4 PROBLEM ANALYSIS AND GOAL SETTING

4.1 OVERVIEW

This section summarizes the concerns identified in each watershed by the characterization presented in Section 3, draws conclusions about the extent to which CSOs cause or contribute to these problems, discusses the regulatory framework, and presents a set of goals to solve the problems based on requirements of the Clean Water Act and goals of PWD's Integrated Watershed Management Plans.

The goals of PWD's *Green City, Clean Waters* program are developed in the context of an Integrated Watershed Management approach to achieve not only Water Quality Standards compliance, but to achieve the true end goal of the Clean Water Act and provide maximum benefit to the public. The watershed approach addresses all the issues confronting urban streams and allows PWD to consider all of the environmental, social, and economic benefits of alternatives. PWD views its LTCP and NPDES permits as elements within the context of this far broader approach. The Integrated Watershed Management Plans (IWMPs) were crafted after extensive input from the community and numerous stakeholders. In each watershed, stakeholders provided input on goals and weighted the relative importance of each goal to the community.

Goals of PWD's *Green City, Clean Waters* Program

Target A: Dry Weather Water Quality, Aesthetics, and Recreation

- A.1 Eliminate dry weather discharges from combined sewer systems to the maximum extent possible. Continue to correct any short-term issues such as blockages as soon as they are identified. Following implementation, CSOs will not cause or contribute to exceedance of water quality criteria for bacteria in dry weather.
- A.2 Control discharges of solids, floatables, and trash to receiving waters.
- A.3 Improve opportunities for water-based recreation under safe physical conditions.
- A.4 Support regional efforts to create safer, more accessible, more enjoyable waterfronts and stream corridors.

Target B: Healthy Living Resources in Streams/Rivers and Along Riparian Corridors

- B.1 Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands. Following implementation of stream channel and habitat restoration measures, CSOs will not cause or contribute to erosion and habitat degradation in the tributaries.
- B.2 Restore tidal wetlands and wetland habitats.

Target C: Wet Weather Water Quality and Quantity

- C.1 Restore a more natural water balance between surface runoff, infiltration, and evaporation. In the tributaries, reduce the magnitude and duration of peak flows to protect investments in channel and habitat restoration.
- C.2 Reduce CSO volume, frequency, and length of discharge.
- C.3 Implement a phased approach to meeting appropriate wet weather bacteria criteria.

Stewardship and Community

- SC.1 Foster community stewardship and improve inter-municipal, inter-county, state-local, and stakeholder cooperation and coordination on a watershed basis.
- SC.2 Support regional efforts to create greener, more inviting urban communities.

4.2 CSO CONTRIBUTION TO WATER QUALITY CONDITIONS

Problems and their sources have been analyzed on a watershed basis, including areas inside and outside the combined sewersheds and areas inside and outside the City of Philadelphia. For many cities like Philadelphia located at the confluence or terminus of streams or river systems with large upstream drainage areas (such as the Delaware and Schuylkill Rivers), boundary load is a significant source of many pollutants. The area served by combined sewers within the City of Philadelphia covers about 20% of the total Cobbs Creek Watershed area, 1% of the total Pennypack Creek Watershed area, 1% of the Schuylkill River Watershed, about 46% of the Tacony-Frankford Creek Watershed area, and less than 1% of the Delaware River Watershed area. As presented in the characterization of pollutant loads, CSO flows typically consist of roughly 90% or more urban stormwater runoff, and except for bacteria and sanitary floatables, have pollutant characteristics similar to other wet weather point and nonpoint sources. Upstream point and non-point sources can be the dominant sources of biochemical oxygen demand (BOD), total suspended solids (TSS), nitrogen, phosphorus, and metals for watersheds.

As in most watersheds, causes of non-attainment are related not only to CSOs, but are proportional to the drainage area for elements such as land use category, the loading per unit area of pollutant from each category of land use, and the hydrologic, hydraulic and water quality processes that govern mixing, transport, sedimentation, die-off and other factors. Another source of bacteria may be contributed through illicit connections to the city's storm drains. Physical factors also play a role in affecting the ability to utilize a water body, including channelization or culverts. Low flow during summer months can contribute to diminished recreational use by hindering activities such as boating or swimming.

4.2.1 Tookany/Tacony-Frankford Creek Watershed Problem Summary

The City of Philadelphia occupies 58% of the Tookany/Tacony-Frankford Creek Watershed, and of that, the CSO drainage area within the City makes up 46% of the Tookany/Tacony-Frankford Creek Watershed. An important aspect of the Tookany/Tacony-Frankford Creek Integrated Watershed Management Plan (TTFIWMP) is a basic description of existing conditions within the watershed and streams. Through the extensive field studies, modeling, and data analysis, the highest priority problems in the Tookany/Tacony-Frankford Creek were identified, and the means for addressing the problems were developed. Section 3 of this LTCPU incorporates many of the relevant findings of the TTFIWMP and related studies. Given that the Tookany/Tacony-Frankford Creek Watershed is a highly urbanized watershed with both CSOs and significant stormwater flows, some of the highest priority problems included:

Dry Weather Water Quality, Aesthetics and Recreation

- Water quality concerns including high fecal coliform and temperature during dry weather
- Potential dry weather sewage flows in separate sewered areas
- Litter and unsightly streams that discourage residential use
- Safety concerns along streams and stream corridors

Watershed Stewardship

- Recreational opportunities and public access below potential
- Limited public awareness and sense of stewardship for TTF Creek

Healthy Living Resources

- Degraded aquatic and riparian habitats
- Loss of wetlands
- Channelized stream sections
- Limited diversity of fish and other aquatic life
- Periodic, localized occurrences of reduced dissolved oxygen concentrations in downstream areas
- Wide diurnal swings in dissolved oxygen
- Utility infrastructure threatened by bank and streambed erosion

Wet Weather Water Quality and Quantity

- Water quality concerns including high fecal coliform, temperature, and metals during wet weather flows
- CSO and stormwater impacts on water quality and stream channels
- Little volume control and treatment of stormwater flows in separate sewered areas

Dry Weather Water Quality, Aesthetics and Recreation

Problem: Water quality concerns including high fecal coliform during dry weather

- Similar concentrations and frequencies of exceedance in combined-sewered and separate-sewered areas, inside and outside Philadelphia
- Suspected dry weather sewage inputs from separate-sewered areas
- Sewage odors noticed by public and sampling teams

What pollutants or physical conditions are causing this problem, and what are their sources?

- Pathogen loads from combined sewers and sanitary sewers caused by dry weather discharges due to choked sewers and illicit cross connections
- Nonpoint sources of pathogens, including animal sources, are an active area of research
- Heated stormwater runoff

Are CSOs causing or contributing to this problem?
No, except for occasional, short-term issues such as blocked sewers. These situations are quickly corrected as soon as they are identified. PWD believes the combined sewer system is being properly operated and maintained in accordance with NMC 5 and other applicable regulations. However, continuing to properly operate and maintain the system is an important component of the LTCPU.

