2024 Annual Status Report

Long Term 2 Enhanced Surface Water Treatment Rule
Watershed Control Program Plan

Baxter and Queen Lane Drinking Water Treatment Plants
Delaware and Schuylkill Rivers, Philadelphia, PA

Prepared by the Philadelphia Water Department

December 2024

This report was produced for the Pennsylvania Department of Environmental Protection in accordance with the Environmental Protection Agency National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule.

DISCLAIMER:

This annual status report is provided as of December 2024. It is being provided to the Pennsylvania Department of Environmental Protection (PADEP) to document PWD's completion of certain Watershed Control Plan (WCP) initiatives during 2024 in connection with the requirements of the Long Term 2 Enhanced Surface Water Treatment Rule. The WCP presents a comprehensive source water protection approach to reducing levels of infectious Cryptosporidium in finished drinking water. By presenting this information, PWD has not undertaken any obligation to update the report beyond its date. As such, the information is subject to change without notice. There is no assurance that the programs or initiatives set forth herein or referenced in this report will be realized or come to fruition, and subsequent or actual plans or proposals may differ, perhaps materially, from the descriptions contained herein. The data and information provided are not warranted as to completeness or accuracy and are subject to change without notice. This report is provided for PADEP's information and convenience only.

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List of Acronyms

AEU	Animal Equivalent Unit
APHIS	Animal and Plant Health Inspection Service
BCCD	Berks County Conservation District
BCWSA	Berks County Water and Sewer Association
BMP	Best Management Practice
CAC	Citizens Advisory Council
CAFO	Concentrated Animal Feeding Operation
CDC	Community Design Collaborative
CNMP	Comprehensive Nutrient Management Plan
CSO	Combined Sewer Overflow
CREP	Conservation Reserve Enhancement Program
DRBC	Delaware River Basin Commission
DRWI	Delaware River Watershed Initiative
EPA	United States Environmental Protection Agency
EWS	Early Warning System (Delaware Valley)
FWWIC	Fairmount Water Works Interpretive Center
GCCW	*Green City, Clean Waters*
LTCPU	Long Term Control Plan Update
LT2	Long Term 2 Enhanced Surface Water Treatment Rule
MS4	Municipal Separate Storm Sewer System
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
PA DEP	Pennsylvania Department of Environmental Protection
PDE	Partnership for the Delaware Estuary
PEC	Pennsylvania Environmental Council
PHS	Pennsylvania Horticultural Society
PWD	Philadelphia Water Department
SAN	Schuylkill Action Network
SAS	Schuylkill Action Students
SRDC	Schuylkill River Development Corporation
SRG NHA	Schuylkill River Greenways National Heritage Area
SRRF	Schuylkill River Restoration Fund
SWA	Source Water Assessment
SWPP	Source Water Protection Plan
WCP	Watershed Control Plan
WSS	Watershed Sanitary Survey
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
USDA	United States Department of Agriculture

1.0 Executive Summary

This document serves as a yearly report for the Philadelphia Water Department's (PWD) Queen Lane and Baxter drinking water treatment plants to maintain compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). In 2024, PWD continued to implement its Watershed Control Plan (WCP) for the Queen Lane intake in the Schuylkill River Watershed in compliance with LT2. The plan aims to reduce *Cryptosporidium* loadings in the Schuylkill River watershed from priority sources such as wastewater effluent, agriculture, animal vectors, and urban stormwater runoff. Source water protection initiatives as well as structural control measures were identified and implemented as part of the WCP to achieve a target *Cryptosporidium* load reduction. Additionally, PWD received approval in Summer 2021 of its Watershed Control Plan Update to expand *Cryptosporidium* control strategies into the Delaware River Watershed for the Baxter intake and improve collaborative foundations among stakeholders and create education and outreach programs.

PWD utilizes two key mechanisms to support WCP implementation: the Schuylkill Action Network (SAN), a watershed-wide collaborative consisting of stakeholders from public, private, and non-profit sectors; and the Schuylkill River Restoration Fund (SRRF), a public-private partnership created to fund the implementation of on-the-ground environmental restoration projects in the Schuylkill River watershed. PWD supports facilitation of the Schuylkill Action Network, with its contract amount increasing from $155,000 annually to $217,000 beginning in fiscal year 2024. PWD has been contributing annually to the SRRF to fund projects that best align with PWD planning priorities. This contribution had historically been $100,000 but was increased to $250,000 beginning in 2024.

Progress towards the WCP objectives is summarized below by priority sources along with highlights from the inception of the WCP.

Priority Source: Wastewater Effluent

In 2018, PWD completed its first triennial update to the Schuylkill Watershed Sanitary Survey (WSS), a comprehensive report detailing the status of wastewater treatment technologies and sewage system planning efforts throughout the Schuylkill River watershed. PWD continues to track developments in the watershed related to Act 537 sewage facility planning through the Schuylkill Action Network (SAN) Pathogen and Point Source Workgroup and updates the WSS accordingly. The 2021 update to the WSS was submitted to the PA DEP in January 2022. Additionally, PWD engages wastewater utilities through its continued participation in the SAN Pathogen and Point Source workgroup and as the owner of the Delaware Valley Early Warning System for the lower Delaware River watershed.

In 2024, the SAN Pathogen and Point Source Workgroup strengthened communication between and provided educational resources to wastewater and drinking water utilities to improve source water protection efforts. The group facilitated data and information sharing to document wastewater treatment technologies and improvements and investigated evolving source water issues – including unregulated contaminants. PWD also helped plan and coordinate 2024's biennial Water Utility Forum, a day-long event where water utilities throughout southeast Pennsylvania meet to discuss source water issues. This year's Water Utility Forum was the first to expand geographically and invite utilities outside

of the Schuylkill River watershed. The next event, likely to be held in 2026, may include Delaware River water utilities as planning committee members.

PWD began outreach to water utilities in the Baxter area of influence in 2023, holding an in-person meeting with Lehigh County Authority (LCA) to discuss watershed protection, source water monitoring, and the Delaware Valley Early Warning System. Dialogue between PWD and LCA remains ongoing, as does PWD's outreach to Delaware River water and wastewater utilities. In 2024, DRBC formally approved and convened a Source Water Protection subcommittee, on which PWD holds the position of reserved member. PWD attended DRBC's inaugural Source Water Protection Subcommittee meeting on November 14, 2024, and accepted the position of chair of the new subcommittee. The initial meeting convened nearly one dozen water and wastewater utilities along the lower Delaware River, along with regulatory partners. This initial meeting focused on available spill modeling and coordinated spill response for future events. The next meeting is expected to be held in spring 2025.

Priority Source: Agriculture

PWD supports agricultural best management practice installation through annual contributions to the Schuylkill River Restoration Fund (SRRF) and participation on the grant advisory committee. In 2024, $123,000 from PWD's annual contribution funded four large watershed protection projects on agricultural properties in the Schuylkill River watershed. These priority projects were selected for the implementation of agricultural best management practices to support WCP *Cryptosporidium* control objectives.

- The Weinsteiger Farm, a beef operation in the headwaters of Perkiomen Creek in Leesport, Berks County, received a $31,000 SRRF grant to construct a roofed manure stack pad and other agricultural best management practices (BMPs). PWD contributed the total amount of the award for the Weinsteiger Farm to Berks County Conservation District.
- The Masemore Farm property, a dairy operation in the headwaters of the Perkiomen Creek Watershed in Hereford Township, Berks County, received a $99,750 SRRF grant to construct a 6-month capacity manure storage facility and other agricultural BMPs. PWD directed $30,750 to Berks Nature for the Masemore Farm project, with Constellation Energy and Aqua contributing a further $69,000.
- The Bitler-Vista Grande Farm, a dairy operation in the headwaters of the Maiden Creek watershed in Richmond Township, Berks County, received a $60,000 SRRF grant to construct a 6-month storage capacity manure storage facility and other agricultural best management practices (BMPs). PWD contributed $30,750 to Berks Nature for the Bitler-Vista Grande Farm, with Constellation Energy contributing the remaining $29,250.
- The Sterner Dairy Farm, located in the headwaters of the Middle Creek watershed in Bechtelsville, Montgomery County, received a $100,000 SRRF grant to decommission a damaged underground manure storage system and replace it with two new waste storage facilities, in addition to adding other agricultural best management practices (BMPs). PWD contributed

$30,500 to Montgomery County Conservation District for the Sterner Dairy Farm, with Constellation Energy contributing the remaining $69,500.

PWD continues to be an active participant in the SAN Agricultural Workgroup to coordinate efforts among watershed partners with similar environmental protection objectives. Through the SAN, education and outreach materials are developed and additional stakeholders are engaged to promote the implementation of agricultural best management practices and nutrient management plans throughout the watershed. In the last year, SAN partners continued to help develop and implement Comprehensive Nutrient Management Plans (CNMP) for agricultural properties across the Schuylkill River watershed.

Priority Source: Animal Vectors

At PWD facilities and Fairmount Park properties, Canada geese—known mechanical vectors of *Cryptosporidium*—were removed and nests and eggs treated through a partnership with the US Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS). Wildlife management activities were also conducted on several PWD properties, including Philadelphia's three drinking water treatment plants.

In the second half of 2023, 3,120 geese were dispersed or removed from Philadelphia public parks and 6,268 geese were dispersed or removed in the first half of 2024, totaling 9,388 geese during FY24. In FY24, 3,589 geese were dispersed or removed from Peter's Island and Pleasant Hill Park, both locations near Philadelphia drinking water intakes.

Priority Source: Urban Stormwater

Stormwater best management practices (BMPs) were not directly included in the scope of the WCP. Stormwater projects are already implemented through a variety of other programs, including stormwater ordinances and MS4 permits. Stormwater management practices are implemented throughout the City of Philadelphia as part of PWD's *Green City, Clean Waters* (GCCW) program, a 25-year plan to reduce stormwater pollution through the installation of green infrastructure. Additionally, the Rain Check program informs Philadelphia residents about the benefits of green stormwater infrastructure and how to select the best options for their property. In FY24, a total of 29 workshops were held with 1,150 participants. As a result of the FY24 program, a variety of stormwater management tools were installed on residential properties, including 14 installations of permeable pavers to allow for better infiltration of stormwater, 146 downspout planters, 1 rain garden planting, and 414 rain barrels.

Through the SAN, a number of riparian buffer plantings and education and outreach events have occurred throughout the watershed. In 2024, the SAN Agriculture workgroup toured an agroforestry project and learned about converting marginal pastureland into new harvestable agricultural product by planting nut-bearing trees. PDE also tabled with information about the SAN at the inaugural Perkiomen Stormwater Workshop at Ursinus College in early March, which was attended by approximately 100

stakeholders in the Perkiomen subwatershed. The SAN Stormwater Workgroup and Pathogens and Point Source Workgroup also collaborated on a tour along the Schuylkill River Trail of the Flat Rock Dam improvement project, which was attended by more than 50 people.

The Future of the WCP

The second round of LT2 compliance sampling ended in March 2017. Each PWD intake on the Schuylkill and Delaware Rivers was sampled bimonthly for a period of 2 years. *Cryptosporidium* results from the Queen Lane Water Treatment Plant achieved an average result less than the 'Bin 1' threshold value of 0.075 oocysts per liter; however, the Queen Lane Water Treatment Plant remains classified as 'Bin 2' due to sampling results obtained from the first round of LT2 monitoring. The Queen Lane Water Treatment Plant will continue to achieve individual and combined filter effluent performance requirements as approved by PA DEP to maintain compliance with the first round of LT2 sampling. The second round of LT2 compliance sampling placed the Baxter Water Treatment plant on the Delaware River in Bin 2. The same microbial toolbox options selected for Queen Lane were selected for Baxter to ensure that PWD maintains compliance with the LT2 regulation. PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework. PWD submitted a WCP Update to PA DEP in October 2020 that expands WCP efforts into targeted areas of the Delaware River watershed. The updated plan was approved in June 2021. WCP Annual Status Reports will now include progress updates relevant to the expanded scope of work.

2.0 Introduction

In April 2011, the Philadelphia Water Department (PWD) completed a Watershed Control Plan (WCP), and after receiving approval from the Pennsylvania Department of Environmental Protection (PA DEP) the WCP went into effect December 2012. The WCP presents a comprehensive source water protection approach to reducing levels of infectious *Cryptosporidium* in source water (US EPA, 2006). The elements of the WCP were achieved through previously established and ongoing efforts of the PWD Source Water Protection Program and through WCP actions aimed to specifically reduce levels of *Cryptosporidium* in the Schuylkill River watershed, a PWD drinking water source. A proposed Watershed Control Plan Update, expanding the geographic scope into priority areas of the Delaware River Watershed, was submitted in October 2020 and approved in June 2021.

