River Conservation Planning (RCP) initiatives, the Tookany/Tacony-Frankford Watershed Partnership has compiled a brief history of the watershed, including Tookany Creek. Portions of this history are reproduced here exactly as they appear in the RCPs.

Prior to the European settlement in the early 1600s, the area that is now Philadelphia was inhabited by the Lenape Indian tribe. The Lenape people, referred to as Delaware Indians by European Settlers, considered themselves the “original people.” Lee Sultzman, in his *History of Delaware*, indicates that there was a widespread belief among native peoples that the Lenape were the original tribe of Algonquin speaking peoples to inhabit the area.

The Unami band of Lenapes occupied the territory of Pennsylvania and New Jersey from Staten Island to just south of Philadelphia. The Unamis were not a politically cohesive group, but shared common language and cultural characteristics.

The Lenape people lived in villages and depended on agricultural crops such as squash and corn as their primary source of sustenance. Men of the tribe supplemented the tribe’s diet through hunting and fishing. Tribal government consisted of three sachems or captains that represented the three matrilineal clans that comprised Lenape society. The head chief was always from the Turtle clan, although the position was elected and not strictly hereditary. The other two clans were the Wolf and Turkey clans.

First contact between the Lenape and Europeans (primarily Dutch explorers) occurred in the early 1600s. The Tacony-Frankford Watershed was colonized in the mid seventeenth century by different groups of immigrants. Swedes and Finns traveling up the Delaware River were the first European inhabitants of the Tacony Creek Valley, while Germans fleeing religious persecution settled in the western portion of the watershed in what is now Germantown. In 1664, the land that is southeastern Pennsylvania was surrendered to the English by the Dutch. In 1681, King Charles II of England granted William Penn 40,000 acres of land in the Delaware Valley as repayment for a debt owed to Penn’s father. The entire Tookany/Tacony-Frankford Watershed lies within the area of this land grant. With the establishment of Penn’s colony, English settlers flocked to the region, establishing homesteads, plantations, and towns.

The Tacony Creek and surrounding valley was primarily developed as an area of agriculture and milling operations. The Tacony Creek was dammed several times for mills and become a center for industrial operations during the late eighteenth and early nineteenth centuries. Expansion of the city in the late 1800s converted farmland into residential neighborhoods. Active agriculture persisted in the upper watershed until the early 1900s. Land for the Tacony Creek Park was purchased by the city in 1915, while land was being consumed for the need for new housing. The park was added to in 1939, and now occupies 302 acres. High-density housing characterizes the development of the area after the 1940s.

1.3 Watershed Description and Demographics

The Tookany/Tacony-Frankford Watershed is defined as the land area that drains to the Delaware River via that variously named creek. The Tookany/Tacony-Frankford study area includes parts of Montgomery County and a portion of Philadelphia County and covers a total of approximately 29 square miles, or about 20,000 acres. Figure 1.1 includes the watershed boundaries, hydrologic features, and political boundaries. The creek is referred to as the Tookany Creek until it enters Philadelphia at Cheltenham Avenue. It is then called the Tacony Creek from that Montgomery County border until the confluence with the historical Wingohocking Creek in Juniata Park. The section of stream from Juniata Park to the Delaware River is referred to as the Frankford Creek, and is underlain by a concrete channel.

The streams in the western portion of the watershed are contained in pipes and combined sewer infrastructure. Historic streams, including the Wingohocking Creek, Rock Run, and Little Tacony Creek, were encapsulated in combined sewers to facilitate the development of this watershed in the early twentieth century. Combined sewers convey sanitary waste, as well as stormwater to the city's wastewater treatment facilities. The total number of stream miles in this study is 14.4 miles in the mainstem creek and approximately 31.9 miles of encapsulated tributaries.

The drainage area is highly urbanized both in the lower reaches, which are primarily located in Philadelphia County, and in the upper reaches; however, that upper portion, included mainly in Montgomery County, is characterized by a more varying mixture of land uses. The population of the entire drainage area, based on 2000 census data, is approximately 331,400 people. This yields an average population density of approximately 16 -17 persons/acre.

In addition to CSO discharges to Frankford Creek from the City of Philadelphia, the drainage area receives a significant amount of point and non-point source discharges that impact water quality. According to the USGS data for the study area, the breakdown by sewer type is as follows: combined sewer areas make up 9,800 acres, or 47% of the drainage area; separate sewers, including areas outside of the City of Philadelphia, account for 9,200 acres or 44% of the drainage area; and non-contributing sewers make up 1,900 acres or 9% of the drainage area.

The waters in the drainage area receive point source discharges including CSOs and other urban and suburban stormwater, sanitary sewer overflows, and industrial storm, process, and cooling waters. Non-point sources in the basin include atmospheric deposition, overland runoff from urban and suburban areas, and potentially some remaining individual on-lot domestic sewage systems discharging through shallow groundwater.

In a relatively undisturbed watershed, the watershed boundaries follow topographic high points or contours. The U.S. Geological Survey (USGS) has further subdivided the Tookany/Tacony-Frankford Watershed based on topography, as shown in Figure 1.2. These USGS subwatersheds are determined from the land area draining to a particular point of interest, such as a stream confluence or gauging site. These boundaries allow initial determinations of drainage areas and modeling elements. However, it is important in the urban environment to include the effects of man-made changes to natural drainage patterns. In the Philadelphia portion of the watershed, drainage areas were adjusted to account for the combined sewer system drainage boundaries.

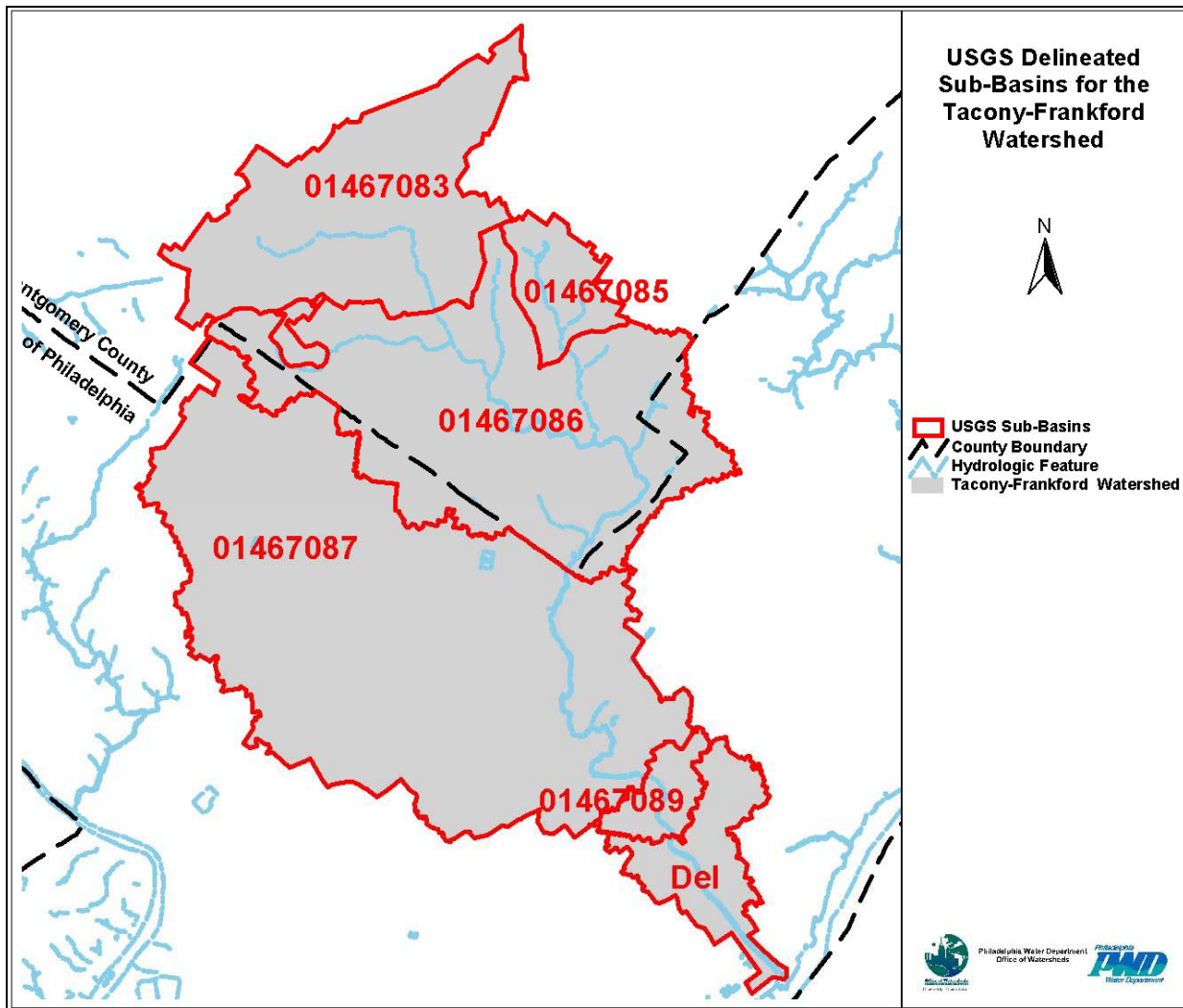


Figure 1.2 USGS Topographic Subwatersheds of the Tookany/Tacony-Frankford Watershed

Geology and Soils

Geology and soils play a role in the hydrology, water quality, and ecology of a watershed. The middle and upper reaches of the study area are in the Northern Piedmont Ecoregion (EPA Enviromapper). The Piedmont is characterized by ridges, hills, and deep narrow valleys. Elevation can vary from 40 feet at the fall line to 400 feet at the ridge tops. The topography of the study area is level except for steep slopes along the banks of the Tacony Creek. This section of the watershed is generally underlain by metamorphic and igneous geologic formations, predominately the Wissahickon Formation with small areas of gneiss and hornblende. These formations are exposed where the Tacony Creek has eroded overlying sediments to the bedrock (PA DEP 2001).