Problem: Potential dry weather sewage flows in separate sewered areas

What pollutants or physical conditions are causing this problem, and what are their sources?

- Defective laterals
- Illicit cross connections

Are CSOs causing or contributing to this problem?
No. CSOs are not directly contributing to this problem.

Problem: Litter and unsightly streams that discourage residential use

What pollutants or physical conditions are causing this problem, and what are their sources?

- Illegal littering and dumping
- Solids loads from CSO and stormwater discharges

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to this problem through loads of solids and floatables to streams. PWD has an effective solids and floatables control program in accordance with NMC 7 and other applicable regulations. Maintaining and increasing this level of control is an important component of the LTCPU.

Problem: Safety concerns along streams and stream corridors

What pollutants or physical conditions are causing this problem, and what are their sources?

- Lack of patrols and enough recreational users to create a safe environment
- Prohibited swimming during poor water quality conditions that may pose a risk to human health (note that swimming in streams and rivers is prohibited throughout the City of Philadelphia)
- Prohibited swimming in areas with unsafe physical conditions or where drowning is a hazard

Are CSOs causing or contributing to this problem?
Yes, CSOs do contribute to the problem

Watershed Stewardship

Problem: Limited public awareness and sense of stewardship for TTF Creek

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public participation and stewardship are an important component of the LTCPU and larger integrated watershed management approach.

Problem: Recreational opportunities and public access below potential

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public recreation and riverfront access are an important component of the LTCPU and larger integrated watershed management approach. CSO outfalls may add to the public's sense that waterfronts are not attractive places to be.

Healthy Living Resources in Streams and along Stream Corridors

Problem: Degraded aquatic and riparian habitats and channelized stream sections

- Bed and bank erosion
- Deposition of sediment in pools and on point bars
- Overwidening and downcutting of stream channels
- Exposure of potential riffle habitats during low flows
- Floodplain disconnection

- Invasive vegetation on stream banks
- Impediments to fish passage

What pollutants or physical conditions are causing this problem, and what are their sources?

- High instream wet weather flows and velocities
- Alteration of the natural hydrologic cycle in wet weather, uncontrolled runoff from impervious surfaces leading to discharges from combined sewer and stormwater outfalls
- Alteration of the natural hydrologic cycle in dry weather, reduced soil infiltration and groundwater recharge

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Problem: Loss of wetlands

- Nearly all wetlands in the watershed exhibit impaired functions that indicate extensive disturbance and deterioration

What pollutants or physical conditions are causing this problem, and what are their sources?

- Urban and suburban development has resulted in the piping of historic streams, destruction of wetlands, and deforestation and modification of historic floodplains
- Stormwater is piped directly to waterways rather than flowing overland through vegetation, wetlands, and woodlands
- Flow and volume of runoff is intensified
- There is no longer a source of water to maintain many of the wetlands that once existed

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Problem: Channelized stream sections

What pollutants or physical conditions are causing this problem, and what are their sources?

- Urban and suburban development has resulted in the straightening and channelizing of historic streams

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Problem: Limited diversity of fish and benthic life

- Nonattainment of designated aquatic life use (warm water fishery, migratory fishes)
- Abundance of pollution-tolerant and disturbance-tolerant species relative to reference sites and scarcity of sensitive species
- Species present exhibit morphological and behavioral adaptations to high velocities

What pollutants or physical conditions are causing this problem, and what are their sources?

- Physical alteration of habitat, erosion and deposition of substrates
- Dry weather flow insufficient to cover key habitats

- Wet weather flows and sediment loads capable of burying or washing away invertebrates, fish, and fish eggs
- Occasional exceedance of water quality criteria designed to protect aquatic life

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts. CSOs may be slightly less destructive because a portion of stormwater is treated.

Problem: Periodic, localized occurrences of reduced dissolved oxygen primarily associated with low flow conditions and plunge pools and stagnant water behind dams; and wide diurnal swings in dissolved oxygen

What pollutants or physical conditions are causing this problem, and what are their sources?

- Structures such as dams and outfalls creating poorly mixed, low velocity pools
- Intensity and duration of sunlight, lack of shade
- Loads of oxygen-demanding material and nutrients introduced by CSOs, stormwater, nonpoint sources, and groundwater
- Localized growth of nuisance algae leading to large diurnal variation in DO
- Naturally occurring low flow conditions

Are CSOs causing or contributing to this problem?
Yes, CSOs and stormwater outfalls contribute to this problem by introducing loads of oxygen-demanding materials and nutrients.

Problem: Utility infrastructure threatened by bank and streambed erosion

What pollutants or physical conditions are causing this problem, and what are their sources?

- High instream wet weather flows and velocities leading to erosion of beds and banks intended to protect the infrastructure

Are CSOs causing or contributing to this problem?
Yes, CSOs and stormwater outfalls are a cause of these problems. CSO and stormwater outfalls cause similar impacts.

Wet Weather Water Quality and Quantity

Problem: Water quality concerns including fecal coliform, temperature, and metals during wet weather

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of pathogens introduced by CSOs, stormwater, and nonpoint sources in wet weather. Because the concentrations of pathogens are much higher in CSOs than in other discharges, loading analyses estimate that CSOs contribute approximately 90% of the fecal coliform load to TTF Creek on an average annual basis
- Heated stormwater runoff
- Loads of metals introduced by CSOs and stormwater in wet weather. Possible exceedance of metals criteria was identified only as a potential problem in the Integrated Watershed Management Plan due to uncertainty in estimation of concentrations of dissolved metals. Please see discussion in the characterization section
- Sediments may store oxygen demanding organisms, which may become re-suspended during storms, moving the area of DO deficit further downstream

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to these problems by introducing significant loads to surface waters. In all cases, loads from other sources in the watershed are also significant and need to be addressed on a watershed basis to solve the problems.

Problem: CSO and stormwater impacts on water quality and stream channels

What pollutants or physical conditions are causing this problem, and what are their sources?

- Uncontrolled discharges from both CSO and stormwater outfalls causing damaging flows and velocities in wet weather

Are CSOs causing or contributing to this problem?
Yes, both CSOs and uncontrolled stormwater runoff contribute to these problems. Both sources need to be addressed concurrently on a watershed basis to solve the problems.

Problem: Little volume control and treatment of stormwater flows in separate sewered areas

What pollutants or physical conditions are causing this problem, and what are their sources?

- Alteration of the natural hydrologic cycle in wet weather, uncontrolled runoff from impervious surfaces leading to discharges from combined sewer and stormwater outfalls

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem.