The following report documents PWD completion of WCP initiatives during 2024. The existing framework of the plan and its underlying initiatives will continue to be maintained and developed to further reduce sources of pathogens, nutrients, and sediment into area waters.

3.0 Background

The US Environmental Protection Agency (EPA) published the first source water quality-based drinking water regulation on January 5, 2006. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2), a series of amendments to the Safe Drinking Water Act, serves to protect the public from waterborne illness caused by *Cryptosporidium* and other microbial pathogens in drinking water. In the United States, *Cryptosporidium* has been the cause of several outbreaks of Cryptosporidiosis, a gastrointestinal disease particularly dangerous for immunocompromised individuals. LT2 requires public drinking water systems with surface water sources, or groundwater sources influenced by surface water, to monitor monthly for *Cryptosporidium* at each supply intake for two years. The observed *Cryptosporidium* concentrations categorize each intake into one of four 'Bins.' Public water systems placed in Bin 1 indicate the lowest concentrations of *Cryptosporidium* and require no additional treatment. Public water systems placed in Bins 2, 3 and 4 require 4-log, 5-log and 5.5-log removals, respectively. A log removal represents a reduction in pathogen concentration during treatment by calculating the logarithm of the ratio of the influent and effluent concentrations; for example, 1-log removal represents 90% reduction, 2-log represents 99%, 3-log represents 99.9%, and so on. Public water systems using conventional treatment processes, coagulation, flocculation, sedimentation, filtration, are assumed to achieve a 3-log removal. Therefore, additional 1-log, 2-log or 2.5-log treatment credit(s) is required of a conventional treatment facility if placed in Bins 2 through 4. The EPA provides a "microbial toolbox" describing options to earn additional treatment credits including source water protection and management programs, pre-filtration processes, treatment performance programs, additional filtration components and inactivation technologies.

PWD *Cryptosporidium* monitoring data categorized each of Philadelphia's three drinking water treatment plants (WTPs) into Bins. During the first round of LT2 compliance sampling, Baxter and Belmont achieved Bin 1 status with average oocyst concentrations less than 0.075 per liter. However, Queen Lane data resulted in an average oocyst concentration of 0.076 per liter, falling into Bin 2. Since Queen Lane uses conventional treatment processes and automatically receives a 3-log removal credit,

an additional 1-log removal credit was required. PWD selected to use the combined filter effluent for 0.5-log credits, the individual filter effluent for 0.5-log credits, and the development and implementation of a WCP for 0.5-log back up credits. PWD submitted a WCP to the PA DEP in April 2011 and received approval in December 2012.

From April 2015 through March 2017, LT2 Round 2 monitoring occurred. Results from this sampling period classified the Queen Lane WTP as Bin 1. However, the ongoing initiatives outlined in the plan as well as annual status reporting and triennial Watershed Sanitary Survey updates are being continued to maintain the 0.5-log backup treatment credit. PWD results from Round 2 sampling reclassified the Baxter Water Treatment Plant on the Delaware River as a Bin 2 facility. The full results of LT2 Round 1 and Round 2 monitoring are summarized below in Table 3-1.

Table 3-1: LT2 Rounds 1 and 2 Monitoring Results

	Round 1 Result (oocysts per L)	Round 1 Bin	Round 2 Result (oocysts per L)	Round 2 Bin
Baxter	0.023	1	0.087	2
Belmont	0.073	1	0.063	1
Queen Lane	0.077	2	0.067	1

**Results less than 0.075 oocysts per L classified as Bin 1*

PWD treatment is selecting the same IFE and CFE filter performance options as selected for the Queen Lane WTP for an additional 1-log treatment credit. Additionally, this document expands ongoing WCP for the Queen Lane intake to include priority areas influencing the Baxter intake to achieve a 0.5-log backup credit to ensure Baxter's compliance with LT2 regulation. In October 2020, PWD submitted a Watershed Control Plan Update to protect both the Baxter and Queen Lane intakes. The updated plan was subsequently approved in June 2021. A timeline of critical LT2 events starting with the second round of *Cryptosporidium* monitoring in April 2015 is shown in Table 3-2 along with links to annual status reports detailing progress towards WCP goals.

Table 3-2: LT2 WCP Timeline

Action	Reporting	Due Date
Second round of *Cryptosporidium* monitoring		April 2015 to March 2017
First triennial Watershed Sanitary Survey Submitted	Watershed Sanitary Survey	December 2015
Annual Status Report Submitted to State	2015 Annual Status Report	January 2016
Annual Status Report Submitted to State	2016 Annual Status Report	January 2017
Round 2 Bin Classification		October 2017
Annual Status Report Submitted to State	2017 Annual Status Report	January 2018
First Update to the Watershed Sanitary Survey Submitted	2018 Watershed Sanitary Survey	January 2018
Letter of intent to submit WCP (Baxter)		October 2018
Annual Status Report Submitted to State	2018 Annual Status Report	January 2019
Annual Status Report Submitted to State	2019 Annual Status Report	January 2020
WCP Update Submitted to State	LT2 Watershed Control Plan Update for Baxter and Queen Lane Intakes	October 2020/Approved June 2021
Annual Status Report Submitted to State	2020 Annual Status Report	January 2021
Approval of WCP Update by State		June 2021
Second Update to the Watershed Sanitary Survey	2021 Watershed Sanitary Survey	January 2022
Annual Status Report Submitted to State	2021 Annual Status Report	January 2022
Annual Status Report Submitted to State	2022 Annual Status Report	January 2023
Annual Status Report Submitted to State	2023 Annual Status Report	January 2024
Third Update to the Watershed Sanitary Survey	2024 Watershed Sanitary Survey	January 2025
Annual Status Report Submitted to State	2024 Annual Status Report	January 2025

Note: Shading indicates milestones that have been completed at the time of the report's preparation.

4.0 Watershed Control Program Updates

As outlined in the Watershed Control Plan Update, the *Cryptosporidium* control strategies within PWD's Watershed Control Plan include the following broader categories:

- ***Capital Improvements at PWD Drinking Water Treatment Plants*** – Includes the planning, design, and construction of treatment upgrades to enhance drinking water treatment abilities
- ***Watershed Protection Initiatives*** – Consists of various research, coordination, and on-the-ground projects to address priority sources of *Cryptosporidium*
- ***Education and Outreach*** – Includes tasks to support the goal of raising awareness of source water protection issues
- ***Stakeholder Engagement and Partnership Building*** – Outlines tasks associated with the feasibility evaluation of a Delaware River Watershed Collaborative and/or funding mechanism

The sections that follow provide further detail on the progress made in each control strategy.

4.1 Capital Improvements at Philadelphia's Water Treatment Plants

Since the development of the Watershed Control Plan, the Philadelphia Water Department has completed a comprehensive Water Revitalization Plan that reviews existing drinking water treatment, pumping, distribution, and supply infrastructure in the context of anticipated regulatory and environmental drivers. The objective of the plan is to develop a strategic, long-term capital improvement strategy that anticipates the capacity, treatment, and resiliency needs of the future.

The 2020 Watershed Control Plan Update includes an overview of these updates and commits to annual reporting on the status of UV disinfection upgrades at Philadelphia's three drinking water treatment plants as an effective inactivation mechanism of *Cryptosporidium*.

Table 4-1 displays the planning, design, and construction timelines. Planning for installation of UV treatment systems and other upgrades at Baxter and Belmont water treatment plants started in 2019. The design phases are anticipated to begin in 2025 and 2030 for the Baxter and Belmont plants, respectively. Planning for the installation of UV treatment and other treatment upgrades at the Queen Lane water treatment plant commenced in 2021.

Table 4-1: Planned Implementation Schedule – UV Inactivation Installation at PWD DWTPs

Control Strategy: UV Inactivation at PWD Water Treatment Plants						
Planned Capital Project	**Planning**		**Design**		**Construction**	
	Start	End	Start	End	Start	End
Installation of UV treatment system at Baxter WTP on Delaware River*	2019	2025	2025	2029	2029	2035
Installation of UV treatment system at Belmont WTP on Schuylkill River*	2019	2026	2030	2034	2035	2039
Installation of UV treatment system at Queen Lane WTP on Schuylkill River*	2021	2029	2033	2038	2039	2048

**and other treatment process upgrades*

4.2 Watershed Protection Program Initiatives

The Philadelphia Water Department has a robust Watershed Protection Program that includes source water protection, climate change adaptation planning, and water quality modeling. The Watershed Protection Program uses a multi-barrier approach that includes emergency preparedness systems, public and private communication networks, computer modeling systems, laboratories, regional and national partnerships, and the development and implementation of formal plans to achieve watershed protection goals.

In the Watershed Control Plan Update, PWD outlines ongoing and proposed initiatives from the Schuylkill River watershed Source Water Protection Plan (SWPP) that are relevant to the control of *Cryptosporidium* upstream of the Queen Lane intake as well as programs and initiatives in the Delaware River watershed to protect the Baxter intake. This section discusses the contribution PWD has made toward each of the ongoing and proposed initiatives by each priority source category during 2024.

4.2.1 Wastewater Discharge/Compliance

Effluent from WWTPs upstream of the Queen Lane intake is a source of *Cryptosporidium* in the watershed (PWD, 2002; PWD, 2011). Table 4-2 outlines planned watershed protection projects and tasks aimed to support the goal of pathogen reduction for the priority source of wastewater discharges. Table 4-2 also includes initiatives for the Delaware River Watershed proposed in the Watershed Control Plan Update submitted in October 2020. Progress towards each initiative is detailed in the sections that follow.

Table 4-2: Planned Implementation Schedule – Watershed Protection Control Strategies to Address Wastewater Discharges

Control Strategy: Watershed Protection			
Priority Source - Wastewater Discharger Compliance			
Initiatives	**Target Watershed**	**Target Completion Date**	**Report Section**
Collaborate on *Cryptosporidium* source tracking studies	Various	On hold	4.2.1.1
Continue to regularly review and update Philadelphia's Act 537 Plan	Lower Delaware River	Ongoing	4.2.1.2
Implement initiatives outlined in the annual Combined Sewer Management and Stormwater Management report	Lower Delaware and tidal Schuylkill River Watersheds	Ongoing	4.2.1.3
Maximize usage for the Delaware Valley Early Warning System while maintaining the system's ongoing O&M needs	Lower Delaware and Schuylkill River Watersheds	Ongoing	4.2.1.4
Continue to support efforts identified in the SAN Pathogens/Compliance Workgroup's Annual Workplans	Schuylkill River	Ongoing	4.2.1.5
Update discharger information from Source Water Assessments to reassess vulnerability from upstream dischargers	Schuylkill and Delaware Rivers	Ongoing	4.2.1.6
Track installation of wastewater treatment upgrades and improvements upstream of Philadelphia's intakes	Schuylkill and Delaware Rivers	Ongoing	4.2.1.7; 4.2.1.8
Work with professional organizations and industry groups e.g., NACWA, WaterRF, et al., to support related research and advocacy efforts	Various	Ongoing	4.2.1.19
Continue to strengthen relationships with upstream wastewater dischargers	Delaware River	Ongoing	4.2.1.10

4.2.1.1 Cryptosporidium Monitoring and Source Tracking Studies

PWD worked with Lehigh University for more than a decade to support ongoing research on *Cryptosporidium* in Philadelphia source water. The collaboration between PWD and Lehigh University consisted of developing sampling programs to better understand the occurrence, sources and vectors of *Cryptosporidium* in the Schuylkill River watershed. Sampling programs were designed to answer research questions and improve and expand methods for field sample collection and laboratory analysis of *Cryptosporidium*. PWD contributed field sample collection support, project management and oversight. PWD regularly communicated with project partners at Lehigh to create solutions for issues

encountered in the field and lab, incorporate improvements, and expand the project. An article detailing some of the outcomes of research collaboration, "Biofilm Sampling for Detection of *Cryptosporidium* Oocysts in a Southeastern Pennsylvania Watershed" was published in November 2020 in *Applied and Environmental Microbiology*[1].

4.2.1.2 Philadelphia's Act 537 Plan

Act 537 is the Pennsylvania Sewage Facilities Act. The program addresses existing sewage disposal needs and future disposal needs through proper planning, permitting and design of sewage facilities. The Philadelphia Act 537 Plan was last updated in 2009.

4.2.1.3 Combined Sewer Overflow (CSO) and Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit Annual Report

Each year, PWD submits a report to PA DEP summarizing activities and programs pertaining to the management of stormwater in combined and separate sewers in accordance with the CSO and MS4 NPDES permits. A major component of PWD CSO NPDES permit requirements is the implementation of the Long Term Control Plan Update (LTCPU), also called the *Green City, Clean Waters* program. *Green City, Clean Waters* is a 25-year program that includes a green stormwater infrastructure-based approach to reduce pollutants discharged by the combined sewer system. The most recent fiscal year annual report is available on http://water.phila.gov/reporting/.