The lower portion of the watershed lies within the Middle Atlantic Coastal Plain Ecoregion. This is an area of low relief. Historically, the coastal plain in the city of Philadelphia was tidal marsh. These marshes were filled and paved over for urban development (PA DEP 2001). The topography of the coastal plain is gently sloping with elevations from 0 to 40 feet above sea level. The coastal plain is mainly comprised of unconsolidated sand and clay. These sands and clays are represented by the Pennsauken Formation, which was deposited in the Cretaceous

period, and unconsolidated sand and clay (Trenton Gravel) deposited during the current quaternary geologic period.

Figure 1.3 displays a map of the geologic formations within the study area. The following are generalized descriptions of the geologic formations:

- **Wissahickon formation:** Typically a phyllite comprised of quartz, feldspar, muscovite, and chlorite. Moderately resistant to weathering. Fractures in platy patterns.
- **Mafic Gneiss, hornblend bearing:** Medium to fine grained, dark colored calcic plagioclase, hyperthene, augite, and quartz. Highly resistant to weathering.
- **Pennsauken formation:** Sand and gravel yellow to dark reddish brown, mostly comprised of quartz, quartzite, and chert. Deeply weathered floodplain formation.
- **Bryn Mawr formation:** White, yellow, and brown gravel and sand. Deeply weathered formation.
- **Quaternary deposits (Trenton gravel):** Unconsolidated sand and clays deposited by the Delaware River during the current geologic period.

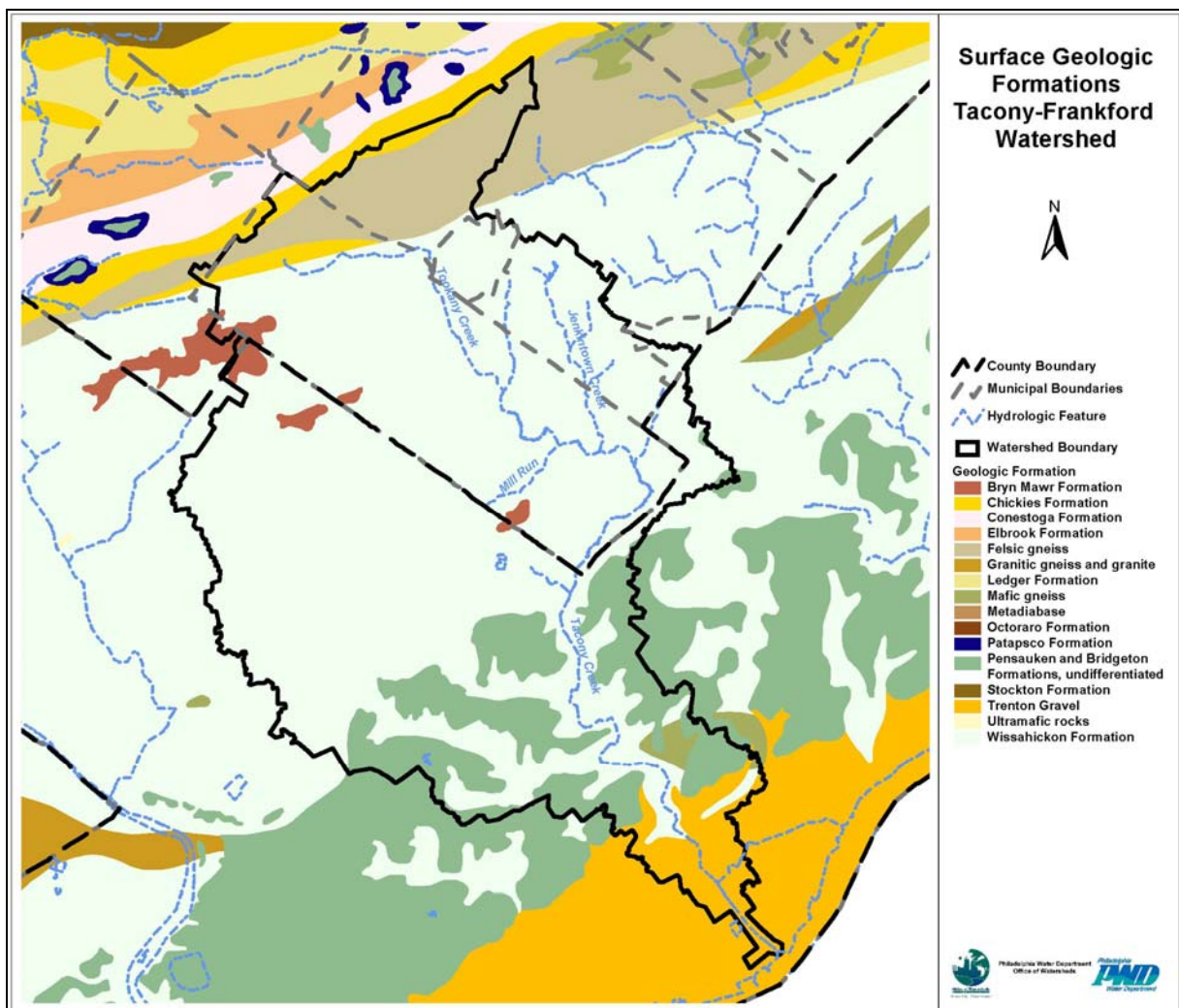


Figure 1.3 Surface Geologic Formations of the Tookany/Tacony-Frankford Watershed

Soils in the United States have been assigned to Hydrologic Soil Groups (HSG). The assigned groups are listed in Natural Resources Conservation Service Field Office Technical Guides, published soil surveys, and local, state, and national soil databases. The Hydrologic Soil Groups, as defined by NRCS engineers, are A, B, C, D, and dual groups A/D, B/D, and C/D.

Soils in hydrologic group A have low runoff potential. These soils have a high rate of infiltration when thoroughly wet. The depth to any restrictive layer is greater than 100 cm (40 inches) and to a permanent water table is deeper than 150 cm (5 feet).

Soils that have a moderate rate of infiltration when thoroughly wet are in hydrologic group B. Water movement through these soils is moderately rapid. The depth to any restrictive layer is greater than 50 cm (20 inches) and to a permanent water table is deeper than 60 cm (2 feet).

Hydrologic group C soils have a slow rate of infiltration when thoroughly wet. Water movement through these soils is moderate or moderately slow; they generally have a restrictive layer that impedes the downward movement of water. The depth to the restrictive layer is greater than 50 cm (20 inches) and to a permanent water table is deeper than 60 cm (2 feet).

Soils in hydrologic group D have a high runoff potential. These soils have a very slow infiltration rate when thoroughly wet. Water movement through the soil is slow or very slow. A restrictive layer of nearly impervious material may be within 50 cm (20 inches) of the soil surface and the depth to a permanent water table is shallower than 60 cm (2 feet).

Dual Hydrologic Soil Groups (A/D, B/D, and C/D) are given for certain wet soils that could be adequately drained. The first letter applies to the drained and the second to the undrained condition. Soils are assigned to dual groups if the depth to a permanent water table is the sole criteria for assigning a soil to hydrologic group D.

The HSG rating can be useful in assessing the ability of the soils in an area to recharge stormwater or to accept recharge of treated wastewater or to allow for effective use of septic systems. Figure 1.4 shows the hydrologic soil groups in the study area. The map indicates that most of the study area contains soil in the hydrologic category B, with some areas at the downstream end shown as category C. This means that most of the study area has soils that have a moderate to high rates of infiltration when thoroughly wet, and water movement through these soils is generally rapid. This has implications for the design of stormwater infiltration systems, and also affects the amount of water that needs to be infiltrated in newly developing areas to maintain predevelopment or natural infiltration rates. The HSG classification is also used when doing stormwater runoff calculations for site development design, and was used in this study in developing the SWMM model runoff calculations.