4.2.2 Cobbs Creek Watershed Problem Summary

The City of Philadelphia occupies 25% of the Cobbs Creek Watershed, and of that, the CSO drainage area within the City makes up only 20% of the Cobbs Creek Watershed. An important aspect of the Cobbs Creek Integrated Watershed Management Plan (CCIWMP) is a basic description of existing conditions within the watershed and streams. Through the extensive field studies, modeling, and data analysis, the highest priority problems in the Cobbs Creek were identified, and the means for addressing the problems were developed. Section 3 of this LTCPU incorporates many of the relevant findings of the CCIWMP and related studies. Given that the Cobbs Creek Watershed is a highly urbanized watershed with both CSOs and significant stormwater flows, some of the highest priority problems included:

Dry Weather Water Quality, Aesthetics and Recreation

- Water quality concerns including high fecal coliform and temperature during dry weather
- Potential dry weather sewage flows in separate sewered areas
- Litter and unsightly streams that discourage residential use
- Safety concerns along streams and stream corridors

Watershed Stewardship

- Recreational opportunities and public access below potential
- Limited public awareness and sense of stewardship for Cobbs Creek

Healthy Living Resources

- Degraded aquatic and riparian habitats
- Limited diversity of fish and benthic life

- Periodic, localized occurrences of reduced dissolved oxygen primarily associated with plunge pools and areas of stagnant water behind dams
- Utility infrastructure threatened by bank and streambed erosion
- Loss of wetlands

Wet Weather Water Quality and Quantity

- Water quality concerns including fecal coliform, temperature, and metals during wet weather
- CSO and stormwater impacts on water quality and stream channels
- Little volume control and treatment of stormwater flows in separate sewered areas

Dry Weather Water Quality, Aesthetics and Recreation

Problem: Water quality concerns including high fecal coliform and temperature during dry weather

- Similar concentrations and frequencies of exceedance in combined-sewered and separate-sewered areas, inside and outside Philadelphia
- Suspected dry weather sewage inputs from separate-sewered areas
- Sewage odors noticed by public and sampling teams

What pollutants or physical conditions are causing this problem, and what are their sources?

- Pathogen loads from combined sewers and sanitary sewers caused by dry weather discharges due to choked sewers and illicit cross connections
- Nonpoint sources of pathogens, including animal sources, are an active area of research
- Heated stormwater runoff

Are CSOs causing or contributing to this problem?

No. PWD believes the combined sewer system is being properly operated and maintained in accordance with NMC 5 and other applicable regulations. However, continuing to properly operate and maintain the system is an important component of the LTCPU.

Problem: Potential dry weather sewage flows in separate sewered areas

What pollutants or physical conditions are causing this problem, and what are their sources?

- Defective laterals
- Illicit cross connections

Are CSOs causing or contributing to this problem?

No. CSOs are not directly contributing to this problem.

Problem: Litter and unsightly streams that discourage residential use

What pollutants or physical conditions are causing this problem, and what are their sources?

- Illegal littering and dumping
- Solids loads from CSO and stormwater discharges

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to this problem through loads of solids and floatables to streams. PWD has an effective solids and floatables control program in accordance with NMC 7 and other applicable regulations. Maintaining and increasing this level of control is an important component of the LTCPU.

Problem: Safety concerns along streams and stream corridors

What pollutants or physical conditions are causing this problem, and what are their sources?
- Lack of patrols and enough recreational users to create a safe environment
- Swimming during water quality conditions that may pose a risk to human health
- Swimming under unsafe physical conditions

Are CSOs causing or contributing to this problem?
Yes, CSOs do contribute to the problem.

Watershed Stewardship

Problem: Limited public awareness and sense of stewardship for Cobbs Creek

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public participation and stewardship are an important component of the LTCPU and larger integrated watershed management approach.

Problem: Recreational opportunities and public access below potential

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public recreation and riverfront access are an important component of the LTCPU and larger integrated watershed management approach. CSO outfalls may add to the public's sense that waterfronts are not attractive places to be.

Healthy Living Resources in Streams and along Stream Corridors

Problem: Degraded aquatic and riparian habitats
- Bed and bank erosion
- Deposition of sediment in pools and on point bars
- Overwidening and downcutting of stream channels
- Exposure of potential riffle habitats during low flows
- Floodplain disconnection
- Invasive vegetation on stream banks
- Impediments to fish passage

What pollutants or physical conditions are causing this problem, and what are their sources?
- High instream wet weather flows and velocities
- Alteration of the natural hydrologic cycle in wet weather, uncontrolled runoff from impervious surfaces leading to discharges from combined sewer and stormwater outfalls

- Alteration of the natural hydrologic cycle in dry weather, reduced soil infiltration and groundwater recharge

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Problem: Limited diversity of fish and benthic life

- Nonattainment of designated aquatic life use (warm water fishery, migratory fishes)
- Abundance of pollution- and disturbance-tolerant species relative to reference sites; scarcity of sensitive species
- Species present exhibit morphological and behavioral adaptations to high velocities

What pollutants or physical conditions are causing this problem, and what are their sources?

- Physical alteration of habitat, erosion and deposition of substrates
- Dry weather flow insufficient to cover key habitats
- Wet weather flows and sediment loads capable of burying or washing away invertebrates, fish, and fish eggs
- Occasional exceedance of water quality criteria designed to protect aquatic life

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts. CSOs may be slightly less destructive because a portion of stormwater is treated.

Problem: Periodic, localized occurrences of reduced dissolved oxygen primarily associated with low flow conditions and areas of plunge pools and areas of stagnant water behind dams

What pollutants or physical conditions are causing this problem, and what are their sources*?*

- Structures such as dams and outfalls creating poorly mixed, low velocity pools
- Intensity and duration of sunlight, lack of shade
- Loads of oxygen-demanding material and nutrients introduced by CSOs, stormwater, nonpoint sources, and groundwater
- Localized growth of nuisance algae leading to large diurnal variation in DO
- Naturally occurring low flow conditions

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to this problem by introducing loads of oxygen-demanding materials and nutrients.

Problem: Utility infrastructure threatened by bank and streambed erosion

What pollutants or physical conditions are causing this problem, and what are their sources?

- High instream wet weather flows and velocities leading to erosion of beds and banks intended to protect the infrastructure

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSO and stormwater outfalls cause similar impacts.

Problem: Loss of wetlands

- Nearly all wetlands in the watershed exhibit impaired functions that indicate extensive disturbance and deterioration

What pollutants or physical conditions are causing this problem, and what are their sources?