4.2.1.4 Early Warning System

The Delaware Valley Early Warning System (EWS) improves the safety of the drinking water supply by providing rapid communication of surface water pollution events or surface water quality changes. An event reported to the EWS website or via the telephone hotline triggers email notifications and sends spill model results to the entire user group in a matter of minutes. The EWS user group consists of more than 519 registered users from 62 organizations, representing drinking water supply, wastewater, industry, emergency response, and government.

In addition to email notification, telephone notifications occur for high-risk events. The EWS utilizes a fully automated email and telephone notification system (which does not require staffing) to notify all downstream users when water quality events are reported. The EWS utilizes predictive spill modeling that can estimate the downstream travel path of the pollution, and the arrival times at water system intakes using real time water data and tidal conditions.

Notifications through the EWS provide critical information to water system and industrial operators who may need to either make changes to treatment processes or to close intakes in response to a surface water contamination event. Participating government agencies are also notified to assist in coordinating spill response activities.

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[1] Jellison K, Cannistraci D, Fortunato J, McLeod C. 2020. Biofilm sampling for detection of *Cryptosporidium* oocysts in a southeastern Pennsylvania watershed. Appl Environ Microbiol 86: https://doi.org/10.1128/AEM.01399-20.

The EWS allows users to review the details of reported pollution events, including the event's location, spill path, arrival time, and risk level, and provides a description of the event and the status of the event report. Notable recent updates to EWS include adding full mobile device (smartphone) functionality for the EWS website and improved mapping and notification features. EWS user training is readily available by request to PWD. Water quality events of concern to EWS members include accidental and illicit discharges, as well as natural changes in water quality that can significantly affect drinking water sources. Such events include truck and vehicle accidents on roadways that drain to nearby streams and rivers, railway accidents, on-water accidents (involving boats and tankers), spills on properties (especially industrial sites) near waterways, runoff from fires/firefighting, wastewater system discharges, sewer overflows, releases of impounded sediments, and failures of waste product basins.

In 2022, the Flood Forecast Viewer (FFV) was added to the EWS. The FFVwas developed to increase users' awareness of possible water quality impacts triggered by flooding events. Flooding often causes sewer overflows, damage to tanks and other liquid storage vessels, and flow across industrial sites that can affect water quality. The FFV displays information about flood conditions predicted by NOAA 24 hours in the future on major waterways in the EWS service area. The EWS continues to serve as an invaluable communication tool to advance public health and safety. For example, the EWS was especially useful in sharing flooding and water quality information during Hurricane Ida in August 2021. The EWS also provided critical information to the many drinking water suppliers and government organizations responding to the Trinseo chemical spill to the Delaware River in March 2023. Since its inception in 2004, the EWS has provided the user group with more than 600 notifications about potential impacts to water supply in the lower Delaware River Basin.

4.2.1.5 SAN Pathogens and Point Source Workgroup

The purpose of the SAN Pathogens and Point Source Workgroup is to facilitate and strengthen communication and coordination among regulatory agencies, downstream water users, and basin stakeholders regarding Clean Water Act and Safe Drinking Water Act goals. PWD regularly attends quarterly SAN Pathogens and Point Source Workgroup meetings and serves as a workgroup co-chair. A quarterly e-newsletter was established in 2019 to improve information sharing among stakeholders. The group continues to be a key mechanism for information exchange among stakeholders on emerging contaminant research, upcoming regulation, and wastewater treatment advancements. The service area of some utility partners in this workgroup, including Aqua PA and PA American Water, comprises areas within the lower Delaware River watershed, part of the expanded geographic scope of the WCP to include Baxter's area of influence.

4.2.1.6 Priority Discharger List

In preparation of the 2020 Watershed Control Plan Update, the 2002 priority *Cryptosporidium* point source list from PWD's Source Water Assessments for the Schuylkill and Delaware River Watersheds was updated to account for changes in treatment technologies. The updated priority *Cryptosporidium* discharger lists for the Schuylkill River and Delaware River Watershed areas of influence are shown in Table 4-3 and Table 4-4.

Table 4-3: Priority Dischargers of *Cryptosporidium* in the Schuylkill River Watershed *(Updated from 2020 Watershed Control Plan Update)*

Priority Discharger	Watershed
Abington Twp WWTP	Schuylkill River
Swamp Creek STP (Berks Montgomery Municipal Authority)	Schuylkill River
Birdsboro Borough MA Schuylkill	Schuylkill River
Conshohocken STP	Schuylkill River
E. Norriton/Plymouth/Whitpain JSA	Schuylkill River
Exeter Twp STP	Schuylkill River
Hamburg Borough Wastewater Treatment Plant	Schuylkill River
Limerick Twp Municipal Authority	Schuylkill River
Montgomery County Sewer Authority	Schuylkill River
Norristown Municipal STP	Schuylkill River
Pennridge Wastewater Treatment Authority	Schuylkill River
Phoenixville Borough STP	Schuylkill River
Pottstown Borough	Schuylkill River
Sinking Spring Borough Municipal Authority	Schuylkill River
Upper Gwynedd-Towamencin Municipal Authority	Schuylkill River
Upper Merion Municipal Utility Authority	Schuylkill River
Upper Merion Twp Authority- Matsunk WPCC	Schuylkill River
Valley Forge Sewer Authority	Schuylkill River
Whitemarsh Twp SA	Schuylkill River
Antietam Valley Municipal Authority	Schuylkill River
Borough of Souderton	Schuylkill River
Bridgeport Borough	Schuylkill River
Lower Frederick Township Treatment Plant	Schuylkill River
Lower Salford Twp Authority (West Branch Skippack Creek)	Schuylkill River
Maidencreek Township Authority	Schuylkill River
North Coventry Municipal Authority STP	Schuylkill River
Oley Township Municipal Authority	Schuylkill River
Schwenksville Borough Authority	Schuylkill River
Spring City Borough Sewage Plant	Schuylkill River
Telford Borough Authority	Schuylkill River
Spring TWP MA	Schuylkill River
Wyomissing Valley JMA	Schuylkill River

Table 4-4: Priority Dischargers of *Cryptosporidium* in the Delaware River Watershed Area of Influence *(Updated from 2020 Watershed Control Plan Update)*

Priority Discharger	Watershed
Bethlehem City	Delaware River
Beverly Sewerage Authority	Delaware River
Bordentown Sewerage Authority	Delaware River
Bristol Township Sewerage Treatment Plant	Delaware River
Burlington City STP	Delaware River
Catasaqua Borough Authority	Delaware River
Cinnaminson Township Sewerage Authority	Delaware River
Delran Sewerage Authority	Delaware River
Easton City	Delaware River
Ewing-Lawrence SA	Delaware River
Florence Township STP	Delaware River
Hamilton Township WPCF	Delaware River
Mount Holly Municipal Utilities Authority	Delaware River
Mt. Laurel Municipal Utilities Authority	Delaware River
Riverside Township Sewerage Authority	Delaware River
Warminster Twp Municipal Authority	Delaware River

4.2.1.7 Watershed Wastewater Treatment Upgrades and Improvements

Several originally prioritized NPDES dischargers have either undergone, or are approved to undergo, upgrades and improvements to their treatment facilities. A detailed list containing update and improvement information is presented below in Table 4–5.

Table 4-5: Planned upgrades and Improvements to the Schuylkill River and Delaware River Source Water Assessments' Priority Dischargers of *Cryptosporidium*

Facility	Owner	Subwatershed	Priority	System Improvements
Conshohocken Borough STP	Borough of Conshohocken	Schuylkill River	Highest - A	• Improvements to plant, pump stations and collection system outlined in 5-year capital improvement plan • In 2018 awarded CFA grant of $341,559 to help rehabilitate the Regional Sanitary Sewer Interceptor • Replacement of 9 rotating biological contractor units planned for FY23; belt filter press replacement planned for FY26
Lower Perkiomen Valley Regional Sewer Authority	Montgomery County Sewer Authority	Perkiomen Creek	Highest - A	• The Perkiomen Middle Interceptor project consisted of the installation of 3.2 linear miles of ductile iron sewer pipe for conveyance to the LPVRSA Oaks WWTP required to meet the growing region's future sewage needs
Fritz Island Wastewater Treatment Plant	City of Reading	Schuylkill River	Highest - A	• The Reading Wastewater Treatment plant is working on a $100 million upgrade needed to accommodate capacities determined in an Act 537 special study and the City's Consent Decree with the Department of Justice
Sinking Spring Borough STP	Municipal Authority of the Borough of Sinking Spring	Cacoosing Creek	Moderately High - B	• $1.7M PA Infrastructure Investment Authority loan to replace 2,950 ft of sanitary sewer line and eliminate raw sewage discharges into Cacoosing Creek
Upper Gwynedd Township Wastewater Treatment Facility	Upper Gwynedd Twp	Wissahickon Creek	Highest - A	• Currently implementing Wastewater Improvement Program • WIP will expand the sewer infrastructure to allow UGT the ability to divert the wastewater currently being sent to the Towamencin Municipal Authority back to Upper Gwynedd Township's Wastewater Treatment Plant – reducing SSOs and allowing rate payer money to be invested in the township.
TMA Wastewater Treatment Facility	Towamencin Municipal Authority	Towamencin Creek	Highest - A	• Awarded $200,000 in CFA funding in March 2019 for a Biosolids Process Transformation and Optimization Planning Study, leading to the adoption of a sustainable biosolids treatment, handling and disposal process within 5 yrs
Whitemarsh WPCC	Whitemarsh Township Authority	Schuylkill River	Highest – A	• In 2018 awarded CFA grant of $323,000 to assist with the rehabilitation of the wastewater treatment plant
Lansdale WWTP	Borough of Lansdale	Neshaminy Creek	Highest – A	• UV treatment system being installed. Expected completion late 2023.

Note: This is not an exhaustive list of all planned facility upgrades in the areas of influence

4.2.1.8 Wildcat Sewer Abatement

Wildcat sewers discharge sewage directly into creeks and streams without any treatment. These sources discharge pathogens into the Schuylkill River watershed and can be a source of *Cryptosporidium.* PWD supports the SAN in efforts to identify and abate wildcat sewers through participation in the SAN Pathogens and Point Source Workgroup. In 2015, PWD completed a Watershed Sanitary Survey (WSS), required under LT2 to maintain the WCP credit. As part of the WSS, PWD compiled available information from the PENNVEST database, news sources, community announcements, and personal communication with a contracted engineering firm on projects addressing wildcat sewers in the Schuylkill River watershed. The wildcat sewer project update serves as a working document and is included in the latest update to the Schuylkill River Watershed Sanitary Survey as well as on the SAN Workgroup Hub as a standalone worksheet.

4.2.1.8.1 River Road Properties

River Road in northwest Philadelphia runs along the Schuylkill River upstream of two PWD treatment plant intakes. Sitting at a low elevation, the stretch of residential road is prone to flooding during rain events. Both the city and PA DEP had been concerned about the on-lot septic systems of many River Road residential properties sitting in the Schuylkill River's floodplain, but the existing septic systems could not be replaced as they did not meet current regulations. PWD began the design for sewer installation and hosted public meetings in 2007, permits and approval for the project were obtained from PA DEP in 2008 and 2009, and the road's residents agreed to move forward following more public meetings in 2017.

The approximately mile-long new sanitary sewer can provide service for 42 properties along River Road from Port Royal Avenue to County Line Road. A sewage pumping station was constructed on the river side and sewage collected from the sewer is pumped to the nearby Nixon Street sewer. Construction began in early 2019 and was completed during 2021.

4.2.1.9 Collaboration with Industry Organizations

PWD has a long-standing partnership with professional/industry organizations. In the 2020 Watershed Control Plan Update, PWD proposes leveraging these partnerships to conduct research and advocacy efforts to further LT2 compliance goals. One of these potential partnership mechanisms includes participation in American Water Works Association's Source Water Technical Advisory Workgroup, which PWD's Source Water Program officially joined in Fall 2021. Additionally, PWD's Source Water staff regularly meet with Water Research Foundation representatives to better understand and define research priorities.

4.2.1.10 Watershed Wastewater Treatment Partnerships

4.2.1.10.1 Wissahickon Clean Water Partnership

In summer 2016, The City of Philadelphia joined 13 Wissahickon Creek watershed municipalities and four wastewater treatment plant operators to form a Wissahickon Clean Water Partnership (WCWP). The WCWP seeks to collaboratively develop a TMDL alternative for nutrients that would better address aquatic life impairments in the Wissahickon Watershed. The municipal participants represent over 98%

of the watershed area, which provides a powerful stakeholder group that is uniquely positioned to develop a coordinated plan to improve water quality in the watershed. The project was funded in part by The William Penn Foundation through the Pennsylvania Environmental Council. Technical work was performed by Temple University. PWD is also a key participant in the effort providing technical support and important historical water quality information about the Wissahickon Creek.