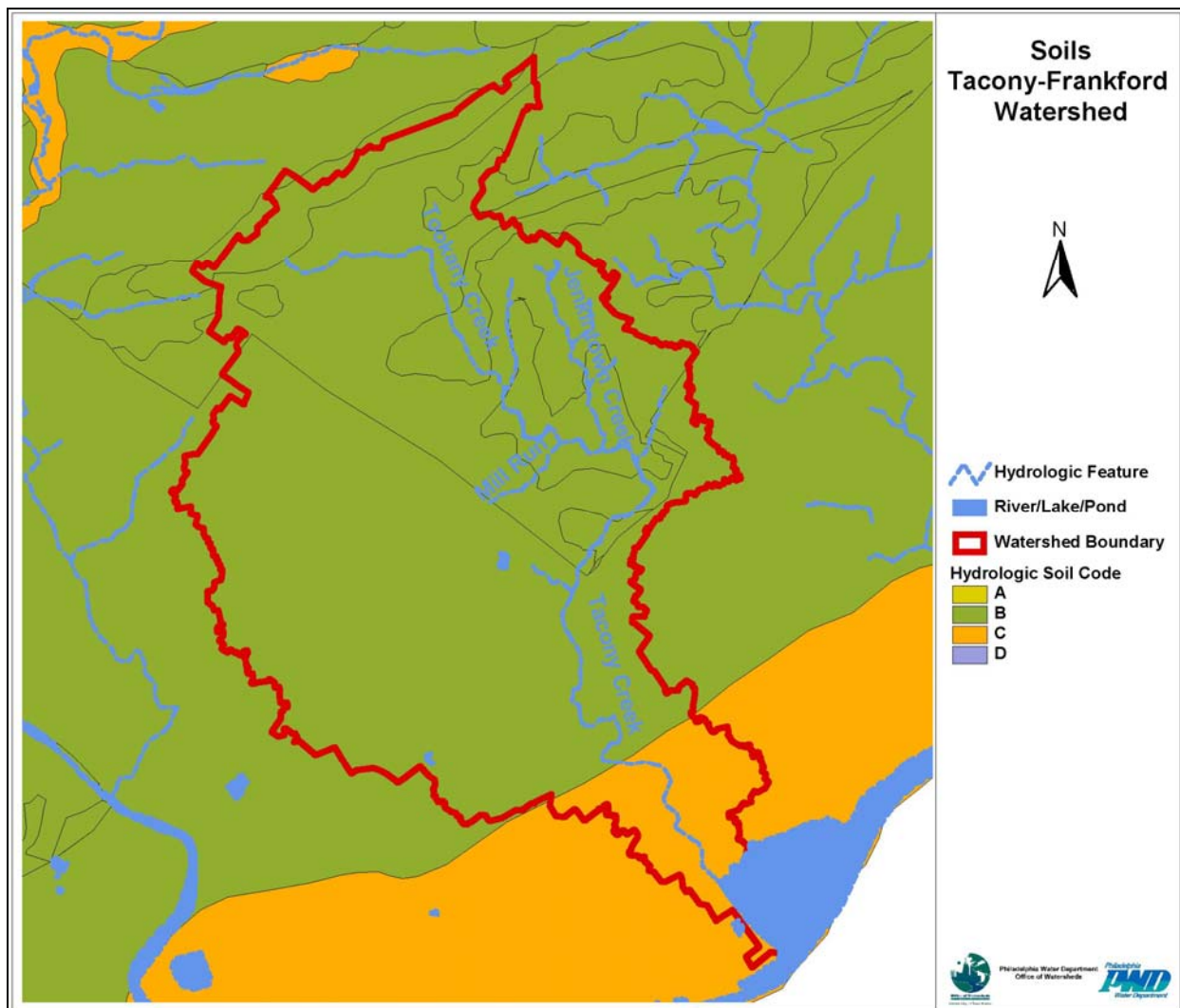


Figure 1.4 Hydrologic Soil Groups in the Tookany/Tacony-Frankford Watershed

Demographic Information

Population density and other demographic information in the watershed are available from the results of the 2000 Census. Approximately 357,104 people live within the drainage area of the Tookany/Tacony-Frankford Creek. Figure 1.5 shows the population density in the watershed at the census block level. Spatial trends in population correspond closely to land use, with multiple-family row homes displaying the greatest population density of 20 people per acre or more, single-family homes displaying a lower density, and other land use types displaying the lowest density. In addition to population data, the U.S. Census Bureau provides a range of socioeconomic data that are often useful in watershed planning and general planning studies. Median household income and mean home value (Figures 1.6 and 1.7) are two of the many sample datasets provided.

The population density of a residential area is related closely to its imperviousness and thus to the quantity and quality of runoff produced. Figure 1.5 depicts the population density in people per acre for the watershed area.

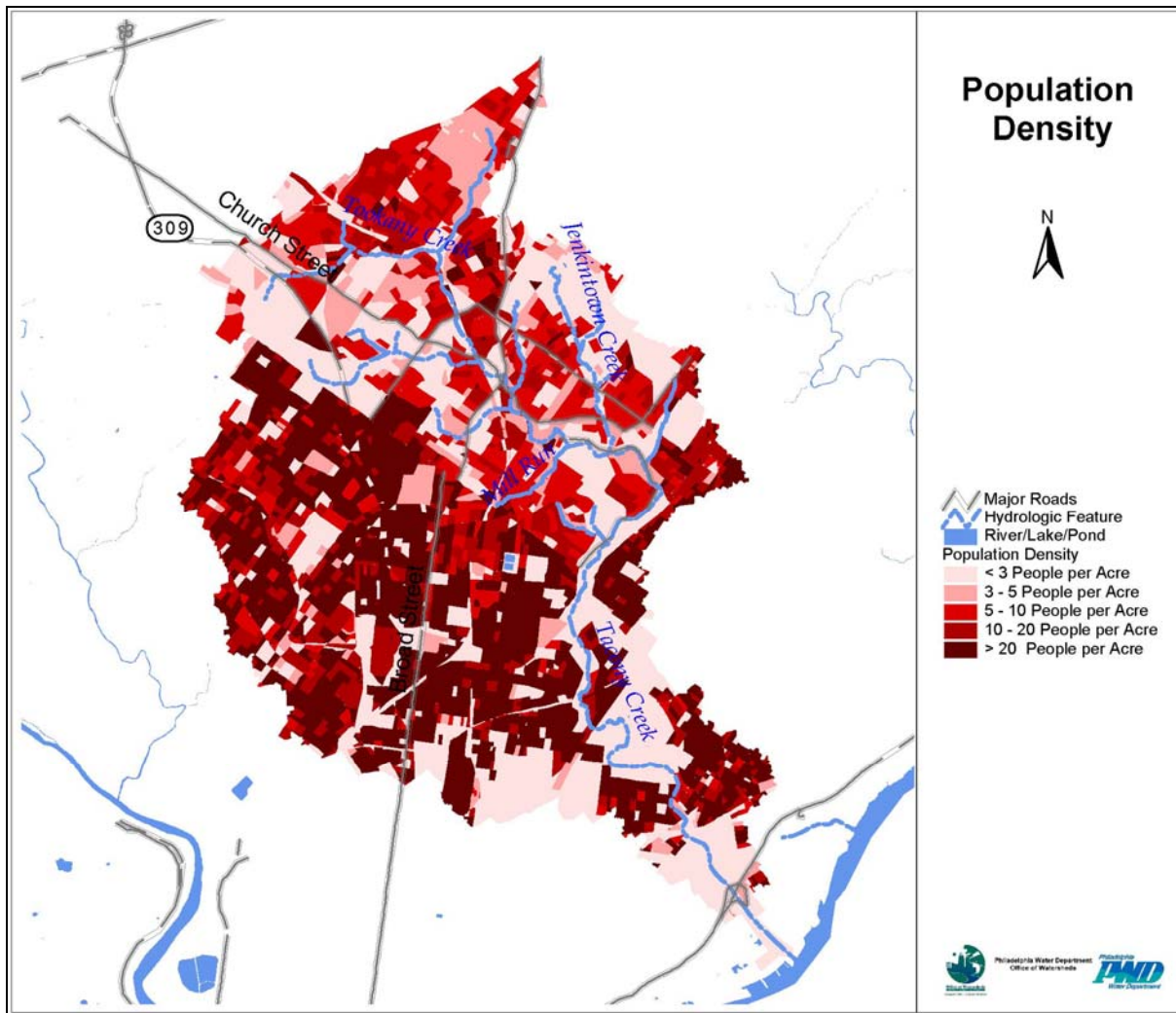


Figure 1.5 Population Density of the Tookany/Tacony-Frankford Watershed (Source: 2000 US Census)

Within the Tookany/Tacony-Frankford drainage area, based on 2000 census data, are 357,104 people. Represented by county, this corresponds to 59,456 people in the Montgomery County portion and 297,648 people in the Philadelphia County portion. The average population/acre in each county is determined to be 7 people/acre for Montgomery County and 24 people/acre for Philadelphia County. Based on this quantitative data and the visual data from the figure above, it is evident that Philadelphia County is more heavily populated than Montgomery County. Therefore, the combination of contributions from both counties yields an overall average (area-weighted) population density of approximately 17 persons/acre.