- Urban and suburban development has resulted in the piping of historic streams, destruction of wetlands, and deforestation and modification of historic floodplains
- Stormwater is piped directly to waterways rather than flowing overland through vegetation, wetlands, and woodlands
- Flow and volume of runoff is intensified
- There is no longer a source of water to maintain many of the wetlands that once existed

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Wet Weather Water Quality and Quantity

Problem: Water quality concerns including fecal coliform, temperature, and metals during wet weather

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of pathogens introduced by CSOs, stormwater, and nonpoint sources in wet weather. Because the concentrations of pathogens are much higher in CSO than in other discharges, loading analyses estimate that CSOs contribute approximately 90% of the fecal coliform load to Cobbs Creek on an average annual basis
- Loads of metals introduced by CSOs and stormwater in wet weather. Possible exceedance of metals criteria was identified only as a potential problem in the Integrated Watershed Management Plan due to uncertainty in estimation of concentrations of dissolved metals. Please see discussion in the characterization section.
- Heated stormwater runoff

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to these problems by introducing significant loads to surface waters. In all cases, loads from other sources in the watershed are also significant and need to be addressed on a watershed basis to solve the problems.

Problem: CSO and stormwater impacts on water quality and stream channels

What pollutants or physical conditions are causing this problem, and what are their sources?

- Uncontrolled discharges from both CSO and stormwater outfalls causing damaging flows and velocities in wet weather

Are CSOs causing or contributing to this problem?
Yes, both CSOs and uncontrolled stormwater runoff contribute to these problems. Both sources need to be addressed concurrently on a watershed basis to solve the problems.

Problem: Little volume control and treatment of stormwater flows in separate sewered areas

What pollutants or physical conditions are causing this problem, and what are their sources?

- Alteration of the natural hydrologic cycle in wet weather, uncontrolled runoff from impervious surfaces leading to discharges from combined sewer and stormwater outfalls

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem.

4.2.3 The Delaware River Watershed Problem Summary

The entire City of Philadelphia occupies less than 1% of the Delaware River Watershed, and of that, the CSO drainage area within the City makes up even less of the drainage area. An important aspect of the characterization of the Philadelphia part of the Delaware River watershed is a basic description of existing conditions within the watershed and streams. Through the extensive field studies, modeling, and data analysis, the highest priority problems in the Philadelphia part of the Delaware River Watershed were identified, and the means for addressing the problems were developed. Given that the Delaware River watershed in Philadelphia is a highly urbanized watershed with both CSOs and significant stormwater flows, some of the highest priority problems included:

Dry Weather Water Quality, Aesthetics and Recreation

- Water quality concerns including bacteria and temperature during dry weather
- Exceedance of bacteria criteria
- Delaware estuary listed as impaired by metals and priority organics
- Potential dry weather sewage flows in separate sewered areas

Watershed Stewardship

- Limited public awareness and sense of stewardship for the Delaware River
- recreational opportunities and public access below potential

Healthy Living Resources

- Loss of wetlands

Wet Weather Water Quality and Quantity

- Water quality concerns including bacteria, temperature, and turbidity during wet weather
- Exceedance of DO criteria
- Total Maximum Daily Load and fish advisories established for PCBs

Dry Weather Water Quality, Aesthetics and Recreation

Problem: Water quality concerns including bacteria and temperature during dry weather

- Fecal coliform and enterococcus, and temperature criteria are exceeded in dry weather samples

What pollutants or physical conditions are causing this problem, and what are their sources?

- Possible pathogen loads from upstream combined sewers and sanitary sewers caused by dry weather discharges due to choked sewers and illicit cross connections.
- Nonpoint sources of pathogens, including animal sources, are an active area of research

- Heated stormwater runoff

Are CSOs causing or contributing to this problem?
No. PWD believes the combined sewer system is being properly operated and maintained in accordance with NMC 5 and other applicable regulations. However, continuing to properly operate and maintain the system is an important component of the LTCPU.

Problem: Litter and unsightly streams that discourage residential use

What pollutants or physical conditions are causing this problem, and what are their sources?
- Illegal littering and dumping
- Solids loads from CSO and stormwater discharges

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to this problem through loads of solids and floatables to streams. PWD has an effective solids and floatables control program in accordance with NMC 7 and other applicable regulations, including use of skimmer vessels. Maintaining and increasing this level of control is an important component of the LTCPU.

Problem: Delaware estuary listed as impaired by metals and priority organics

What pollutants or physical conditions are causing this problem, and what are their sources?
- The scientific basis for these listings is unknown, and recent water quality monitoring data do not indicate a problem

Are CSOs causing or contributing to this problem?
No. There is no evidence of a current problem with metals or priority organics caused by CSOs.

Problem: Potential dry weather sewage flows in separate sewered areas

What pollutants or physical conditions are causing this problem, and what are their sources?
- Defective laterals
- Illicit cross connections

Are CSOs causing or contributing to this problem?
No. CSOs are not directly contributing to this problem.

Watershed Stewardship

Problem: Limited public awareness and sense of stewardship for the Delaware River

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public participation and stewardship are an important component of the LTCPU and larger integrated watershed management approach.

Problem: Recreational opportunities and public access below potential

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public recreation and riverfront access are an important component of the LTCPU and larger integrated watershed management approach. CSO outfalls may add to the public's sense that waterfronts are not attractive places to be.

Healthy Living Resources in Streams and along Stream Corridors

Problem: Loss of wetlands

- Nearly all wetlands in the watershed exhibit impaired functions that indicate extensive disturbance and deterioration

What pollutants or physical conditions are causing this problem, and what are their sources?

- Urban and suburban development has resulted in the piping of historic streams, destruction of wetlands, and deforestation and modification of historic floodplains
- Stormwater is piped directly to waterways rather than flowing overland through vegetation, wetlands, and woodlands
- Flow and volume of runoff is intensified
- There is no longer a source of water to maintain many of the wetlands that once existed

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Wet Weather Water Quality and Quantity

Problem: Water quality concerns including bacteria, temperature, and turbidity during wet weather

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of pathogens introduced by CSOs, stormwater, and nonpoint sources in wet weather
- Heated stormwater runoff

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to these problems by introducing significant loads to surface waters. In all cases, loads from other sources in the watershed are also significant and need to be addressed on a watershed basis to solve the problems.

Problem: Exceedance of DO criteria

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of oxygen-demanding material and nutrients introduced by CSOs, stormwater, and nonpoint sources

Are CSOs causing or contributing to this problem?
Yes, CSOs may contribute to this problem by introducing loads of oxygen-demanding materials and nutrients. However, DRBC indicated that CBOD loads introduced by Philadelphia CSOs cause a maximum DO reduction of 0.5 mg/L in the lower estuary.

Problem: Total Maximum Daily Load and fish advisories established for PCBs

What pollutants or physical conditions are causing this problem, and what are their sources?

- Historical sources
- Sediments
- Loads of PCBs introduced by CSOs, municipal separate sewer systems, continuous point sources, contaminated sites, stormwater discharges, tributaries and the atmosphere in wet weather

Are CSOs causing or contributing to this problem?
Yes, the contribution of CSOs was estimated for the TMDL study and a pollutant minimization plan is in place.