With encouragement from PA DEP and EPA, the WCWP is preparing a comprehensive Water Quality Improvement Plan for this highly visible, urbanized watershed that will include a long-term program to achieve significant water quality improvements through an adaptive management process. Specified projects and/or treatment upgrades may reduce pathogens in addition to nutrients as well as establishing a partnership framework for future collaborative efforts.

4.2.1.10.2 Delaware Estuary Water Quality Improvement Partnership

The Philadelphia Water Department has developed the Delaware Estuary Water Quality Improvement Partnership (DEWQIP) with other large regional municipal utilities to share strategic utility planning and technology evaluations in response to potential changes in water quality criteria that could impact acceptable levels of DO in local waterways, while also being mindful of other emerging issues impacting Water Pollution Control Plant effluent. Dissolved oxygen, or DO, is influenced by several factors, including ammonia-containing discharges and the presence of excess nutrients in rivers and streams. To continue progress in reducing nutrient discharges and improving DO levels, many of the dischargers have participated in the development of an early action matrix that outlines steps to prepare for or better understand the needs for the potential implementation of advanced technologies and operational adjustments. Understanding infrastructure capabilities, limitations, and affordability will be critical to further reducing pollutants in the Delaware Estuary in the future. The DEWQIP continued to meet in 2024, following a reissuance of the facilitation contract by PWD, which is committing $300,000 per year to the partnership. The DEWQIP has established a foundation for communication and data sharing among the municipal dischargers, with future possibilities to leverage the DEWQIP as a vehicle to collectively address additional wastewater permitting-related concerns.

4.2.2 Agricultural Land Use and Runoff

Stormwater runoff containing manure from agricultural land is a source of *Cryptosporidium* and pathogens in the Schuylkill River watershed (PWD, 2002; PWD, 2011). PWD efforts to address agricultural runoff occur upstream of Philadelphia because the agricultural land within the city and upstream of the intakes is minimal and best management practices (BMPs) have previously been installed at Northwestern Stables, Belmont Stables, Courtesy Stables, Monastery Stables and W.B. Saul High School (PWD, 2011). In the *Watershed Control Plan Update* (2020), opportunities to address agricultural sources of runoff in the lower Delaware River watershed are also identified.

Table 4-6: Planned Implementation Schedule – Watershed Protection Control Strategies to Address Agricultural Runoff

Control Strategy: Watershed Protection			
Priority Source – Agricultural Runoff			
Initiatives	**Target Watershed(s)**	**Target Completion Date**	**Report Section**
Coordinate with watershed partners to develop Comprehensive Nutrient Management Plans for WB Saul High School, Fox Chase Farm, and Manatawna Farm.	Wissahickon and Pennypack Creeks, Schuylkill River	Ongoing	4.2.2.1
Work with USDA/NRCS, PA Dept of Agriculture and the Philadelphia School District to implement best management practices at WB Saul High School.	Wissahickon Creek	Ongoing	4.2.2.1
Work with USDA/NRCS, PA Dept of Agriculture and the Philadelphia School District to implement best management practices at Fox Chase Farm	Pennypack Creek	Ongoing	4.2.2.1
Work with Northwestern, Courtesy Stables, and Monastery Stables to implement conservation planning practices	Wissahickon and Pennypack Creeks	Some work completed; effort ongoing	4.2.2.1
Develop maintenance plans or MOUs for PWD's in-city agricultural BMPs	Wissahickon and Pennypack Creeks	Ongoing	4.2.2.1
Reassess land use in the Schuylkill River Watershed with each update of the National Land Cover Database	Schuylkill River	Ongoing	4.2.2.2.1
Reassess land use in the priority Delaware River Watershed sub-basins with the 2019 National Land Cover Database (NLCD)	Delaware River	Completed	4.2.2.2.2
Actively participate in the SAN Agricultural Workgroup and support initiatives outlined in the Annual Workplans	Schuylkill River	Ongoing	4.2.2.3
Identify priority projects and available funding sources; work with SAN partners to best utilize Farm Bill funds; Promote drinking water protection in existing funding programs	Schuylkill and Delaware Rivers	Ongoing	4.2.2.6

Assess status of CAFO NPDES permits in the delineated Area of Influence	Schuylkill River	Ongoing	4.2.2.3
Participate in nutrient management trainings and conferences to further develop expertise and enhance liaison role to Philadelphia's agricultural properties	Wissahickon and Pennypack Watersheds	Ongoing	4.2.2.5

4.2.2.1 Philadelphia In-City Agricultural Best Management Practices

4.2.2.1.1 W.B. Saul High School

In 2016, Saul High School created a 501(c)(3) as a mechanism to acquire funding for projects identified in their school master plan. PWD began collaborating with Saul and other stakeholders in 2018 to facilitate the implementation of BMPs to reduce sediment, pathogen, and nutrient loading in the Schuylkill watershed. Construction of BMPs at Saul began in 2019, when the construction of a swale and culvert diverting runoff from the adjacent Henry Avenue was completed. The diversion system connects to a highway inlet at the top of the Saul High School access drive and conveys diverted flow below pastureland adjacent to the Wissahickon Valley Park.

4.2.2.1.2 Fox Chase Farm

In the Watershed Control Plan Update submitted in October 2020, Fox Chase Farm is identified as a potential project opportunity in the Pennypack Creek watershed of the Upper Delaware Estuary sub-basin. Project implementation should follow future establishment of a funding mechanism for private projects in the Delaware River watershed, analogous to the Schuylkill River Restoration Fund.

4.2.2.1.3 Philadelphia Stables

There are several horse stables located throughout the City of Philadelphia. These locations provide opportunities for best management and conservation practices. Water quality benefits include sediment and erosion control, nutrient management and pathogen controls. Figure 4-1 shows the locations of horse stables on public land along the Schuylkill River (2), Wissahickon Creek (3), and Pennypack Creek (1).

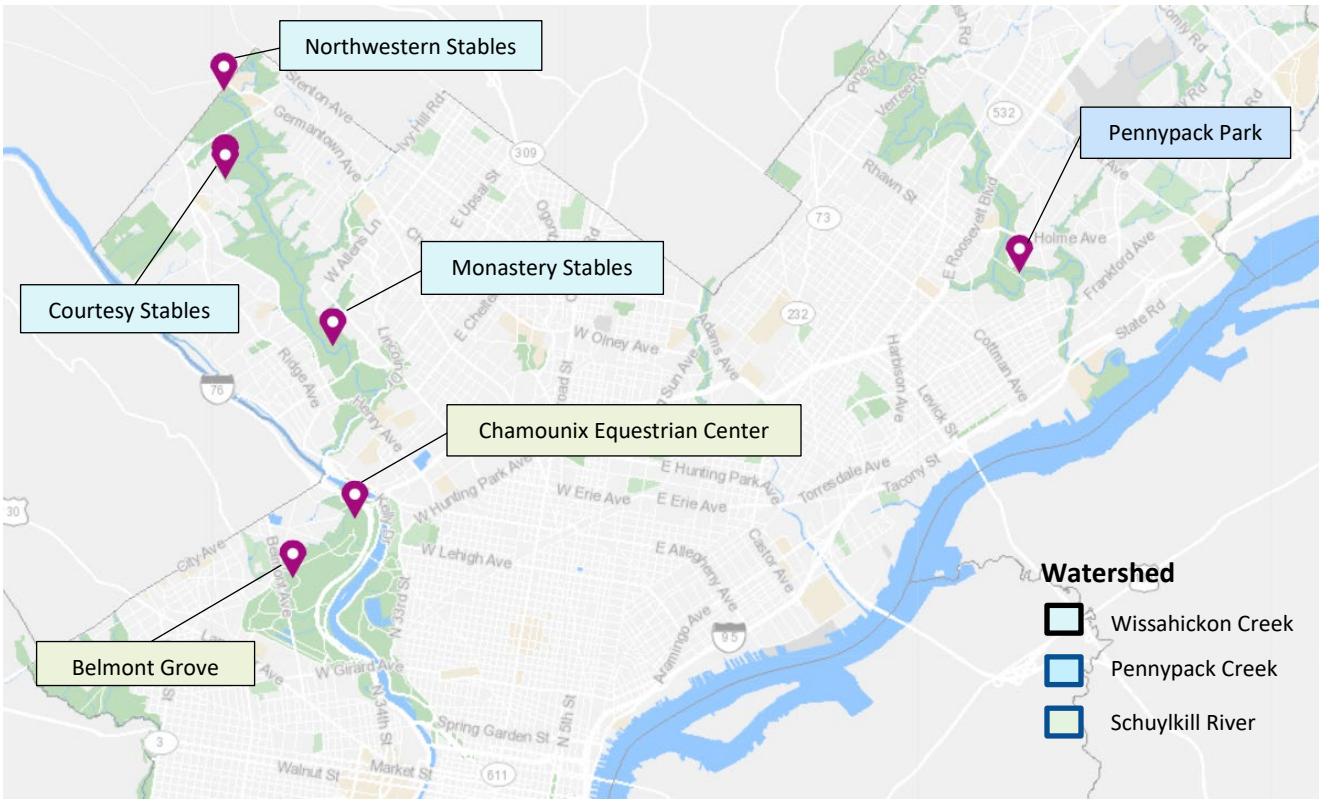

Figure 4-1: Horse Stables in Philadelphia *(Adapted from Philadelphia Parks and Recreation 2020)*

Northwestern Stables

In 2019, PWD contributed $50,000 through the SRRF toward stormwater management projects at Northwestern Stables. The property on which the non-profit stables sit drains into a small tributary of the nearby Wissahickon Creek, which then discharges into the Schuylkill River upstream of the Queen Lane intake. Following recommendations from the NRCS, Northwestern Stables implemented various BMPs including diverting street runoff through a newly constructed trench drain and 200 ft of outlet pipe; roof gutter installation, downspout connection repairs, and underground pipe installation to manage 22,000 ft^2 of impervious roof area; planting 12,000 ft^2 of vegetated buffers; and grading and stabilization of ~41,000 ft^2 of paddock area. In 2020, construction of the stormwater management and paddock stabilization project at Northwestern Stables was completed. Before and after photos of the three main heavy use areas are shown in Figure 4-2. In 2021, Northwestern Stables was the host of the Schuylkill River Restoration Fund grant announcements and project showcase event. Attendees were able to speak to the landowners as well as NRCS staff to get a better understanding of the planning and design considerations.

Pre-Construction Heavy Use Area 1

Post Construction Heavy Use Area 1

Pre-Construction Heavy Use Area 2

Post Construction Heavy Use Area 2

Pre-Construction Heavy Use Area 3

Post Construction Heavy Use Area 3

Figure 4-2: Pre and Post Construction Photos from Northwestern Stables Stormwater Management and Paddock Stabilization Project

4.2.2.2 Land Use Assessments

4.2.2.2.1 Schuylkill River Watershed

In 2021, the United States Geological Survey released the latest iteration of the National Land Cover Database (NLCD). This latest release was update-based and the Land Cover and Impervious Surface data which had been released in 2019 were unchanged. PWD recently completed land use assessments using NLCD 2019 data and will continue to cite this data until NLCD releases updated Land Cover data. The land use categories are broken out in Table 4-7. Definitions of the land cover classifications are available from the Multi-Resolution Land Characteristics Consortium. The 2019 dataset is mapped for the Schuylkill River Watershed in Figure 4-3. A total of 27.1% of the Schuylkill River Watershed land cover is attributed to agricultural uses (e.g., pasture/hay and cultivated crops). More information on the National Land Cover Database project can be found on the Multi-Resolution Land Characteristics Consortium website at https://www.mrlc.gov/data.