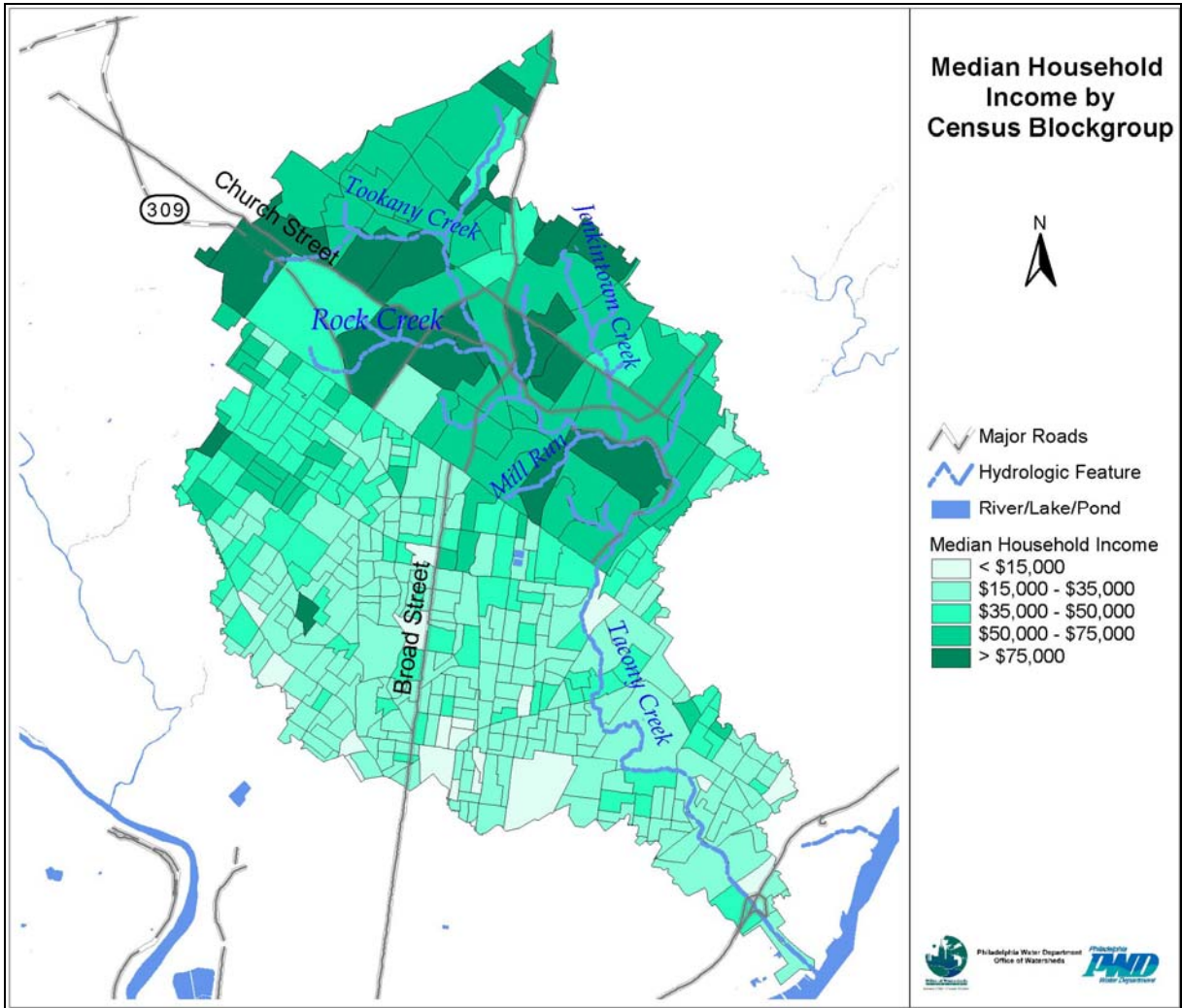


Figure 1.6 Median Household Income in the Tookany/Tacony-Frankford Watershed (Source: 2000 US Census)

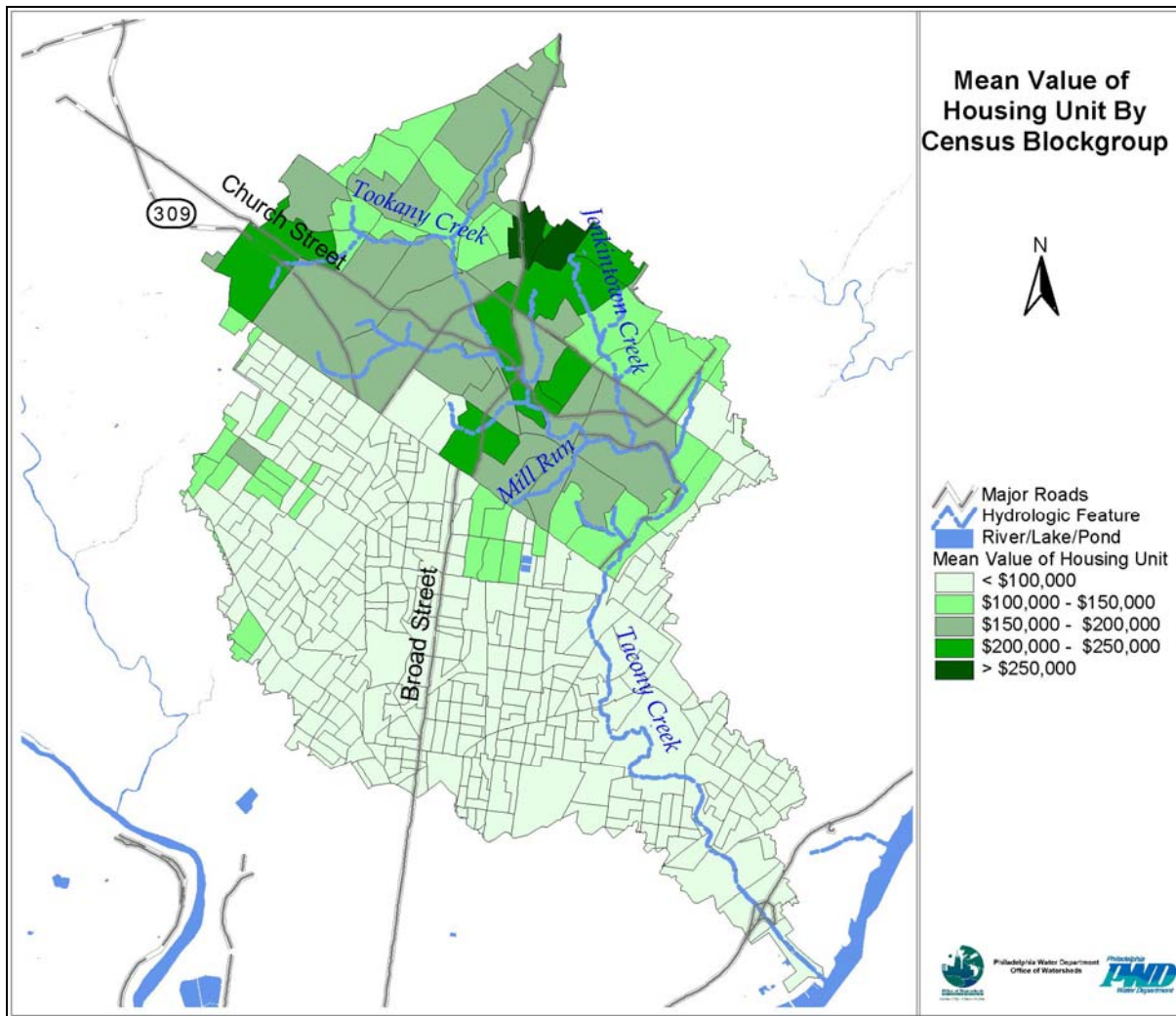


Figure 1.7 Mean Home Value in the Tookany/Tacony-Frankford Watershed (Source: 2000 US Census)

Figure 1.8, below, shows numerical population change, based on municipality areas within the watershed, from the 1990 to year 2000 census. This graph shows that all municipalities except Cheltenham have experienced slight losses in population and also a loss in population watershed-wide.