4.2.4 The Schuylkill River Watershed Problem Summary

The entire City of Philadelphia occupies only 2% of the Schuylkill River Watershed, and of that, the CSO drainage area within the City makes up less than 1% of the Schuylkill River Watershed. An important aspect of the characterization of Philadelphia's part of the Schuylkill River Watershed is a basic description of existing conditions within the watershed and streams. Through the extensive field studies, modeling, and data analysis, the highest priority problems in the Schuylkill River Watershed within Philadelphia were identified, and the means for addressing the problems were developed. Given that the Schuylkill River Watershed in Philadelphia is a highly urbanized watershed with both CSOs and significant stormwater flows, some of the highest priority problems included:

Dry Weather Water Quality, Aesthetics and Recreation

- Exceedance of temperature criteria
- Exceedance of DO criteria

Watershed Stewardship

- Limited public awareness and sense of stewardship for the Schuylkill River
- Recreational opportunities and public access below potential

Healthy Living Resources

- Loss of wetlands

Wet Weather Water Quality and Quantity

- Water quality concerns including bacteria and temperature during wet weather
- Exceedance of DO criteria
- Total Maximum Daily Load and fish advisories established for PCBs

Dry Weather Water Quality, Aesthetics and Recreation

Problem: Exceedance of temperature criteria

What pollutants or physical conditions are causing this problem, and what are their sources?

- Heated stormwater runoff

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to these problems by introducing stormwater with elevated temperatures.

Problem: Exceedance of DO criteria

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of oxygen-demanding material and nutrients introduced by CSOs, stormwater, and nonpoint sources

Are CSOs causing or contributing to this problem?
Yes, CSOs may contribute to this problem by introducing loads of oxygen-demanding materials and nutrients. However, DRBC modeling results indicated that CBOD loads introduced by Philadelphia CSOs cause a maximum DO reduction of 0.5 mg/L in the lower estuary below the city boundary.

Problem: Potential dry weather sewage flows in separate sewered areas

What pollutants or physical conditions are causing this problem, and what are their sources?

- Defective laterals
- Illicit cross connections

Are CSOs causing or contributing to this problem?
No. CSOs are not directly contributing to this problem.

Watershed Stewardship

Problem: Limited public awareness and sense of stewardship for the Schuylkill River

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public participation and stewardship are an important component of the LTCPU and larger integrated watershed management approach.

Problem: Recreational opportunities and public access below potential

Are CSOs causing or contributing to this problem?
No, CSOs are not directly contributing to this problem. However, public recreational and riverfront access are an important component of the LTCPU and larger integrated watershed management approach.

Healthy Living Resources in Streams and along Stream Corridors

Problem: Loss of wetlands

- Nearly all wetlands in the watershed exhibit impaired functions that indicate extensive disturbance and deterioration

What pollutants or physical conditions are causing this problem, and what are their sources?

- Urban and suburban development has resulted in the piping of historic streams, destruction of wetlands, and deforestation and modification of historic floodplains
- Stormwater is piped directly to waterways rather than flowing overland through vegetation, wetlands, and woodlands
- Flow and volume of runoff is intensified
- There is no longer a source of water to maintain many of the wetlands that once existed

Are CSOs causing or contributing to this problem?
Yes, CSOs are a cause of these problems. CSOs and stormwater outfalls cause similar impacts.

Wet Weather Water Quality and Quantity

Problem: Water quality concerns including bacteria and temperature during wet weather

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of pathogens introduced by CSOs, stormwater, and nonpoint sources in wet weather
- Stormwater runoff from warm surfaces

Are CSOs causing or contributing to this problem?
Yes, CSOs contribute to these problems by introducing significant loads to surface waters. In all cases, loads from other sources in the watershed are also significant and need to be addressed on a watershed basis to solve the problems.

Problem: Exceedance of DO criteria

What pollutants or physical conditions are causing this problem, and what are their sources?

- Loads of oxygen-demanding material and nutrients introduced by CSOs, stormwater, and nonpoint sources

Are CSOs causing or contributing to this problem?
Yes, CSOs may contribute to this problem by introducing loads of oxygen-demanding materials and nutrients. However, DRBC modeling results indicated that CBOD loads introduced by Philadelphia CSOs cause a maximum DO reduction of 0.5 mg/L in the lower estuary below the City boundary.

Problem: Total Maximum Daily Load and fish advisories established for PCBs

What pollutants or physical conditions are causing this problem, and what are their sources?

- Historical sources
- Sediments
- Loads of PCBs introduced by CSOs, stormwater, and nonpoint sources in wet weather

Are CSOs causing or contributing to this problem?
Yes, the contribution of CSOs was estimated for the TMDL study and a pollutant minimization plan is in place.

4.3 REGULATORY COMPLIANCE FRAMEWORK

4.3.1 NPDES Permits, National CSO Control Policy, and Consent Order

As required by its NPDES Permits, PWD submitted a Long Term Control Plan to PADEP in 1997. This document laid out a three-part program: continuing implementation of the Nine Minimum Controls, implementation of a series of traditional stormwater and combined sewer overflow controls, and a commitment to watershed-based assessment and planning. This program led to creation and implementation of Integrated Watershed Management Plans for each of the combined-sewered watersheds. The plans identify goals of PWD, watershed stakeholders, and the public, while also making sure these goals are consistent with regulatory requirements.

To provide an appropriate enforcement mechanism as required by the National CSO Control Policy, PWD entered into a Consent Order and Agreement (CO&A) with the Pennsylvania Department of Environmental Protection on August 4, 2008. As stated in the CO&A, the goal of PWD's Combined Sewer Overflow control program is to meet the water quality requirements of the Clean Water Act and Pennsylvania Clean Streams Law no later than September 1, 2029. This CO&A is intended to be consistent with the requirements of the National CSO Control Policy and PWD's Integrated Watershed Management Plans.

4.3.2 Planning Approach

The goal of PWD's "Green City-Clean Waters" program is not just to achieve Water Quality Standards compliance, but to achieve the true end goal of the Clean Water Act: to have healthy streams where aquatic life can prosper; to make these streams pleasant, accessible and safe when people are recreating in and around them; to protect, preserve and maintain these streams against the challenges of sedimentation, erosion and the careless disposal of trash; to improve the riparian habitat and to make stream corridors a great asset for everyone to enjoy.

The watershed approach, recommended by the National CSO Control Policy, addresses all these issues confronting urban streams - in dry and wet weather - whether they fall within or outside the direct control of the Clean Water Act. The approach allows PWD to consider all of the societal and environmental benefits and impacts. In Combined Sewer Overflows: Guidance for Long Term Control Plan, EPA encourages permittees "to consider innovative and alternate approaches and technologies that achieve the objectives of the Policy and the Act." PWD's watershed-based, green infrastructure-focused approach to address CSOs accomplishes exactly that.