Table 4-7: Land Cover Classification Areas in the Schuylkill River Watershed (NLCD 2019)

Schuylkill River Watershed Land Cover (NLCD 2019)				
Land Cover Class	**Land Use Classification**	**Code**	**2019 Area (sq. miles)**	**% of Total Area**
Water	Open Water	11	17.6	0.9%
Water	Perennial Ice/Snow	12	-	0.0%
Developed	Developed-Open Space	21	255.6	13.4%
Developed	Developed-Low Intensity	22	158.4	8.1%
Developed	Developed-Medium Intensity	23	91.7	4.8%
Developed	Developed-High Intensity	24	48.6	2.5%
Barren	Barren Land	31	8.7	0.5%
Forest	Deciduous Forest	41	636.6	33.3%
Forest	Evergreen Forest	42	6.5	0.3%
Forest	Mixed Forest	43	117.0	6.1%
Shrubland	Shrub/Scrub	52	18.6	1.0%
Herbaceous	Grassland/Herbaceous	71	11.5	0.6%
Planted/Cultivated	Pasture/Hay	81	247.1	12.9%
Planted/Cultivated	Cultivated Crops	82	271.5	14.2%
Wetlands	Woody Wetlands	90	23.8	1.2%
Wetlands	Herbaceous Wetlands	95	1.9	0.1%
		Total	1,915.1	100.0%

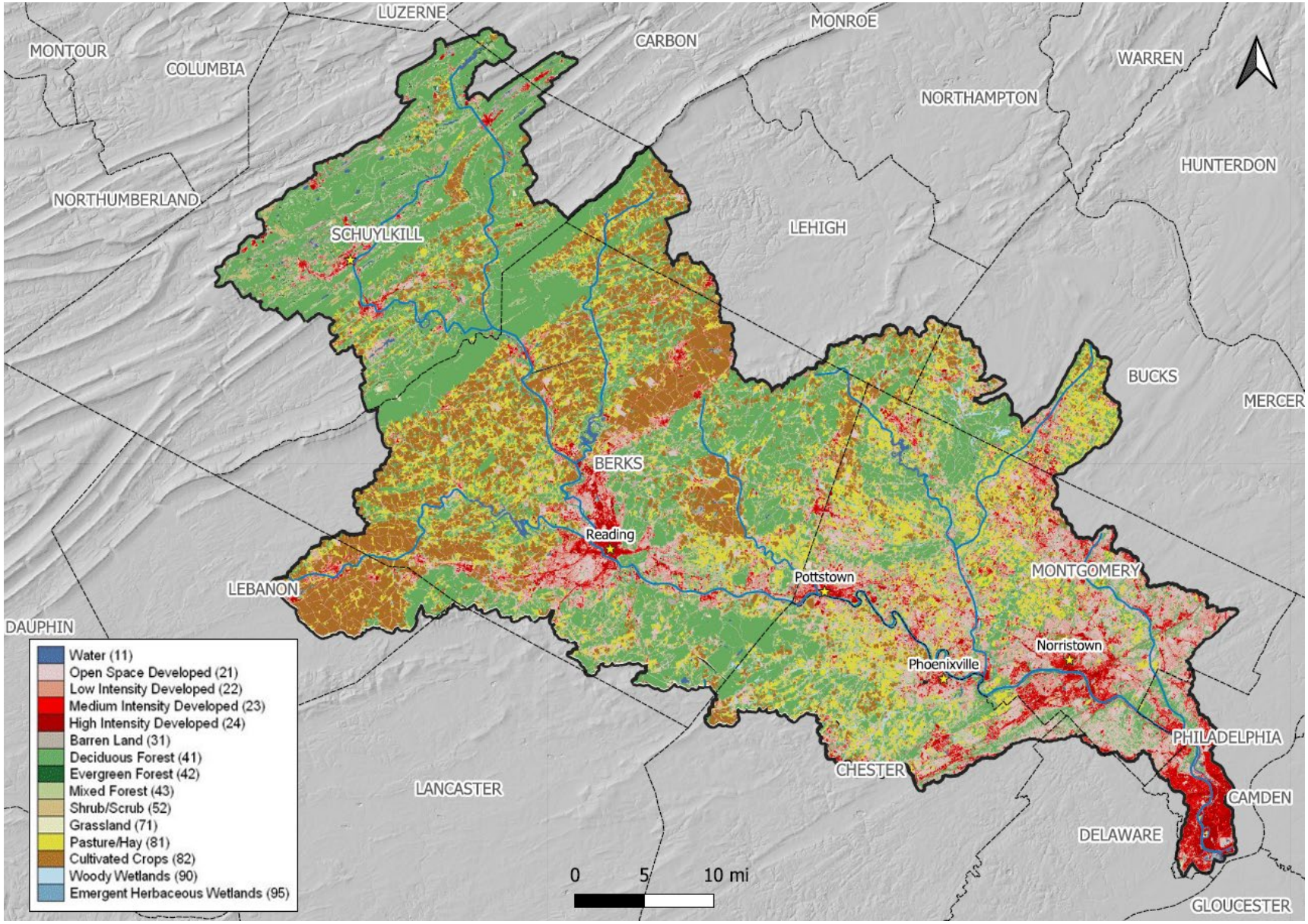

Figure 4-3: Land Use in Schuylkill River Watershed (NLCD 2019)

4.2.2.2.2 Delaware River Watershed

A land use analysis of the Baxter intake's area of influence in the Delaware River Watershed using the 2019 NLCD was completed in 2022.

The sub-basins of the Delaware River Watershed within the Baxter Water Treatment Plant's Area of Influence (AOI) are delineated in the 2020 *PWD Watershed Control Plan Update*. The Baxter intake AOI covers a total of 2,873 square miles and includes the Lehigh Valley sub-basin and the Pennsylvania side of the Upper Central, Lower Central, and Upper Estuary sub-basins comprising 47%, 28%, 9%, and 15% of the land area in the AOI, respectively. The largest land cover type in the Baxter AOI is deciduous forest, which comprises 41% of the land cover in the Baxter AOI. In contrast to the Schuylkill River watershed, only 15% of the Baxter AOI land cover is attributed to agricultural uses (e.g., pasture/hay and cultivated crops). Table 4-8 and Figure 4-4 show the NLCD 2019 land use data for the Baxter Water Treatment Plant area of influence. More information on the National Land Cover Database project can be found on the Multi-Resolution Land Characteristics Consortium website at https://www.mrlc.gov/data.

Table 4-8: Land Cover Classification Areas in the Baxter Area of Influence (NLCD 2019)

Baxter Water Treatment Plant Area of Influence Land Cover (NLCD 2019)				
Land Cover Class	**Land Use Classification**	**Code**	**2019 Area (square miles)**	**% of Total Area**
Water	Open Water	11	50.2	1.7%
Water	Perennial Ice/Snow	12	-	-
Developed	Developed-Open Space	21	364.5	12.7%
Developed	Developed-Low Intensity	22	218.1	7.6%
Developed	Developed-Medium Intensity	23	130.6	4.5%
Developed	Developed-High Intensity	24	74.7	2.6%
Barren	Barren Land	31	10.7	0.4%
Forest	Deciduous Forest	41	1,168.8	40.7%
Forest	Evergreen Forest	42	47.2	1.6%
Forest	Mixed Forest	43	207.5	7.2%
Shrubland	Shrub/Scrub	52	15.5	0.5%
Herbaceous	Grassland/Herbaceous	71	15.2	0.5%
Planted/Cultivated	Pasture/Hay	81	223.2	7.8%
Planted/Cultivated	Cultivated Crops	82	214.5	7.5%
Wetlands	Woody Wetlands	90	126	4.4%
Wetlands	Herbaceous Wetlands	95	6.3	0.2%
		Total	1,847,367	100.00%

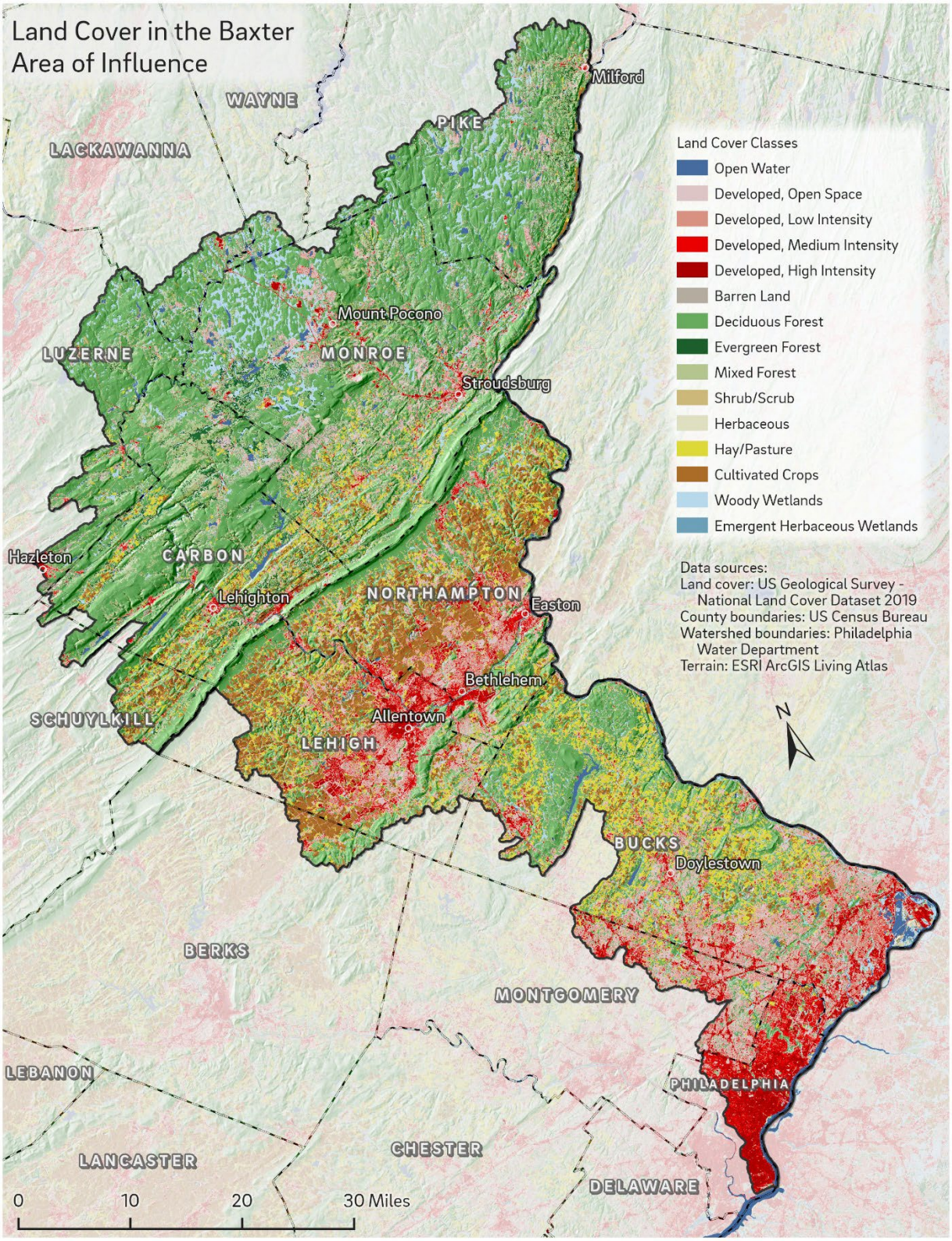

Figure 4-4: Map of Land Use in the Baxter Intake's Area of Influence in the *PWD Watershed Control Plan Update* (2020), (NLCD 2019)

4.2.2.3 SAN Agriculture Workgroup

PWD contributions to the Schuylkill River Restoration Fund (SRRF) and involvement in the SAN Agriculture Workgroup are the main vehicles for identifying and implementing agricultural best management practices in Philadelphia's source watersheds. Through the SAN Agriculture Workgroup, PWD is kept informed about the progress of recent SRRF grant recipients and potential future high priority agricultural BMP projects. The workgroup also develops education and outreach materials including *A Farmer's Guide for Healthy Communities* (available on the SAN website at www.Schuylkillwaters.org) and engages fellow stakeholders to promote the implementation of agricultural best management practices and the development of Comprehensive Nutrient Management Plans throughout the watershed.

In 2024, PWD regularly attended quarterly workgroup meetings which were held both in-person and virtually.

4.2.2.4 CAFO Identification in the Area of Influence

Concentrated animal feeding operations (CAFOs) are agricultural operations where animals are confined in small land areas. CAFOs have the potential to contribute *Cryptosporidium* contaminated runoff to the Schuylkill River watershed. In 2022, PWD retrieved updated CAFO data from PA DEP including number of animal equivalent units and primary animal for each operation. As of November 2022, a total of 86 CAFOs exist in the Schuylkill River watershed representing more than 69,000 animal equivalent units (AEUs, 1 AEU = 1,000 lbs. of animal weight). These totals mark a significant increase from 2019 data, during which 36 CAFOs representing more than 25,000 AEUs existed in the Schuylkill River watershed.

Following the first full implementation year of the approved Watershed Control Plan update, in 2022 PWD for the first time also retrieved CAFO data from PA DEP for the Baxter intake's area of influence. Within this area, a total of 8 CAFOs exist representing over 3,400 AEUs.

A map depicting 2022 data for both the Schuylkill River watershed and the Baxter intake's area of influence is shown below in Figure 4-5. Due to a lack of significant changes from year to year, this dataset will be updated every 5 years.