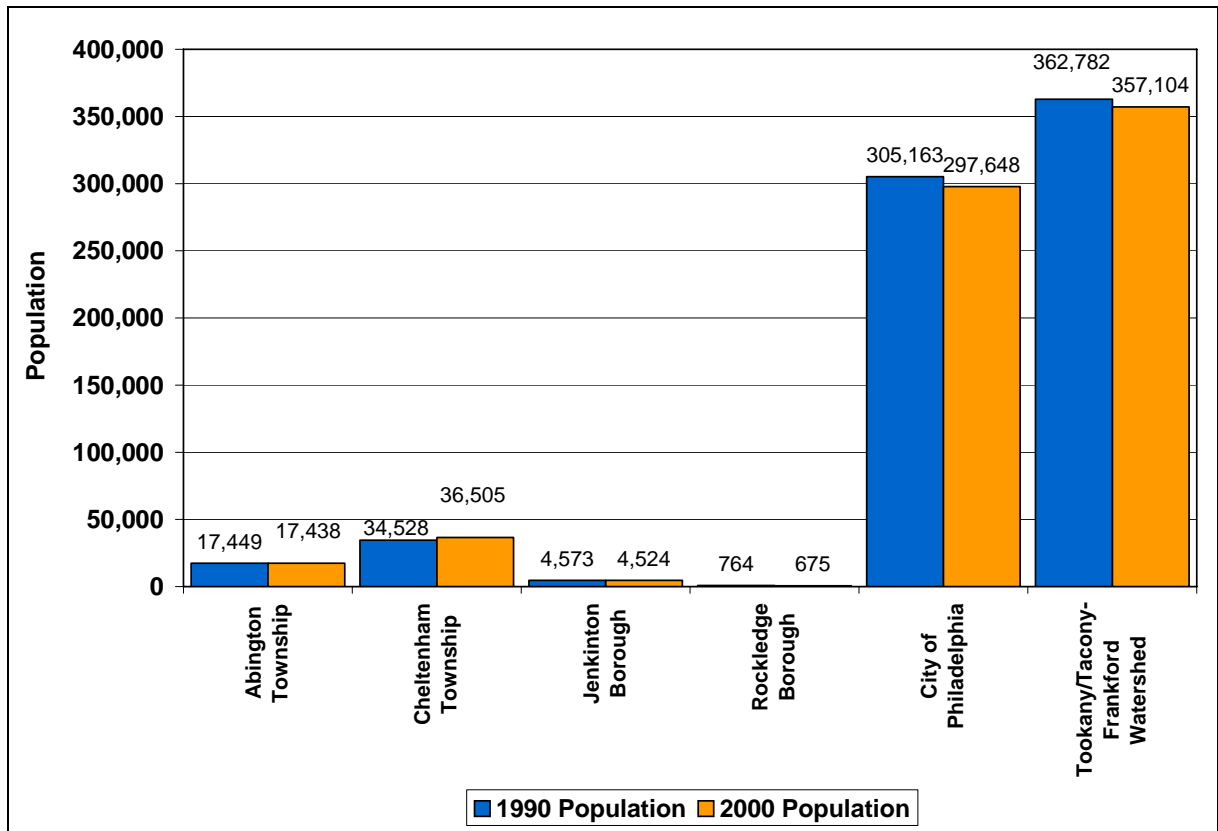


Figure 1.8 Population Change 1990-2000 in Tookany/Tacony-Frankford Watershed (Source: 2000 US Census)

1.4 Comprehensive Planning and the Regulatory Framework

In many states, numerous federal and state regulations and programs are aimed at improving the water quality and flow patterns in urban streams, while at the same time reducing flooding. Pennsylvania is no exception; the U.S. EPA and the Pennsylvania Department of Environmental Protection (PA DEP) have a complex regulatory framework for managing water resources with frequently overlapping demands and requirements. There are five major regulatory programs that contain significant elements related to watershed management in the Tookany/Tacony-Frankford Watershed. These are:

- the NPDES Phase I and Phase II stormwater regulations to control pollution due to stormwater discharges from municipal stormwater systems;
- the stormwater management PA Act 167 to address management of stormwater runoff quantity particularly in developing areas;
- PA Act 537 sewage facilities planning to protect and prevent contamination of groundwater and surface water by developing proper sewage disposal plans;
- the TMDL process to improve water quality on impaired streams and water bodies; and
- EPA's Combined Sewer Overflow (CSO) Control Policy to minimize mixed sewage and stormwater overflowing directly into streams.

Each of these programs, described on the pages that follow, provides guidelines that are transformed into a series of planning objectives within the watershed management planning process, leading directly to the selection of watershed management options to address those objectives.

1.4.1 NPDES Stormwater Rules

In response to the 1987 Amendments to the Clean Water Act (CWA), the Environmental Protection Agency (EPA) developed Phase I of the NPDES Stormwater Program in 1990. Phase I required NPDES (National Pollutant Discharge Elimination System) permits for all stormwater discharging from storm sewers (MS4s) of medium and large urban areas with populations of 100,000 or more. It also required permits from eleven categories of industrial activity, including construction activities that disturb five or more acres of land. Permit coverage can be either under an individually tailored NPDES permit (used by MS4s and some industrial facilities) or a general NPDES permit (used by most industrial facilities and construction sites).

Phase II of the NPDES Stormwater Program was published in November 1999. The Phase II regulation requires NPDES permit coverage, mostly general permits, for stormwater discharges from most small-urbanized areas (small MS4s) and construction activities that disturb from 1 to 5 acres of land. A list of affected communities has been published in the Federal Register.

There are six “minimum control measures” (MCMs) that communities must implement as part of a municipal stormwater management program whose goal is Phase II compliance. These are:

- 1. Public Education and Outreach:** Distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality.
- 2. Public Participation and Involvement:** Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives to be part of a stormwater management panel.
- 3. Illicit Discharge Detection and Elimination:** Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system. Includes the developing of a system map as well as informing the community about hazards associated with illegal discharges and improper waste disposal.
- 4. Construction Site Runoff Control:** Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one or more acres of land (controls could include for example, silt fences, and temporary stormwater detention ponds).
- 5. Post Construction Runoff Control:** Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
- 6. Pollution Prevention/Good Housekeeping:** Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, and frequent catch-basin cleaning).

The EPA has listed the following municipalities within the Tookany/Tacony-Frankford watershed for inclusion in the Phase II program: Cheltenham Township, Jenkintown Borough, and Rockledge Borough. The permit cycle for these permits started in 2003.

1.4.2 Act 167 Stormwater Management

The Stormwater Management Act 167 of 1978 is administered by PADEP and is designed to address the inadequate management of accelerated stormwater runoff resulting from development. An Act 167 plan must address a wide range of hydrologic impacts due to development on a watershed basis, and include such considerations as tributary timing, flow volume reduction, base flow augmentation, water quality control, and ecological protection. Watershed runoff modeling is usually a critical component of the study, with modeled hydrologic responses to 2, 5, 10, 25, 50, and 100-year storms.

The primary purposes of Act 167 are to:

- Encourage planning and management of stormwater runoff;
- Authorize a comprehensive program of stormwater management designed to preserve and restore the flood carrying capacity of Commonwealth streams;
- Preserve natural stormwater runoff regimes;
- Protect and conserve groundwater.

Act 167 requires that each county – in consultation with affected municipalities – prepare and adopt a stormwater management plan for each watershed that falls wholly or partially within the county. The Act focuses on reduction of stormwater runoff quantities, rather than on water quality. Each stormwater plan will include, but is not limited to:

- A survey of existing runoff characteristics in small as well as large storms, including the impact of soils, slopes, vegetation, and existing development;
- A survey of existing significant obstructions and their capacities;
- An assessment of projected and alternative land development patterns in the watershed, and the potential impact of runoff quantity, velocity, and quality;
- An analysis of present and projected development in flood hazard areas, and its sensitivity to damages from future flooding or increased runoff;
- A survey of existing drainage problems and proposed solutions;
- A review of existing and proposed stormwater collection systems and their impacts;
- An assessment of alternative runoff control techniques and their efficiency in the particular watershed;
- An identification of existing and proposed state, federal, and local flood control projects located in the watershed and their design capacities;
- A designation of those areas to be served by stormwater collection and control facilities within a 10-year period;
- An estimate of the design capacity and costs of such facilities;
- A schedule and proposed methods for financing the development, construction, and operation of the facilities;

- An identification of the existing or proposed institutional arrangements to implement and operate the facilities;
- An identification of floodplains within the watershed;
- Standards for the control of stormwater runoff from existing and new development which are necessary to minimize dangers to property and life;
- Priorities for implementation of action within each plan;
- Provisions for periodically reviewing, revising, and updating the plan.

After adoption and approval of a stormwater plan, the location, design, and construction within the watershed of stormwater management systems, flood control projects, subdivisions and major land developments, highways, and transportation facilities must all be conducted in a manner consistent with the approved plan.

An Act 167 Plan is under preparation for the Tookany/Tacony-Frankford Creek watershed by Cheltenham Township with assistance from Philadelphia and Montgomery Counties.

1.4.3 Act 537 Sewage Facilities Planning

Act 537, enacted by the Pennsylvania Legislature in 1966, requires every municipality in the state to develop and maintain an up-to-date sewage facilities plan. The Act requires proper planning of all types of sewage facilities, permitting of individual and community on-lot disposal systems, and uniform standards of design.

The main purpose of a municipality's sewage facilities plan is to correct existing sewage disposal problems including malfunctioning on-lot septic systems, overloaded treatment plants or sewer lines, and improper sewer connections. The program is also designed to prevent future sewer problems and to protect the groundwater and surface water of the locality. To meet these objectives, PADEP uses the Official Sewage Planning requirements of Act 537 that prevent and eliminate pollution of the waters of the Commonwealth by coordinating planning for the sanitary disposal of sewage with a comprehensive program of water quality management.