Therefore, PWD has viewed its CSO LTCP, as it has all of its NPDES permits and other obligations, as elements within the context of a far broader Integrated Watershed Management approach. The Integrated Watershed Management Plans (IWMPs) were crafted after extensive input from the community and numerous stakeholders. The goals, and the strategies employed to achieve them, go well beyond nominal compliance with Water Quality Standards and look to achieve a broad array of environmental and societal goals that the community values and respects. The IWMPs set forth three targets - A, B and C, - to be achieved in all watersheds. Target A relates to improvements in dry weather conditions when use of our waterways is greatest. Target B restores ecosystems and natural habitats. Finally, Target C addresses wet weather concerns.

The National CSO Control Policy recognizes the site specific nature of CSOs and their impacts and provides the necessary flexibility to tailor controls to local situations. PWD believes it will be able to demonstrate that after the LTCPU has been implemented it will have achieved not only the broader endpoints of the ambitious goals contained in the IWMPs but also the more narrowly focused

compliance with Water Quality Standards. PWD believes that after implementation of the LTCPU it will be able to demonstrate that the level of protection provided by the Water Quality Standards has been achieved.

PWD has begun a preliminary study to document recreation occurring along waterways and potential health implications of that recreation. PWD would like to develop this data in a more comprehensive fashion and looks forward to working with EPA, DEP and local Health Department authorities in planning and conducting further studies.

While PWD believes that the protective goal of the Water Quality Standards can be achieved, it recognizes that there is a possibility that achieving this goal may take longer than 20 years. Should additional time be needed to achieve wet weather water quality goals, PWD will work with PADEP in reviewing and possibly revising the Water Quality Standards as permitted under the Clean Water ACT regulations. PWD's decentralized green infrastructure-based approach will continue to make improvements year after year beyond the 20-year window of the LTCPU. Revamping the way development is practiced over time will change the very fabric of the City. Updating the infrastructure will continue forever to make constant improvements not only to the water environment but to air and to the quality of life in neighborhoods as well.

4.3.3 Policy and Guidance on the Watershed Approach

Approaching CSO control on a watershed basis is clearly supported in recent Federal policy and guidance. One example is provided in the encouragement to NPDES permit writers "... to evaluate water pollution control needs on a watershed management basis and coordinate CSO control efforts with other point and nonpoint 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 USEPA *Combined Sewer Overflows: Guidance For Long-Term Control Plan*), which, in recommending that NPDES permitting authorities allow a demonstration of attainment of WQS, provides for consideration of natural background conditions and pollution sources other than CSOs.

Combined Sewer Overflows: Guidance For Long-Term Control Plan ("the Guidance") suggests that EPA is committed to supporting the implementation of a comprehensive watershed management approach. According to the Guidance, 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 NPDES Watershed Strategy also supports the development of basin management as part of an overall watershed management approach

The 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; and septic systems and landfills. The benefits to implementing a watershed approach are significant and include:

- Consideration of all important sources of pollution or impairment
- Clearer definition of water quality benefits resulting from a given level of CSO reduction
- Greater flexibility to reflect the site-specific nature of CSO discharges
- 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 in using a watershed-based approach to develop a 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 well be less significant contributors to non-attainment than stormwater or upstream sources. In such cases, a large expenditure on CSO control could result in negligible improvement in water quality.

The Guidance outlines a conceptual framework for conducting CSO planning in a watershed context (Figure 4-1). The approach is intended to identify CSO controls for each receiving water segment based on the concepts of watershed management and use attainability.

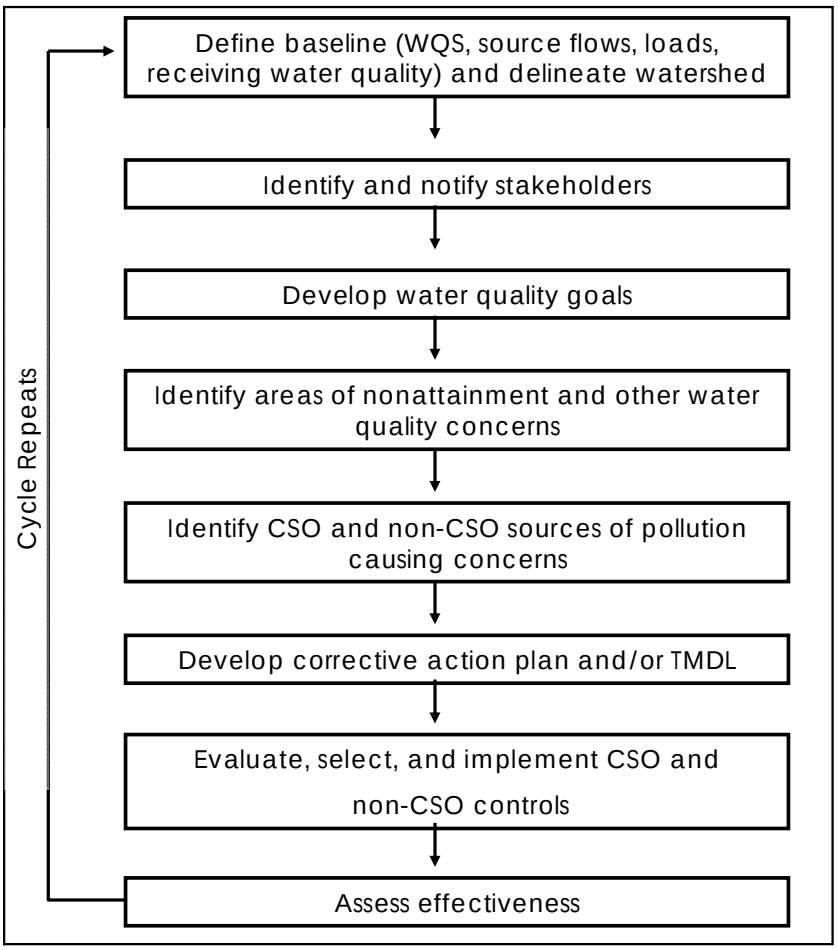

Figure 4-1 Watershed-Based CSO Control Planning Approach for a Receiving Water Segment (adapted from LTCP Guidance, Exhibit 1-5)

4.3.4 Policy and Guidance on Green Infrastructure

The City of Philadelphia's LTCPU also has been devised in light of the recent Green Infrastructure guidance and policy documents developed by the United States Environmental Protection Agency (US EPA). The US EPA signed the "Green Infrastructure Statement of Intent" in April 2007 and issued a "Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint

Source and other Water Programs" memo in March 2007. This memo was intended to highlight opportunities for increasing the development and use of Green Infrastructure. Former Assistant Administrator to the US EPA Benjamin Grumbles states in this memo that he strongly supports the use of green infrastructure approaches and suggests to the EPA Regional offices that they promote green infrastructure approaches to the states. Also, in a memo titled "Use of Green Infrastructure in Permits and Enforcement" from the Directors of the Water Permits Division and the Water Enforcement Division, it is stated that "in developing permit requirements permitting authorities may structure their permits, as well as guidance or criteria for stormwater plans and CSO Long-term control plans, to encourage permittees to utilize green infrastructure approaches, where appropriate, in lieu of or in addition to more traditional controls." This memo also states that EPA will consider the feasibility of the use of green infrastructure as a pollution control technology in its enforcement activities, and encourages state authorities to do so as well.