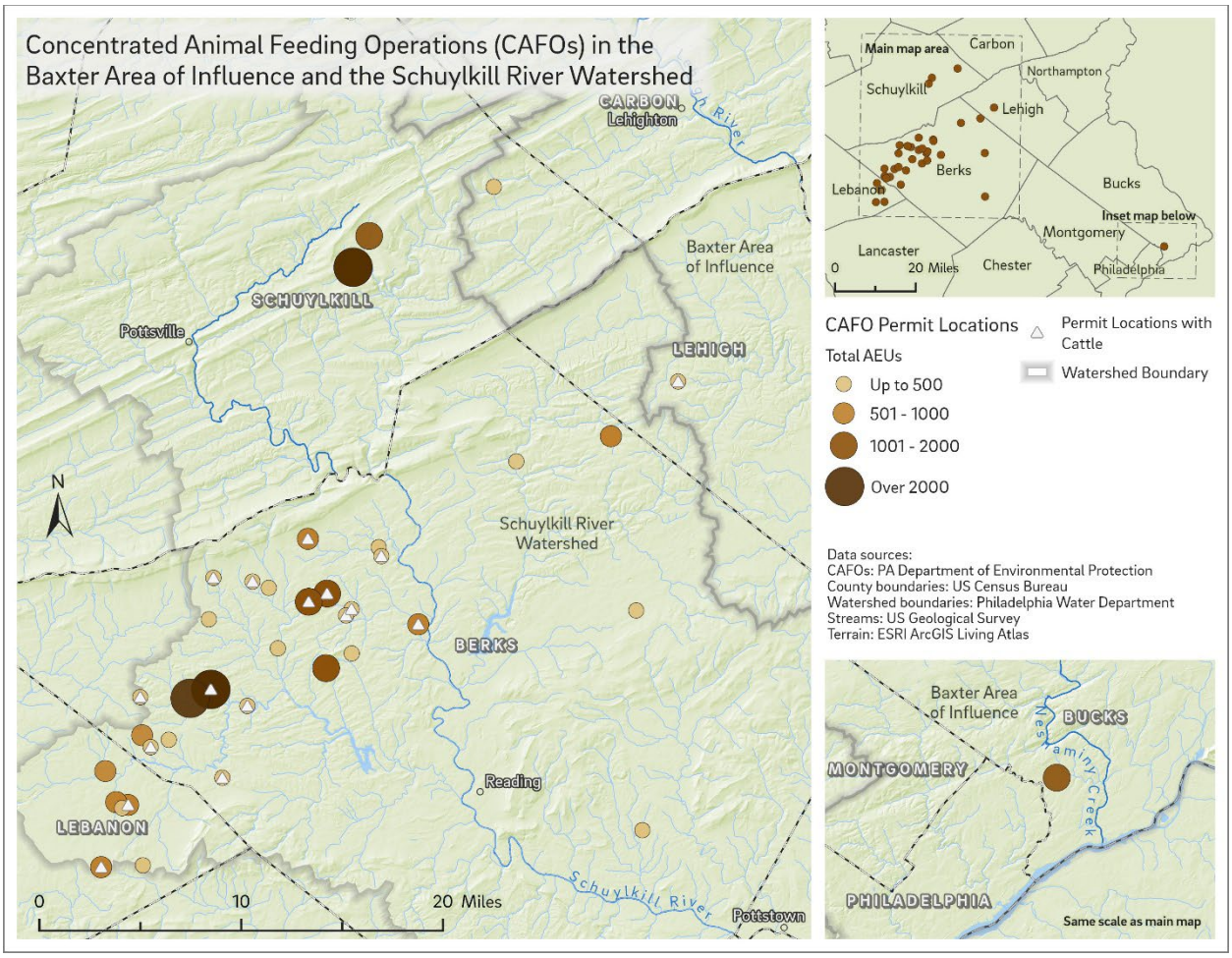

Figure 4-5: Concentrated Animal Feeding Operations in the Schuylkill River Watershed and Baxter Area of Influence by Total Animal Equivalent Units (AEUs) (PA DEP 2022)

4.2.2.5 Schuylkill River Restoration Fund Grants for Agricultural BMP Projects

In the WCP, PWD outlines several actions to reduce *Cryptosporidium* in the Schuylkill River watershed from agricultural runoff. These include the installation of agricultural BMPs, including manure storage basins and vegetated buffers, on select farms in the Schuylkill River watershed. PWD contributions to the Schuylkill River Restoration Fund (SRRF) and involvement in the SAN Agriculture Workgroup are the main vehicles for identifying and implementing projects.

In 2006, Exelon, SAN, and the Schuylkill River Greenways National Heritage Area (SRG NHA) established the Exelon Restoration Fund, now named the SRRF. The SRRF provides grants to support projects that improve and protect water quality throughout the Schuylkill River watershed. Initially, Exelon provided all the funding to fulfill a requirement in their DRBC docket for the Wadesville Mine Demonstration Project. Beginning in 2009, PWD became the second annual contributor to the SRRF. Partnership for the Delaware Estuary (PDE) became a member and contributor in 2010 and Aqua PA followed in 2012. In 2021, Pennsylvania American Water Company signed on to contribute annual funds to the SRRF and officially made their first contribution in 2022. Members of the SAN serve as technical experts in the

grant selection process to support the review of project applications for their benefit to the Schuylkill River watershed. SRG NHA oversees the SRRF and distributes grant money.

PWD had historically contributed approximately $100,000 to the SRRF each year but increased its annual contribution to $250,000 beginning in 2024. Priority projects are selected for the implementation of agricultural best management practices to support WCP *Cryptosporidium* control objectives. To meet the WCP objectives specified for the first five years of plan implementation, PWD supported the construction of either manure storage basins or vegetated buffers at 10 separate agricultural operations in the watershed through its participation in the SRRF.

Recognizing the water quality benefits of reducing pathogens, nutrients, and sediment, PWD continues to support the implementation of conservation practices on agricultural properties. SRRF projects that have received PWD grant funding in the past five years are listed in Table 4-9.

Table 4-9: Additional Schuylkill River Restoration Fund Agriculture Projects

Farm	Subwatershed	Award Year	BMP Work Completed or In Progress
Weinsteiger Ferm	Perkiomen Creek	2024	Roofed manure stack pad, roofed heavy use area, roof runoff structures, animal trails and walkways, water pipeline, stream bank exclusion fencing
Masemore Farm	Perkiomen Creek	2024	Roofed liquid manure storage facility, heavy use area, roof runoff structures, 2,100 linear feet of stream bank exclusion fencing
Bitler-Vista Grande Farm	Maiden Creek	2024	Manure storage tank, rain gutters and stormwater controls
Sterner Dairy Farm	Middle Creek	2024	Roofed manure storage facility, slatted underground liquid manure storage system, decommissioning of leaking manure storage system, roof runoff structures, stream bank exclusion fencing and establishment of riparian buffer
Phillips Farm	Maiden Creek	2023	Manure storage facility, a roofed barnyard and heavy use area, installation of a water well to allow for the elimination of animal access to the tributary, and a 35- foot riparian buffer
Burkholder Farm	Saucony Creek	2023	Manure storage facility, a roofed barnyard and heavy use area, and a stormwater control system
Last Chance Angus Farm	Maiden Creek	2023	Manure storage facility, a roofed barnyard and heavy use area, over 1,500 linear feet of streambank fencing, a designated animal stream crossing, and revegetation around the new structures
Watts Farm	Hay Creek	2023	2,000 linear feet of livestock exclusion fencing, 1,400 linear feet of in-stream habitat and streambank protection, paddock fencing and 500 feet of vegetated livestock walkway for rotational grazing, and the transition of six acres of marginal pasture lands along 1,800 linear feet of stream into riparian forest
Lynnacres Dairy	Maiden Creek	2022	Liquid manure storage facility, a roofed heavy use area, 8,315 linear feet of streambank fencing, two steam crossings, and riparian buffer plantings
Hollinger Farm	Manor Creek	2022	Roofed manure storage area, a heavy use area, rain gutters, and other stormwater controls
Pond View Farm	Maiden Creek	2022	Roofed manure storage area, 1,600 linear feet of streambank fencing, rain gutters, roof leaders, and a lined stormwater outlet
Bolton Farm	Saucony Creek	2021	Liquid manure storage basin, two manure transfer systems, a reception pit, a concrete heavy use area, and 650 linear feet of stream bank fencing
Miller Farm	Manatawny Creek	2021	Liquid manure storage basin, a dry manure storage, a reception pit, two manure transfer systems, a concrete heavy use area, stormwater controls, 400 linear feet of paddock fencing, 310 linear feet of stream bank fencing, and a designated stream crossing

Kunkel Farm	Manor Creek	2020	Dry manure storage, roofed heavy use area, and barnyard stormwater controls
Grube Farm	Irish Creek	2020	Liquid manure storage basin, manure transfer system, dry manure storage, concrete heavy use area, livestock exclusion fencing, barnyard controls, and rain gutters

Projects Funded to Reduce Non-Point Source Pollution from Agricultural Lands

In 2024, PWD partially or fully funded four new agricultural projects in the Schuylkill River Watershed:

WeinSteiger Farm, 2024 SRRF Grant Recipient

The Weinsteiger Farm is a beef operation located in the headwaters of the Perkiomen Creek in Leesport, Berks County. An unnamed headwaters tributary to the West Branch of the Perkiomen Creek flows through the farm's land. Currently, the farmer utilizes an unroofed earthen heavy use area absent of stormwater controls for the farm's nearly 50 cows. There is also no central manure storage system on the farm, allowing nutrients, sediment, and pathogens to run off into the headwaters tributary of the Perkiomen Creek, which eventually drains into the Schuylkill River.

The shovel-ready project suite includes the installation of a 6-month-capacity manure storage facility, a roofed heavy use area, installation of a pipeline and watering facilities to allow for the elimination of animal access to the unnamed tributary, and 540 feet of streambank fencing. The project is estimated to reduce nutrient loading to the Perkiomen's unnamed tributary by 2,739 lbs. of nitrogen and 1,743 lbs. of phosphorus annually.

The project has a cash match from the Agricultural Conservation Assistance Program (ACAP) of $264,000. PWD is contributing the total grant request of $31,000 for this project.

Masemore Farm, 2024 SRRF Grant Recipient

The Masemore Farm is a dairy operation located in the headwaters of the Perkiomen Creek in Hereford Township, Berks County. An unnamed headwaters tributary to the Perkiomen Creek flows through the farm's property. The farm's current heavy use area lacks stormwater controls to house its more than 125 cows. And there is no central manure storage system on the farm, allowing nutrients, sediment, and pathogens to run off into the headwaters of the Perkiomen Creek, which eventually drains into the Schuylkill River.

The shovel-ready project suite includes the installation of a 6-month-capacity liquid manure storage facility, a roofed heavy use area with stormwater control systems, and 2,100 feet of stream bank fencing.

The project has a cash match through NRCS and ACAP of nearly $272,000. PWD is contributing $30,750 for nearly one third of the requested SRRF award for this project, with Constellation and Aqua contributing the remaining funding. A total of $99,750 is being awarded towards this project.

Bitler-Vista Grande Farm, 2024 SRRF Grant Recipient

The Bitler-Vista Grande Farm is a dairy operation located in the headwaters of Maiden Creek in Richmond Township, Berks County. Situated within the region's limestone geology, a lowland drainage area sits on the property downhill of the animal heavy use area. The current heavy use area lacks stormwater controls to house the farm's nearly 550 cows. There is also no central manure storage

system on the farm, allowing nutrients, sediment, and pathogens to percolate into the groundwater discharge sources of the Maiden Creek headwaters, which eventually drains into the Schuylkill River.

The shovel-ready project suite includes the installation of a 6-month-capacity manure storage tank and the installation of stormwater controls.

The project has a cash match from NRCS of $725,000. PWD is contributing $30,750 for roughly one half of the requested SRRF award for this project, with Constellation contributing the remaining funding. A total of $60,000 is being awarded towards this project.

Sterner Dairy Farm, 2024 SRRF Grant Recipient

The Sterner Farm is a dairy operation located in Bechtelsville, Montgomery County. An unnamed tributary to Middle Creek flows through the farm's property. The farm's current heavy use area is unroofed and lacks any stormwater controls. The farm also still utilizes an old and damaged underground liquid manure storage tank which NRCS has advised needs to be decommissioned. There are currently visible concentrated flow paths within 500 feet of the tributary, to which the animals are also allowed unrestricted access. Nutrients, sediment, and pathogens thus routinely run off into Middle Creek, which eventually drains into the Perkiomen Creek and the Schuylkill River.