Official plans contain comprehensive information, including:

- Planning objectives and needs;
- Physical description of planning area;
- Evaluation of existing wastewater treatment and conveyance systems;
- Evaluation of wastewater treatment needs.

Currently, all of the municipalities in the watershed have an Act 537 Plan, which provides for the resolution of existing sewage disposal problems, future sewage disposal needs of new land development, and future sewage disposal needs of the municipality. As of December 2005, Abington Township's Act 537 Plan is more than 5 years old and Philadelphia's is more than 10 years old. However, some plans are older than 30 years: Cheltenham, Rockledge, and Jenkintown boroughs. Also, the plans vary in their level of detail.

1.4.4 Impairment Designations and the TMDL Process

Section 303(d) of the Clean Water Act and the U.S. EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) provide a framework for watershed planning based on Total Maximum Daily Loads. TMDLs are the sum of individual waste load allocations (point sources) and load allocations (non-point sources) plus a margin of safety. They establish a link between water quality standards and water quality based controls. The objective of TMDLs is to allocate allowable loads among different pollutant sources so that the appropriate control actions can be taken and water quality standards achieved.

The basic steps in the water quality based approach to TMDLs include:

- Identification of the water quality-limited waters and the quality parameters of concern;
- Prioritizing the locations by ranking and targeting;
- Establishing the TMDL;
- Implementing the control actions;
- Assessment of the control actions.

Pennsylvania has listed water quality-limited waters according to point and non-point sources for toxic, conventional (BOD, TSS, fecal coliform, oil, and grease), and non-conventional (ammonia, chlorine, and iron) pollutants. Streams that are listed under Section 303(d) of the CWA are particularly targeted for improvement. The Tacony Creek Watershed is within Subbasin 03J, which also includes Jenkintown Creek, Mill Run, and Chester Creek watersheds. Within the Tookany-Tacony/Frankford Watershed, the following stream segments are listed as impaired (Figure 1.9):

- 13.4 miles of Tookany Creek and 13.0 miles of tributaries outside of Philadelphia are impaired due to habitat modification, siltation, and water/flow variability from urban runoff and storm sewers.
- 3.1 miles of Tacony-Frankford Creek inside the City are impaired due to habitat modification, siltation, and water/flow variability from urban runoff and storm sewers.
- The tidal portion of the creek (illustrated in blue) flowing toward the confluence with the Delaware River has not been assessed.

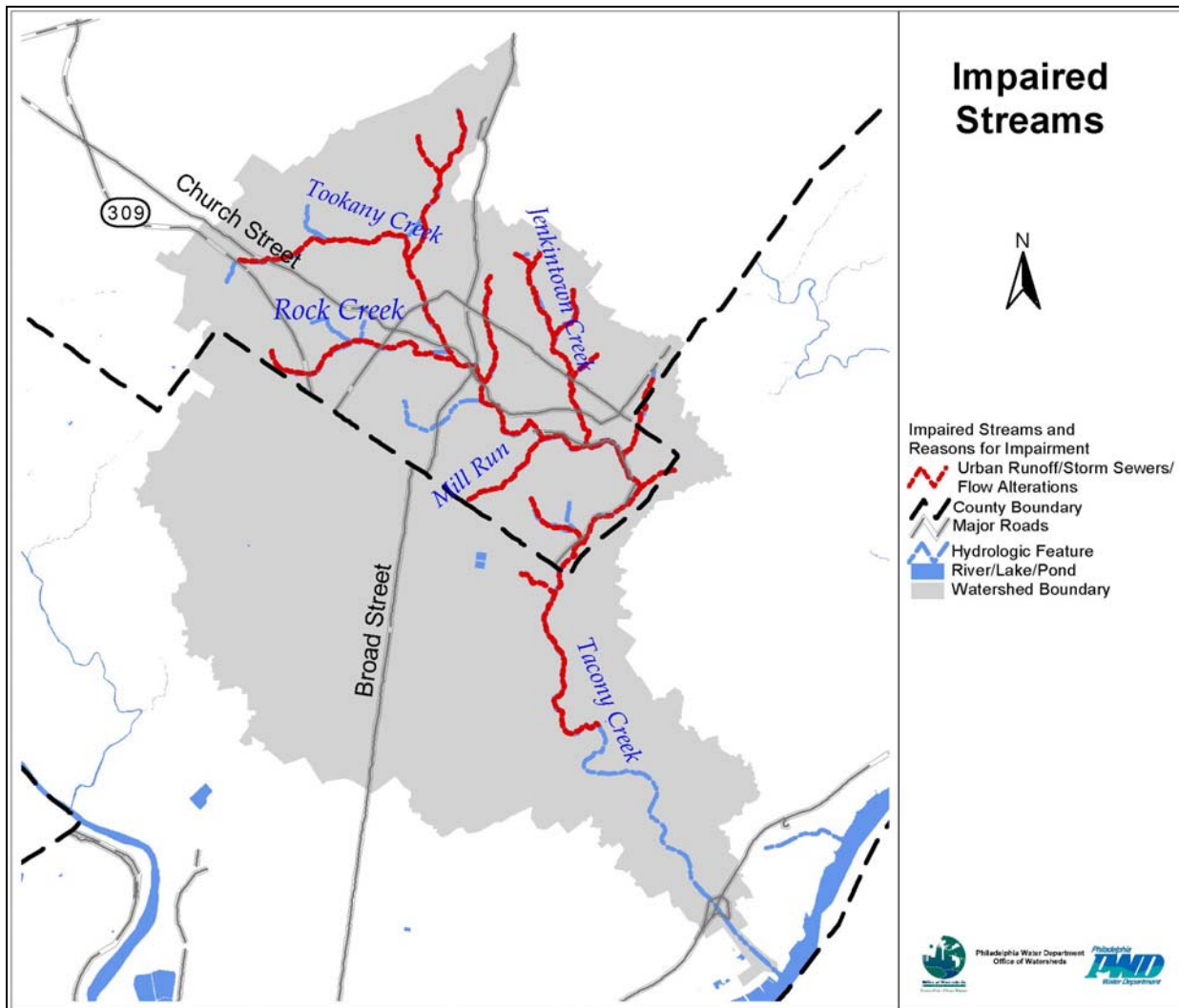


Figure 1.9 Impaired Streams in the Tookany/Tacony-Frankford Watershed

The next step in the statewide TMDL process includes prioritization of the list and the development of TMDLs for high-priority water bodies. It is this phase of the TMDL process that is of interest to the integrated watershed planning process.

Prioritization must take into account the severity of the pollution and the designated uses of the water body. It should consider the following:

- Risks pertaining to human health and aquatic life;
- Degree of public interest and support;
- Recreational, economic, and aesthetic importance;
- Vulnerability or fragility of the aquatic habitat.
- New permit applications for discharges or revisions to existing permits;
- Court orders and decisions;
- National policies and priorities.

TMDL development requires the quantification of pollutant sources and the allocation of maximum discharge loads to contributing point and non-point sources in order to attain water quality standards. TMDLs are best developed on a watershed basis in order to efficiently and effectively manage the quality of the water. The TMDL process may be developed using a phased approach that includes monitoring requirements and it generally includes the following five activities:

- Selection of the pollutants;
- Evaluation of the water body's assimilative capacity;
- Assessment of the pollutants discharged from all sources;
- Predictive analysis of the water body's response to pollution and determination of the total allowable pollutant load;
- Allocation (with a margin of safety) of the allowable pollutant load among the different sources.

The National Pollutant Discharge Elimination System's (NPDES) permitting process is used to implement control measures to limit effluent from point sources. In the case of non-point sources, state and local laws can be used to implement best management practices (BMPs), as well as Section 319 state management programs. These programs must be coordinated in order to effectively achieve the required non-point source reductions.

1.4.5 Combined Sewer Overflow (CSO) Control Policy

EPA's CSO Control Policy, published in 1994, provides the national framework for regulation of CSOs under NPDES. The policy guides municipalities and state and federal permitting agencies in meeting the pollution control goals of the CWA in as flexible and cost-effective a manner as possible. As part of the program, communities serviced by combined sewer systems are required to develop CSO Long-Term Control Plans (LTCPs) that will result in full compliance with the CWA, including attainment of water quality standards.

As the first step under the CSO policy, nine technology-based minimum controls are required; these are measures that can reduce the prevalence and impacts of CSOs and that are not expected to require significant engineering studies or major construction.

- Proper operation and regular maintenance programs for the sewer system and the CSOs;
- Maximum use of the collection system for storage;
- Review and modification of pretreatment requirements to assure CSO impacts are minimized;
- Maximization of flow to the publicly owned treatment works for treatment;
- Prohibition of CSOs during dry weather;
- Control of solid and floatable materials in CSOs;
- Pollution prevention;
- Public notification to ensure that the public receives adequate notification of CSO occurrences and CSO impacts;
- Monitoring to effectively characterize CSO impacts and the efficacy of CSO controls.