4.4 WATER QUALITY GOALS

4.4.1 Introduction: LTCPU and the Integrated Watershed Management Framework

PWD's Integrated Watershed Management Planning (IWMP) process is designed to address both stakeholder goals and regulatory obligations in one coordinated implementation approach for each of the watersheds that drain to the City. The City of Philadelphia's Long Term CSO Control Plan Update seeks to meet the regulatory requirements of the National CSO Control Policy through this comprehensive watershed-based approach.

Implementation of IWMPs shall create and maintain safe, inviting stream corridors and riverfronts as well as improve recreational opportunities for residents of the city. The approach is part of the City's larger vision of creating greener and more attractive urban communities. PWD's IWMP commitment involves restoration of historical amenities through creation of physical habitat to support healthy aquatic communities. PWD's LTCPU has a complimentary commitment to mitigating physical and water quality conditions that prevent establishment of healthy aquatic communities and safe enjoyment of streams and rivers by reducing runoff and increasing baseflow to the creeks through infiltration practices.

PWD has defined three distinct "targets" to meet the plan objectives and priorities identified by stakeholders, which will be addressed simultaneously. Two of the targets were defined so that they could be fully met through implementation of a limited set of options, while the third target would best be addressed through an adaptive management approach.

The US EPA, through their watershed academy, defines adaptive management as follows: Adaptive management is the process by which new information about the health of the watershed is incorporated into the watershed management plan. Adaptive management is a challenging blend of scientific research, monitoring, and practical management that allows for experimentation and provides the opportunity to "learn by doing." It is a necessary and useful tool because of the uncertainty about how ecosystems function and how management affects ecosystems.

PWD's watershed management approach is separated into three targets, or parallel tracks:

Target A: Dry Weather Water Quality, Aesthetics, and Recreation

The first target is to meet water quality standards in streams and rivers during dry weather flows. Target A was defined for the tributaries with a focus on trash removal and litter prevention, and the elimination of sources of sewage discharge during dry weather. Target A is also associated with improving the aesthetic quality of streams and stream corridors so that it can be viewed and treasured as a resource. Access and interaction with the stream during dry weather has the highest priority, because dry weather flows occur about 60-65% of the time during the course of a year. These are also the times when the public is most likely to be near or in contact with the stream.

The LTCPU includes implementation of Minimum Control Measure 5, which prohibits dry weather discharge from combined sewer systems. The LTCPU supports efforts to create more enjoyable, safer streams by ensuring the physical and water quality conditions needed for safe recreation.

Target B: Healthy Living Resources

Improvements to the number, health, and diversity of benthic macroinvertebrate and fish species in the tributaries will require investment in habitat improvement and measures to provide the opportunity for organisms to avoid high velocities during storms. Improving the ability of an urban stream to support viable habitat and fish populations must focus primarily on the elimination or remediation of the more obvious impacts of urbanization. These include loss of riparian habitat, eroding and undercut banks, scoured streambed or excessive silt deposits, channelized and armored sections, trash buildup, and invasive species. In the tidal rivers, impairment of living resources has not been identified as a problem.

The LTCPU complements Target B measures by protecting investments in restored stream channels and habitat, which in turn support healthy living resources.

Target C: Wet Weather Water Quality and Quantity

The third target of the integrated approach is to restore water quality to meet fishable and swimmable criteria during wet weather and to address flooding issues. Improving water quality and flow conditions during and immediately following storms is the most difficult target to meet in the urban environment. The integrated approach seeks to restore a more natural water balance to help recharge groundwater, reduce the burden on sewer systems, and reduce the quantity and pollutant loads of discharges to receiving waters. The approach also seeks to identify appropriate wet weather water quality criteria that do not pose a health risk to people engaging in recreation.

The LTCPU will make specific commitments to improving wet weather water quality and reducing the impacts of combined sewer overflows.

4.4.2 Review of Integrated Watershed Management Plan Goals

PWD's Integrated Watershed Management Plans (IWMPs), developed in cooperation with stakeholder partnerships, are based on a carefully developed approach to meeting the challenges of watershed management in an urban setting. A critical step in the IWMP Process is the establishment of stakeholder goals – deemed representative of the multitude of watershed perspectives. PWD's interest is in seeing that the final set of goals that drive the planning process are designed to meet the goals and objectives of the numerous water resource related regulations and programs that PWD and our upstream municipal partners must address. They also draw from the similarities contained in many watershed-based planning approaches authored by PADEP and US EPA. As such, PWD has developed a set of consolidated watershed goals with a focus on attaining priority environmental goals in a phased approach, by making use of the numerous existing programs that directly or

indirectly require watershed planning. These consolidated goals were presented to each stakeholder partnership as a "master set" of goals, which they are invited to evaluate for applicability and completeness.

PWD's IWMP goal setting process is based on the use of the following definitions for the terms "goal", "objective", and "indicator":

> **Goal:** Goal statements are intentionally general and not specifically measurable (however a goal must be able to be "translated" into a measurable objective). Goals should represent a series of "wishes" for the watershed.
>
> **Objective:** For each goal statement – one or more objectives will be defined. An objective *translates* the broad language of a goal statement into a measurable quantity. The objective should lead toward the establishment of a target value, and could help to establish a trend over time.
>
> **Indicator:** Indicators are directly related to the measurable objectives; for each watershed objective – an indicator has been developed to measure whether progress is made. Indicators are often defined by actual numeric quantity that the objective is measured against. They are intended to broadly characterize condition and vulnerability.

The goals and objectives represent the collective idea of the stakeholders on what the watershed management plan should achieve. Not all goals, however, are of equal importance. It is important to elicit from the stakeholders a collective opinion on the relative importance of each goal for the watershed. Because the achievement of goals is an important yardstick for measuring the effectiveness of the management plan, some numerical representation of the importance of each goal is useful.

Results from the Darby-Cobbs Watershed Partnership are presented here as an example of the relative importance one stakeholder group assigned to each goal. To develop a set of numerical weights that represent the importance of each goal relative to the other goals, a workshop was held on October 29, 2002, with members of the partnership participating. The goal of the workshop was to work towards a consensus on a numerical set of weights that best represent the collective opinion on the importance of each goal. Each participant filled in a worksheet that described, as a percent, the individual contribution of each goal to the overall goal of watershed management. These sheets provided a variety of opinions on how the goals should be weighted, and served as a guide to a discussion on the relative importance of each goal. Through the group discussion, a consensus set of goal weights was developed that best represents the importance of each goal as defined by the stakeholders. Table 4-1 shows the weights assigned to each goal. The weights represent a percentage of the overall importance of each goal relative to all goals.