The shovel-ready project suite includes closure and decommissioning of the damaged manure storage system, installation of two new waste storage facilities, two new heavy use areas with stormwater controls, and the installation of streambank fencing with a 35-foot riparian buffer.

The project has a cash match through NRCS and ACAP of nearly $1,000,000, with an additional cash match of nearly $200,000 being provided by the landowner. PWD is contributing $30,500 for nearly one third of the requested SRRF award for this project, with Constellation contributing the remaining funding. A total of $100,000 is being awarded towards this project.

In-City Projects Funded to Reduce Non-Point Source Pollution

In 2024, PWD fully funded one in-city stormwater management project:

Pachella Gully Stabilization and Restoration, 2024 SRRF Grant Recipient

Observations of ditch and gully erosion on the Pachella access trail within the Wissahickon Valley Park were initially identified over a decade ago, with a site assessment completed by PWD's retained consultant, Skelly & Loy. Still uncorrected, stormwater runoff from the parking area and playing areas of Pachella Field flows down the forested slope of the access trail. Significant scouring has created a 500-foot gully leading from Pachella Field to the Wissahickon Creek, creating a safety hazard for trail users and carrying large amounts of sediment into the creek. Continued erosion could also eventually threaten PWD infrastructure which runs below-ground adjacent to the trail.

Figure 4-6: Uphill view of one segment of the scouring along the Pachella access trail. ***Photo Credit: PWD 2024***

The shovel-ready project proposes to restore the trail and divert future runoff through the installation of stormwater controls, including: a 2,188 square foot infiltration basin and 778 linear feet of stabilized armored ditch construction. The proposal utilizes green stormwater infrastructure to control erosion stemming from runoff of nearly 6.5 acres of land and would reduce sediment loading to the Wissahickon Creek by 22,000 pounds and phosphorus loading by 34 pounds annually.

The project has a cash match through NFWF and PADEP of nearly $970,000. PWD is contributing the total requested amount of the $100,000 SRRF award for this project.

4.2.3 Animal Vectors

Animals in the Schuylkill River watershed serve as mechanical vectors of *Cryptosporidium*, transferring viable oocysts from original hosts. Geese are particularly effective vectors, as identified in PWD and Lehigh University source tracking studies (Jellison et al., 2009; Jellison, 2010a). The SWPP details ongoing and proposed initiatives that aim to reduce the impact of animal vectors near the PWD Queen Lane and Belmont intakes and expand implementation of animal vector control in the Schuylkill River watershed.

Table 4-10: Planned Implementation Schedule – Watershed Protection Control Strategies to Address Animal Vectors

Control Strategy: Watershed Protection			
Priority Source - Animal Vectors			
Initiatives	**Target Watershed**	**Target Completion Date**	**Report Section**
Maintain education and outreach initiatives concentrating on animal vectors of source water contamination	Lower Schuylkill and Delaware River Watersheds	Ongoing	4.2.3.1
Implement goose control measures on Fairmount Park Properties, including Peter's Island	Wissahickon Creek and Lower Delaware	Ongoing	4.2.3.2
Implement waterfowl management programs at Philadelphia Water Department Facilities	Lower Schuylkill and Delaware River Watersheds	Ongoing	4.2.3.2
Continue to support source tracking research	Various	Ongoing	4.2.1.1
Support efforts to publish scientific journal article to raise awareness and contribute to the state of the science	Various	Ongoing	4.2.1.1
Redesign and install "Do –Not Feed Geese" educational signage in priority locations	Pennypack and Wissahickon Creeks	Ongoing	N/A

4.2.3.1 Education and Outreach on Threat of Animal Vectors in the City

PWD provides education and outreach efforts concerning the management of animal vectors in the Schuylkill River watershed. In partnership with PDE, PWD conducts outreach focused on educating dog owners on the importance of picking up pet waste. The Dog Waste Reduction Program educates dog owners about the negative impacts of dog waste on local waterways and the overall environment. During 2024, the program consisted of the Best Friends Partner Program, social media campaigns, and participation in pet-related outreach events in the city. Through the Best Friends Partner Program, PDE distributed copies of PWD's dog waste publications and PWD-branded dog waste bag rolls to 4 vet clinics and animal shelters in the city. On a monthly basis, PDE provided educational social media posts to each of the partner organizations to promote on their own accounts. Sharing content on social media helps to increase the reach of the program by informing Philadelphia dog owners about the connection between dog waste, clean water, and best practices for disposal. Finally, PDE and PWD tabled at events like Manayunk Development Corporation's Dog Day of Summer and the PAWS Mutt Strut which enabled PDE and PWD to share information directly with dog owners about why picking up dog waste is essential to watershed protection.

4.2.3.2 Wildlife Management at Fairmount Park and PWD Properties

To address animal vectors of *Cryptosporidium*, PWD is committed to geese management through the WCP. PWD has active contracts with the United States Department of Agriculture (USDA) for geese management at Fairmount Park properties and PWD facilities. Geese management is conducted at Fairmount Park properties including Peter's Island, Pleasant Hill Park, Concourse and Centennial Park, and FDR Park. Geese management is also conducted at PWD facilities including the Belmont WTP, Queen Lane WTP, Baxter WTP, Southeast WWTP, Southwest WWTP, Northeast WWTP, and Oak Lane Reservoir. A total annual budget of $150,000 is reserved for wildlife management initiatives throughout Fairmount Park and PWD facilities. These locations are displayed in Figure 4-7.

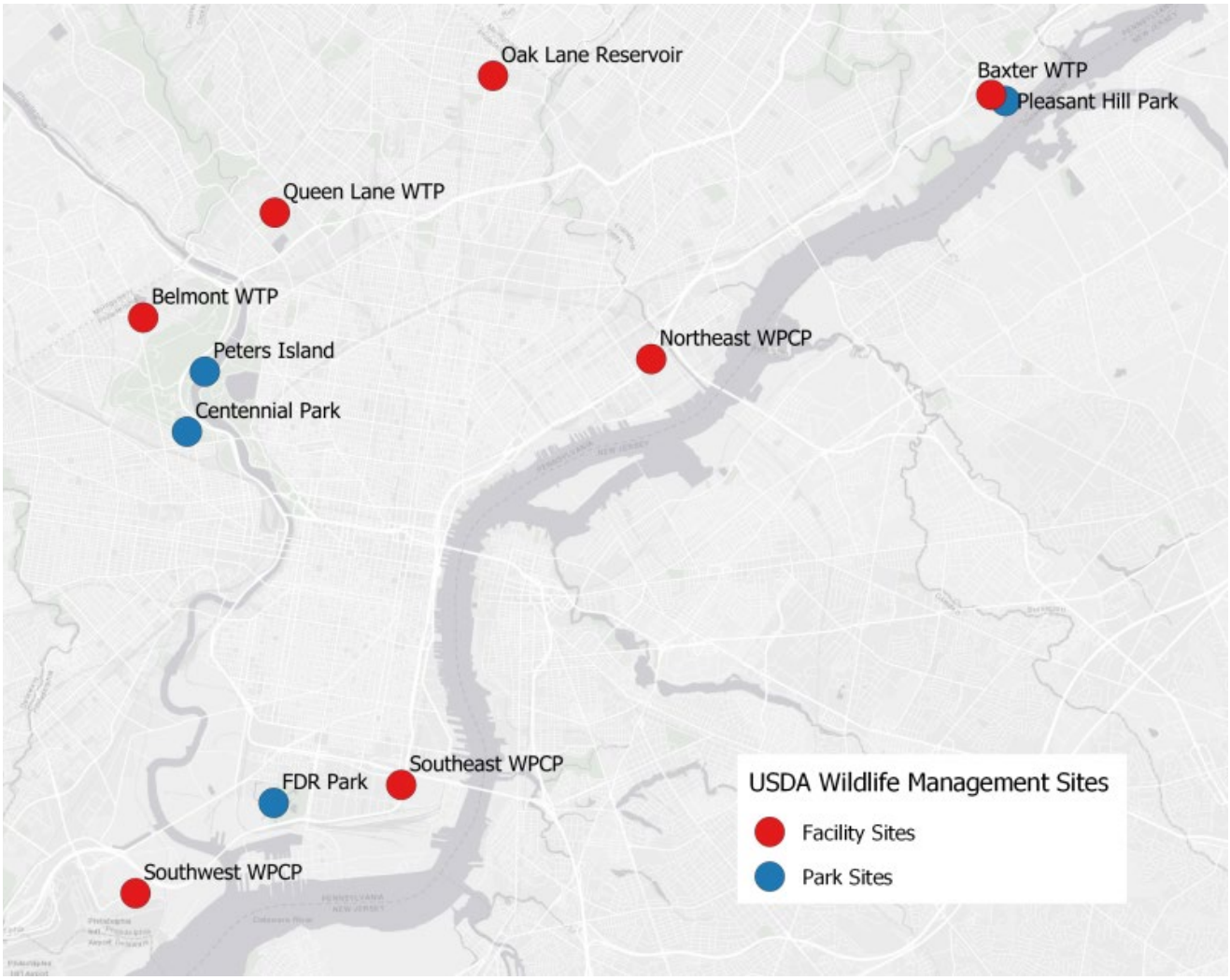

Figure 4-7: Map of USDA-APHIS Wildlife Management Sites

On Fairmount Park properties and PWD facilities, the geese are harassed and dispersed or removed from the site. Geese are dispersed using a range of harassment techniques including physical harassment, electronic harassment devices, pyrotechnics, lasers, and paintball guns. At all locations, any

nests and eggs are treated with 100% food grade corn oil that stops embryo development by preventing air from passing through the shell.

In the last year, goose control measures were maintained at several Fairmount Park locations, including Pleasant Hill Park, FDR Park, Concourse and Centennial Park, and Peter's Island under a PWD contract with the USDA-APHIS (Table 4-11). Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population.

Table 4-11: Wildlife Management Data for Philadelphia Parks for FY24

	Peter's Island	Centennial Park	Pleasant Hill Park	FDR Park and Golf Course
Quarter	No. of Geese Dispersed/Removed	No. of Geese Dispersed/Removed	No. of Geese Dispersed/Removed	No. of Geese Dispersed/Removed
2023-Q3	1,030	0	15	0
2023-Q4	1,260	15	0	800
2024-Q1	960	582	292	4,402
2024-Q2	20	0	12	0
Subtotal	*3,270*	*597*	*319*	*5,202*

Also, under a PWD contract with the USDA APHIS, goose control measures were maintained at the three drinking WTPs, three WWTPs and Oak Lane Reservoir. Under this contract, geese are harassed or removed from the site and eggs and nests are treated to reduce the population. Additional measures are taken to control other wildlife populations at PWD facilities.

4.3 Education and Outreach

Education and outreach initiatives are a critical component of PWD SWPP because point and nonpoint source discharges and land management throughout the Schuylkill River watershed influence water quality at the Queen Lane and Belmont intakes. Many education and outreach initiatives are implemented through PWD watershed partnerships, which are maintained by various programs within PWD. The education and outreach control strategy aims to raise awareness of source water protection issues in Philadelphia and throughout Philadelphia's source watersheds. Table 4-12 details initiatives and planned implementation timelines for the in-city education and outreach.

Table 4-12: Planned Implementation Schedule – In-City Education and Outreach Control Strategies

Control Strategy: Education and Outreach **Goal - Continue to raise awareness of source water protection issues in Philadelphia**			
Objectives and Tasks	Target Watershed	Target Completion Date	Report Section
Continue to submit a comprehensive annual water quality report that emphasizes critical source water issues	NA/Citywide	Ongoing (Annually)	4.3.1.1
Continue to maintain the FWWIC and promote source water protection through the center's exhibits and programs	NA/Citywide	Ongoing	4.3.1.2
Continue to operate and maintain Philly RiverCast and promote the web-based recreational warning system	NA/Citywide	Ongoing (Seasonal)	4.3.1.3
Implement in-City stormwater education programs	NA/Citywide	Ongoing	4.3.1.4
Continue to implement pet waste education program in the City of Philadelphia	NA/Citywide	Ongoing	*see 4.2.3.1*

4.3.1 Annual Water Quality Report

PWD annually distributes source water protection information to customers in the annual Drinking Water Quality Report. The most recent report published in 2024 shares 2023 water quality data and information on the Schuylkill and Delaware River SWPPs, pharmaceuticals and *Cryptosporidium* source tracking. The report also includes sources for additional information on source water protection issues. PWD takes a proactive approach to customer education and goes beyond reporting requirements by including robust overviews of source water and watershed protection efforts.