In the longer term, the CSO policy includes four requirements to ensure that the CSO systems meet the pollution control goals and local environmental objectives in a cost-effective manner:

- Clear levels of control to meet health and environmental objectives;
- Flexibility to consider the site-specific nature of CSOs and find the most cost-effective way to control them;
- Phased implementation of CSO controls to accommodate a community's financial capability;
- Review and revision of water quality standards during the development of CSO control plans to reflect the site-specific wet weather impacts of CSOs.

One of the three major components of the City of Philadelphia's CSO LTCP strategy involves a substantial commitment by the City to watershed planning to identify long term improvements throughout its watersheds, including any necessary additional CSO controls, which 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. Because of this deficiency, at the time the CSO LTCP was developed, it was impossible to determine what needed to be done for additional CSO control or control of other wet weather sources throughout the watershed. This deficiency, especially with respect to the effects of wet weather discharges and receiving water dynamics, was increasingly recognized nationwide and led to a broader recognition of the need for watershed-based planning and management to properly define water quality standards and goals. In its LTCP, PWD suggested that the National CSO Policy, state and federal permitting and water quality management authorities, cities, environmental groups, and industry all recognized that effective long-term water quality management could be accomplished only through watershed-based planning.

The CSO Control Policy acknowledges the importance of watershed planning in the long term control of CSOs by encouraging the permit writer “... to evaluate water pollution control needs on a watershed management basis and coordinate CSO control efforts with other point and non-point source control activities” (1.B). The watershed approach is also discussed in the section of the CSO Control Policy addressing the demonstration approach to CSO control (II.B.4.b, and Chapter 3 of the U.S. EPA Guidance for Long Term Control Planning), which, in recommending that NPDES permitting authorities allow a demonstration of attainment of water quality standards (WQS), provides for consideration of natural background conditions and pollution sources other than CSOs.

The EPA Long Term Control Planning Guidance suggests that EPA is committed to supporting the implementation of a comprehensive watershed management approach. EPA has convened a Watershed Management Policy Committee consisting of senior managers to oversee the reorientation of all EPA water programs to support watershed approaches.

Of particular importance to CSO control planning and management is the NPDES Watershed Strategy. This strategy outlines national objectives and implementation activities to integrate the NPDES program into the broader watershed protection approach. The strategy also supports the development of basin management as part of an overall watershed management approach.

The Long Term Control Planning Guidance suggests that the sources of watershed pollution and impairment, in addition to CSOs, are varied and include other point source discharges; discharges from storm drains; overland runoff; habitat destruction; land use activities, such as agriculture and construction; erosion; septic systems; and landfills. The benefits to implementing a watershed approach are significant and include:

- Consideration of all important sources of pollution or impairment;
- Closer ties to receiving waters;
- Greater flexibility;
- Greater cost effectiveness (through coordination of monitoring programs, for example);
- Fostering of prevention as well as control;
- Fairer allocation of resources and responsibilities.

The Guidance notes that the major advantage of using a watershed-based approach to develop an LTCP is that it allows the site-specific determination of the relative impacts of CSOs and non-CSO sources of pollution on water quality. For some receiving water reaches within a watershed, CSOs could be less significant contributors to nonattainment than stormwater or upstream sources. In such cases, a large expenditure on CSO control could result in negligible improvement in water quality.

The EPA LTCP Guidance outlines a conceptual framework for conducting CSO planning in a watershed context (Figure 1.10). The approach is intended to identify CSO controls for each receiving water segment based on the concepts of watershed management and use attainability. The Tookany/Tacony-Frankford Watershed planning approach outlined in this document is conceptually identical. It moved from data collection through analysis and modeling to arrive at a set of recommended measures or options designed to meet the goals and objectives agreed upon through the stakeholder process. Figure 1.10 also identifies which section of this TTF Integrated Watershed Management Plan documents each step in the process.

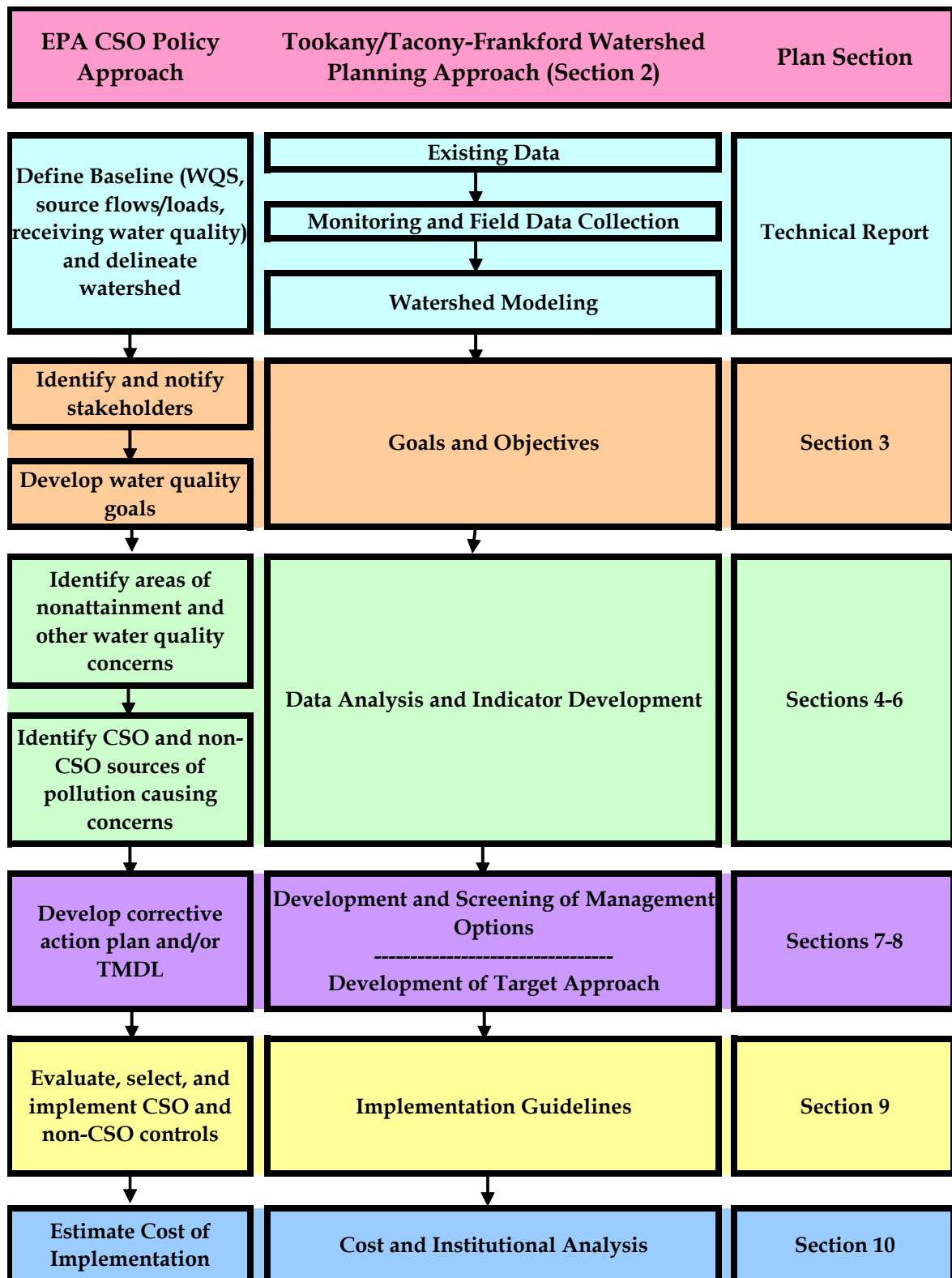


Figure 1.10 Tookany/Tacony-Frankford Planning Approach
Watershed-Based CSO Control Planning Approach for a Receiving Water Segment – from U.S. EPA Guidance for Long Term Control Plan (1995)

1.5 Overlapping Aspects of Regulatory Programs

Integrated watershed planning includes various tasks, ranging from monitoring and resource assessment to technology evaluation and public participation. The scope and importance of each task varies for each watershed, depending on site-specific factors such as environmental features of the watershed, regulatory factors such as the need to revise permits or complete TMDLs, available funding, extent of previous work, land use, and the size and degree of urbanization of watershed.

There are numerous activities required by each of the five programs mentioned above, and those activities demand a wide range of data collection. Table 1.1 gives an overview of the types of data required under each program, and Table 1.2 shows the corresponding types of activities required. Both tables highlight the fact that the task performed or the data collected under one program is often identical or very similar to the work done under other programs. It is clear that significant savings can be achieved through coordination of the programs and the development of one comprehensive plan for a watershed that meets all five program needs.