Table 4-1 Weights Assigned to Individual Goals by the Darby-Cobbs Watershed Partnership

Streamflow and Living Resources. Reduce the impact of urbanized flow on the living resources (increase baseflow and recharge, reduce impervious area and runoff peaks, improve stormwater ordinances).	**12**
Stream Habitat and Aquatic Life. Improve stream habitat and indices of aquatic integrity (improve physical habitat, benthic, fish, algae).	**9**
Stream Channels and Banks. Reduce streambank and stream channel deposition and scour to protect and restore the natural functions of aquatic habitat and ecosystems, streambanks, and stream channels (increase stabilized areas, reduce frequency of bankfull flow).	**7**
Flooding. Decrease flooding (improve stormwater management, trouble spots, inlet cleaning, floodplain management and structures).	**11**
Water Quality. Improve dry and wet weather stream quality (meet designated uses, prevent fish advisories).	**9**
Pollutant Loads. Decrease pollutant loads to surface waters (decrease runoff, SSO, septic tank, CSO, and debris loads).	**10**
Stream Corridors. Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands.	**11**
Quality of Life. Enhance community environmental quality of life (protect open space, access and recreation, security, aesthetics, historical/cultural resources).	**12**
Stewardship. Foster community stewardship (increase awareness and responsibility, volunteer programs, education).	**11**
Coordination. Improve inter-municipal, inter-county, state-local, and stakeholder cooperation and coordination on a watershed basis.	**8**

For each watershed, after a series of broad-based goals was adopted by the stakeholder partnership, PWD developed a number of specifically measurable objectives and associated indicators for each goal so that progress toward achievement of these goals can be assessed as implementation takes place. These were also presented to watershed stakeholders for approval and adoption.

Prior to presenting the master set of goals to watershed stakeholders, PWD evaluated a number of existing plans for each watershed planning area in order to assemble a comprehensive list of "existing" stakeholder goal statements, which were then compared with PWD's master list. What has emerged in each watershed planning area is that PWD's goals, which are purposely broadly worded, are able to encompass the intent of each of the goals of the numerous plans as a subset because they are often of the same intent – but more geographically or project specifically focused, and can be fit neatly under the broad goal set.

PWD's "master goal set" has successfully been applied and accepted by stakeholders in five watershed planning processes city-wide thus far, and are the existing draft set for two ongoing

planning initiatives. PWD has evaluated this goal set against the intent of their LTCPU commitment to see which goals will be complimented and/or addressed by the LTCPU (Table 4-2).

Table 4-2 Integrated Watershed Management Plan Goals

IWMP Goal	Is This Goal Addressed?		Notes
	Guidance for LTCP	*Green City, Clean Waters*	
Goal 1 – Streamflow and Living Resources. Improve stream habitat and integrity of aquatic life.		X	Restoration of a more natural water balance protects investments in restored stream channels and habitat, which in turn support healthy living resources.
Goal 2 – Instream Flow Conditions. Reduce the impact of urbanized flow on living resources.		X	Measures to control stormwater at the source restore a more natural water balance with minimal negative impact on water resources.
Goal 3 – Water Quality and Pollutant Loads. Improve dry weather stream quality to reduce the effects on public health and aquatic life.		X	Both the traditional LTCP approach and PWD's approach address pollutant loads and water quality standards in wet weather.
Goal 4- Water Quality and Pollutant Loads. Improve wet weather stream quality to reduce the effects on public health and aquatic life.	X	X	*Green City, Clean Waters* targets dry weather water quality.
Goal 5 – Stream Corridors. Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands.		X	Restoration of stream channels, riparian areas, and wetlands restores habitat features necessary for healthy ecosystems.
Goal 6 – Flooding. Identify flood prone areas and decrease flooding by similar measures intended to support Goals 1, 2, and 4.			*Green City, Clean Waters* does not directly address flooding. Although out-of-bank flooding is uncommon in Philadelphia, basement flooding is a concern. These concerns are addressed separately by PWD's Storm Flood Relief program.
Goal 7 – Quality of Life. Enhance community environmental quality of life.		X	PWD's approach complements efforts to make urban communities greener and more inviting.
Goal 8 – 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	PWD's public participation program directly involves the public and municipal officials in decisions and helps all stakeholders to understand the amenities that healthy urban water resources systems can provide. LTCP guidance also requires public participation.

4.4.3 LTCPU Goals

Goals of the LTCPU have been generated based on both the assessment of problems identified in the receiving waters (Section 4.1) and from the goals utilized by the IWMPs, as well as through alignment with the City's vision "Green City – Clean Waters." This vision seeks to unite the City with its water environment, creating a green legacy for future generations while incorporating a balance between ecology, economics and equity. Each goal is intended to improve the water resources system and help the community to recover a historical resource or amenity that has been impaired through urbanization.

Outlined below are the goals of the LTCPU aligned with the target that each will help to achieve:

Target A: Dry Weather Water Quality, Aesthetics, and Recreation

- A.1 Eliminate dry weather discharges from combined sewer systems to the maximum extent possible. Continue to correct any short-term issues such as blockages as soon as they are identified. Following implementation, CSOs will not cause or contribute to exceedance of water quality criteria for bacteria in dry weather.
- A.2 Control discharges of solids, floatables, and trash to receiving waters.
- A.3 Improve opportunities for water-based recreation under safe physical conditions.
- A.4 Support regional efforts to create safer, more accessible, more enjoyable waterfronts and stream corridors.

Target B: Healthy Living Resources in Streams/Rivers and Along Riparian Corridors

- B.1 Protect and restore stream corridors, buffers, floodplains, and natural habitats including wetlands. Following implementation of stream channel and habitat restoration measures, CSOs will not cause or contribute to erosion and habitat degradation in the tributaries.
- B.2 Restore tidal wetlands and wetland habitats.

Target C: Wet Weather Water Quality and Quantity

- C.1 Restore a more natural water balance between surface runoff, infiltration, and evaporation. In the tributaries, reduce the magnitude and duration of peak flows to protect investments in channel and habitat restoration.
- C.2 Reduce CSO volume, frequency, and length of discharge.
- C.3 Implement a phased approach to meeting appropriate wet weather bacteria criteria.

Stewardship and Community

- SC.1 Foster community stewardship and improve inter-municipal, inter-county, state-local, and stakeholder cooperation and coordination on a watershed basis.
- SC.2 Support regional efforts to create greener, more inviting urban communities.