Table 1.1 Overview of Data Collection Required by Watershed Programs

Data Collection	Act 167 Stormwater	Act 537 Sewage Facilities	TMDL Program	NPDES Stormwater	CSO Program	RCPs
Geographic data (political, transportation, topographic, hydrographic, land use, etc.)	X	X	X	X	X	X
Economic and demographic		X		X	X	X
Meteorological	X	X	X	X	X	
Hydrologic characteristics	X	X	X	X	X	X
Designated uses and impaired water bodies			X	X	X	X
Water quality		X	X	X	X	X
Biological and habitat assessment			X	X	X	X
Floodplains and flooding issues	X					X
Point sources / Potential sources		X	X	X	X	X
Non-point sources of pollution			X	X		X
Sewer system performance and CSO	X	X	X	X	X	
Storm drainage system	X			X	X	
Historical and cultural resources	X					X

Table 1.2 Overview of Planning Tasks Required by Watershed Programs

Planning Tasks	Act 167 Stormwater	Act 537 Sewage Facilities	TMDL Program	NPDES Stormwater	CSO Program	RCPs
Preliminary reconnaissance survey						
Existing data collection and assessment	X	X	X	X	X	X
Preliminary water quality assessment		X	X		X	X
Present / Future land use and resource mapping	X	X	X		X	X
Inventory of point and non-point sources		X	X	X		X
Definition of regulatory issues and requirements			X		X	
Preliminary biological habitat assessment			X	X		X
Preliminary problem assessment	X	X	X		X	X
Public Involvement	X	X	X	X	X	X
Individual Watershed Plan						
Survey of runoff characteristics for storm events	X		X		X	
Survey of drainage problems, flood plains, drainage structures	X			X		X
Mapping of point sources, sewer system	X		X	X	X	
Monitoring, sampling, and bioassessment			X		X	
QA/QC and data evaluation	X	X	X	X	X	X
Sewer system modeling		X			X	
Watershed modeling	X		X		X	
Water body modeling	X		X			
Problem definition and goal setting	X	X	X	X	X	X
Identification and evaluation of runoff, flood control measures	X			X		
Identification of Combined Sewer Overflow				X	X	
Identification and evaluation of pollution control measures		X	X	X	X	
Economic assessment and funding requirements	X	X	X	X	X	X
Public involvement	X	X	X	X	X	X
Development of a Watershed Management Plan	X	X	X	X	X	X*

*Note: An RCP includes some but not all elements of an integrated watershed management plan.

Watershed-based planning is now the preferred approach on both the federal and state level. General water quality and water quantity goals have been established at a state level, and the next step is to develop specific goals for each watershed. Table 1.3 shows the watershed planning goals for Tookany/Tacony-Frankford Creek and how they correspond to many of the overlapping goals of the five major regulatory programs.

Table 1.3 Overview of the Statement of Goals of the Watershed Programs

Goal Description	Act 167 Stormwater	Act 537 Sewage Facilities	TMDL Program	NPDES Stormwater	CSO Program	RCPs
1. Streamflow and Living Resources. Improve stream habitat and integrity of aquatic life.	X		X	X	X	X
2. Instream Flow Conditions. Reduce the impact of urbanized flow on living resources.	X				X	X
3. Water Quality and Pollutant Loads. Improve dry and wet weather stream quality to reduce the effects on public health and aquatic life.		X	X	X	X	X
4. Stream Corridors. Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands.						X
5. Flooding. Identify flood prone areas and decrease flooding by similar measures intended to support Goals 1, 2, and 4.	X					X
6. Quality of Life. Enhance community environmental quality of life (protect open space, access and recreation, security, aesthetics, historical/cultural resources).	X	X	X	X	X	X
7. Stewardship, Communication, and Coordination. Foster community stewardship and improve inter-municipal, inter-county, state-local, and stakeholder cooperation and coordination on a watershed basis.	X	X	X	X	X	X

1.6 Other Relevant Programs

Other programs, both regulatory and non-regulatory, influence the watershed management planning approach and are briefly described under this section.

1.6.1 Rivers Conservation Program (RCP)

One significant non-regulatory program is the PA Department of Conservation and Natural Resources' (DCNR) Rivers Conservation Program (RCP), which was developed to conserve and enhance stream resources by implementing locally initiated plans.

The program provides technical and financial assistance to municipalities and stream support groups for the conservation of local streams. Generally, the RCP plans intend to assess the river's resources, identify potential threats, and recommend restoration/maintenance options. That involves the statement of goals to be accomplished and the listing of recommendations for the development and implementation of the plan.

The goals and recommendations from an RCP can be an important building block for an integrated watershed management plan (IWMP). The programs are similar in structure and approach; they have the same geographic scope, require overlapping data collection; and they involve the statement of goals and listing of recommendations. However, an RCP is narrower in scope than an IWMP and focuses more on quality of life along the stream corridor rather than on regulatory compliance. The RCP for the Tookany Watershed was completed in October 2003 by Abington Township, Cheltenham Township, Jenkintown Borough, and Rockledge Borough. The Tookany/Tacony-Frankford Watershed Partnership completed the Tacony-Frankford RCP in February 2004. The goals and objectives from both RCPs are incorporated into this TTF Integrated Watershed Management Plan.

1.6.2 Summary of Other Programs

Other relevant programs that have been incorporated or that may affect the watershed management program are listed on Table 1.4.

Table 1.4 Other Programs that May Influence the Watershed Management Plan

<p>Sanitary Sewer Overflow (SSO) Policy Requires revisions to the NPDES permit regulations to improve the operation of municipal sanitary sewer collection systems, eliminate the occurrence of sewer overflows, and provide more effective public notification when overflows do occur.</p>
<p>PA DEP On-Lot Sewage Disposal Regulations Require local agencies to administer a permitting program for the installation of on-lot sewage disposal systems.</p>
<p>PENNVEST State Revolving Fund Program Provides funding for sewer, stormwater, and water projects throughout the Commonwealth.</p>
<p>Delaware River Basin Commission (DRBC) Programs Regulate both groundwater and surface water use for withdrawals greater than 100,000 gpd based on average 30-day use in a large portion of the study area, which drains to the Delaware River.</p>
<p>Delaware Valley Regional Planning Commission (DVRPC) Programs Address transportation, land use, and environmental protection issues in addition to economic development. Also provide services in planning analysis, data collection, and mapping.</p>
<p>PA DCNR Greenways Program An Action Plan for Creating Connections is designed to provide a coordinated and strategic approach to creating connections through the establishment of greenways in the state.</p>
<p>CWA Section 104(b)(3) Program Promotes the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of pollution.</p>
<p>CWA Section 208 Wastewater Planning Intended to encourage and facilitate the development and implementation of area-wide waste treatment management plans.</p>
<p>CWA Section 319(b) Non-point Source Management Program Designed to address mine drainage, agricultural runoff, construction/urban runoff, hydrologic and habitat modifications, on-lot wastewater systems, and silviculture.</p>

1.7 Regulatory Agency and Stakeholder Partnerships

Beginning in 2000, PWD acted as the municipal sponsor of the Tookany/Tacony-Frankford Watershed Partnership, an exciting and groundbreaking effort to connect residents, businesses, and government as neighbors and stewards of the watershed. PWD hired the Pennsylvania Environmental Council (PEC), a well-respected, non-profit institution with a reputation for supporting watershed-based, holistic planning, as facilitator and outreach coordinator of this partnership. PEC pulled together diverse representatives from the watershed: municipalities, “friends” groups, educators, citizens, agencies, and watershed organizations.

Within the partnership there were originally two standing committees: the Public Participation and Outreach Committee and the Technical Advisory Committee. The partnership as a whole was called together for general planning status updates and what were called “focus group” meetings, which were initiated to elicit input on the management planning process. Additionally, in 2004 a third committee called the Structure Committee was initiated. Generally, partnership meetings were devoted to education about watershed concepts and to understanding the visions and concerns of participants as they related to their communities’ environmental health. The TTF Partnership participated in the selection and prioritization of goals and objectives for this watershed management plan.

The Public Participation Committee was open to all partnership members. It consisted largely of watershed organizations, educators, residents, and educational non-profits. The committee established a number of projects to raise general awareness about watershed issues and to recruit further partnership membership. Projects included two watershed surveys (as a part of the two River Conservation Planning initiatives), a large-scale public event celebrating “the return of the Great Blue Heron” to the watershed area, a stream signage program, a rain barrel implementation program, clean-ups, participation in Philadelphia Cares Day, and many more.

The Technical Committee was also open to all members of the partnership, though the participants consisted mainly of representatives from local, state, and federal government agencies. This committee reviewed the technical documents produced by PWD, including a watershed reconnaissance of past and existing water quality studies, a current water quality sampling and modeling report, a sediment pollutant loading report, and a bioassessment summary. This technical data is essential for justifying and prioritizing the goals and objectives of the watershed management plan.

The Structure Committee was born out of a recommendation of the Public Participation Committee. It had become apparent to the partnership that in order to fully realize their watershed vision and to move forward with implementation of the recommendations put forth by the TTFIWMP, they would need to evaluate their own organizational structure for its feasibility in making this possible. The result of a series of Structure Committee meetings was that the Tookany/Tacony-Frankford Watershed Partnership evolved into an independent nonprofit watershed organization, with a mission of implementing the recommendations of the TTFIWMP. To view a copy of the new Tookany/Tacony-Frankford Watershed Partnership 501(c)3 bylaws, see Appendix C.

The role of the TTF Partnership will continue to evolve and become more critical to implementation of the plan.