4.3.2 Fairmount Water Works Interpretive Center

The Fairmount Water Works Interpretive Center (FWWIC) is a PWD educational center that presents the history of the Schuylkill River and the influence of human activities on water quality and quantity through innovative exhibits and interactive educational programs. Fairmount Water Works, PWD,

Academy of Natural Sciences and PDE have partnered to develop a Freshwater Mussel Recovery Program. Freshwater mussels filter water and improve water quality. The goal of the program is to rebuild populations of native mussels through hatchery propagation to improve water quality in the Schuylkill and Delaware River watersheds. Additional program information is available online at delawareestuary.org. The project includes the development and construction of a freshwater mussel hatchery and an aquatic field station at the FWWIC. The goal of the hatchery is to propagate new mussels to increase the population in the Delaware and Schuylkill River watersheds. Installation of the demonstration hatchery at the FWWIC was completed in 2017 and over the course of the past several years, tens of thousands of individual mussels consisting of five distinct species have been successfully propagated. Innovative research at the demonstration hatchery has also to led to new scientific discoveries and novel propagation techniques that will be implemented at a largescale production hatchery at Bartram's Garden.

4.3.3 Philly RiverCast

PWD continues to promote and maintain Philly RiverCast. The website, www.phillyrivercast.org, has received more than 1.6 million visits since its launch in 2005. In 2022, PWD launched a revamped version of the website to modernize its appearance and enhance public comprehension. PWD continues to assist individuals and recreational groups in interpreting RiverCast ratings. In 2019, PWD analyzed the data communicated by RiverCast as it compared to laboratory-tested data from PWD routine sampling. This analysis showed that RiverCast continues to protect public health by providing accurate characterizations of ambient bacteria conditions in the river.

4.3.4 In-City Stormwater Education and Outreach

PWD continues to help Philadelphia residents manage stormwater and beautify their homes through the Rain Check program, a collaborative effort with the Pennsylvania Horticultural Society (PHS). As part of the program, residents attend a workshop to learn about stormwater tools and how to select the most appropriate management tools for their property. Once the property owner identifies the most suitable stormwater management practices, PWD and PHS will help connect them with a contractor to assist with the installation, and Rain Check provides a portion of the project cost. In FY2024, Rain Check held 29 workshops throughout Philadelphia with a total of 1,150 participants. Stormwater controls installed are itemized in Table 4-13.

Table 4-13: Rain Check Program Progress

Stormwater Management Practice	Total FY2022 Installations	Total FY2023 Installations	Total FY2024 Installations	Cumulative Total (Fall 2014 - July 2023)
Permeable pavers	33	25	14	438
Downspout planters	114	164	146	1,161
Rain gardens	5	8	1	99
Rain barrels	454	422	414	5,384

Source: Ben Bristol, personal communication, September 30, 2024.

Table 4-14 details initiatives and planned implementation timeline for watershed-wide education and outreach programs to support the LT2 WCP goals.

Table 4-14: Planned Implementation Schedule – Watershed Education and Outreach Control Strategies

Control Strategy: Education and Outreach			
Education and Outreach Goal - Raise awareness of source water protection issues throughout Philadelphia's source watersheds			
Objectives and Tasks	Target Watershed	Target Completion Date	Report Section
Continue to participate in the SAN workgroups and support initiatives outlined in each group's workplan	Schuylkill River	Ongoing	4.5.1.5
Continue to collaborate with the PDE on various education and outreach initiatives	Schuylkill and Lower Delaware River	Ongoing	4.5.1.6
Continue to promote the use of the Delaware Valley Early Warning System among industries, wastewater dischargers, and water suppliers	Schuylkill and Lower Delaware River	Ongoing	4.2.1.4 and 4.2.1.5
Work with Philadelphia and regional schools to identify opportunities to enhance conservation practice education in the curriculum	Wissahickon and Pennypack Creeks	Ongoing	4.5.1.7

4.3.5 Schuylkill Action Network Collaboration

PWD maintains a professional services contract with the Partnership for the Delaware Estuary which incorporates facilitation of the SAN, including workgroup meetings, communication, and project coordination. Previously set at a contract amount of $155,000, a budgetary increase to $217,000 begins in PWD fiscal year 2024. PWD also sits on the SAN's Planning and Executive Steering Committees, assisting in the planning of annual events and drafting strategic planning documents. PWD regularly

attends quarterly SAN Pathogens and Point Source and Agriculture Workgroup meetings, and PWD personnel serve as a co-chair on the Pathogens and Point Source Workgroup.

The SAN workgroups provide a mechanism for PWD to engage and collaborate with stakeholders to address priority sources of *Cryptosporidium*, such as agricultural runoff and wastewater effluent. Through the SAN Agriculture Workgroup, PWD is kept informed about the progress of recent SRRF grant recipients and potential future high priority agricultural BMP projects. Through the SAN Pathogens and Point Source Workgroup, PWD can track changes related to wastewater discharge throughout the watershed. PWD and other workgroup partners also share information about water quality, treatment technology improvements, regulatory updates, effective water management best practices, and contaminants of emerging concern (CECs).

4.3.6 Collaboration with Partnership for the Delaware Estuary

PWD continues to contribute financial resources toward collaboration efforts with Partnership for the Delaware Estuary (PDE) on several education and outreach initiatives. Initiatives include engaging Philadelphia residents in the prevention of stormwater pollution to the Schuylkill and Delaware Rivers and facilitating coordinated action, communication, and projects for the Schuylkill Action Network (SAN).

PDE hosted what was formally known as the annual Pennsylvania Coast Day at Penn's Landing in Philadelphia, which was renamed the Delaware River Festival beginning in 2019. This celebration of the Delaware River also included partners and activities across the river in Camden, NJ. Despite poor weather, including an overcast and rainy day, the 2024 Delaware River Festival took place on Saturday, September 28, and brought roughly 1,500 attendees to the Philadelphia and Camden waterfronts. In Philadelphia alone, contact information for 256 groups was collected and 700 wristbands were distributed to attendees for free RiverLink ferry rides and free access to the Independence Seaport Museum. The event also featured activities from 40 environmental organizations, face painting, pedal boat rides, and two meet and greet style bird shows with individuals able to interact up close with different bird species. Over 500 attendees participated in Delaware River trivia and won a variety of water-themed prizes, including reusable water bottles, water books and activities, and planting kits. To encourage participation at all exhibitor tables, attendees could participate in a festival-wide scavenger hunt and enter to win one of several raffle prizes. This activity, as well as key event information, was available in English, Spanish, Simplified Chinese, and Vietnamese. Following the event, feedback from attendees, staff and exhibiting organizations as well as metrics from advertising mechanisms were utilized to identify strengths of this year's event and areas for future improvement.

Additionally, PDE promotes and coordinates the annual Schuylkill Scrub initiative, which takes place from March through May in collaboration with Keep Pennsylvania Beautiful. The 2024 Schuylkill Scrub included nearly 800 cleanup events that engaged 14,488 volunteers. In this three-month period, volunteers removed an estimated 37,821 trash bags of litter and bulk waste from the watershed, as well as 3,528 tires.

From June 14 through June 21, 2024, Schuylkill River Greenways hosted the annual Schuylkill Sojourn, a 112-mile kayak journey from Schuylkill Haven to Philadelphia. The SAN sponsored the 2024 Schuylkill Sojourn Steward, who assists in promoting and documenting the event and connecting participants to stewardship of the river and its watershed.

Additionally, PWD, PDE, Academy of Natural Sciences, and FWWIC partnered to install a freshwater mussel hatchery demonstration project at FWWIC that was opened to the public on February 16, 2017. The FWWIC and freshwater mussel hatchery exhibits underwent repair following a flooding event in September 2021 and reopened in the spring of 2022. See Section 4.3.2 for more detail on the FWWIC.

4.3.7 Educational Partnerships

The 2020 Watershed Control Plan Update commits to working with Philadelphia and regional schools to identify opportunities to enhance conservation practice education.

In FY2023, PWD engineering staff participated as leading members of the Occupational Advisory Council (OAC) for Lincoln High School, a Philadelphia public school adjacent to a tributary to Pennypack Creek. PWD staff played an active role in supporting and enhancing the school's Environmental Engineering career pathway. The OAC went on hiatus in FY24 due to staff turnover within participating agencies. PWD plans to explore direct partnerships with the school district in the coming years, with the mission of creating student opportunities for internships and post-graduation employment, and to support a yearly work plan that includes procuring guest speakers and facilitating project-based learning.

PWD has also partnered with PDE and Philadelphia Public Schools on education and outreach programming focused on freshwater mussel research and reintroduction efforts. These programs are centered on the lifecycle of freshwater mussels and how their filter-feeding can benefit water quality. Programs like Mussel Maniacs and Mussels in the Classroom use the bivalves to encourage interest into natural ecosystems and the many ways in which both humans and animals interact with their environment to affect water quality.

4.4 Stakeholder Engagement and Partnerships

As described in the 2020 Watershed Control Plan Update, stakeholder engagement and partnership initiatives are intended to support the following goals:

1) Maintain and strengthen existing watershed partnerships, and
2) Develop a framework for a Delaware River Watershed Collaborative.

The first goal focuses primarily on existing Schuylkill River Watershed partnerships and reinvigorating Philadelphia's in-city watershed partnerships. The second goal is to identify and assess the gaps in collaborative efforts to protect and preserve the Lower Delaware River Watershed. Associated objectives and tasks are outlined in Table 4-15.

Table 4-15: Planned Implementation Schedule – Stakeholder Engagement and Partnership Building

Control Strategy: Stakeholder Engagement and Partnership Building			
Goal - Continue to strengthen existing partnerships			
Objectives and Tasks	Target Watershed	Target Completion Date	Report Section
Continue to support the Schuylkill River Restoration Fund to achieve implementation of priority projects	Schuylkill River	Ongoing	4.4.1.1
Champion the Schuylkill River Restoration Fund and work with SAN partners to draw in more funders	Schuylkill River	Ongoing	4.4.1.2
Promote the Schuylkill River Restoration Fund to potential applicants where appropriate	Schuylkill River	Ongoing	4.4.1.2
Remain an active participant in watershed partnerships and reinvigorate Philadelphia Watershed partnerships e.g., Friends of the Pennypack and Friends of Fox Chase Farm	Pennypack and Poquessing Creeks	Ongoing	4.4.1.4
Engage Philadelphia stables in the implementation of erosion and sediment control measures	Wissahickon, Pennypack and Poquessing Creeks	Ongoing	4.2.2.1.3
Engage water suppliers and agricultural stakeholders in the lower Delaware River watershed to expand or form new working groups modeled after the Schuylkill Action Network	Delaware River (Baxter AOI)	Ongoing	4.4.1.5

4.4.1 Schuylkill River Restoration Fund Grant Advisory Committee

The Schuylkill River Restoration Fund (SRRF) provides grants to government agencies, non-profits, businesses and other organizations to support environmental projects that improve and protect water quality in the watershed. Contributors include Constellation Energy, PWD, Aqua PA, and PA American Water. The Schuylkill River Greenways National Heritage Area (SRG NHA) oversees the SRRF and distributes grant money. Grant recipients from the SRRF are selected by an advisory committee comprised of representatives from Constellation, Aqua PA, PA American Water, DRBC, PWD, EPA, PA DEP, SRG, Partnership for the Delaware Estuary, and the Schuylkill Action Network (SAN).

With less than two percent of the Philadelphia source watershed located within the jurisdiction of the city, taking a partnership approach is critical for PWD. Through the SRRF, PWD can leverage funding and support projects that protect the drinking water for Philadelphia, educate the public on the importance of source water protection, and implement on-the-ground projects that support Watershed Control Plan goals.

On May 20, 2024, the SRRF advisory committee met to hear presentations from SRRF applicants and to select grant recipients. More than $500,000 was available for 2024 grants. PWD contributed $250,000 to the SRRF in 2024. In the 2024 SRRF grant round, PWD awarded a total of $223,000 to the following grant recipients:

- $100,000 to the Friends of the Wissahickon to implement stormwater runoff controls and trail stabilization measures below Pachella Field in the Wissahickon Valley Park
- $31,000 to Berks County Conservation District to implement agricultural best management practices at the Weinsteiger Farm in the Perkiomen Creek Watershed
- $30,750 to Berks Nature to implement agricultural best management practices at the Masemore Farm in the Perkiomen Creek Watershed
- $30,750 to Berks Nature to implement agricultural best management practices at the Bitler-Vista Grande Farm in the Maiden Creek Watershed, and
- $30,500 to Montgomery County Conservation District to implement agricultural best management practices at Sterner Dairy Farm in the Perkiomen Creek Watershed.

More information on the above projects is in Section 4.4.2.6.

4.4.2 Schuylkill River Restoration Fund Outreach and Promotion

On September 5, 2024, Schuylkill Action Network partners hosted *Celebrate the Schuylkill: SRRF Grant Announcement and Project Showcase* at the Audubon Discovery Center in Philadelphia, PA. During this event, nearly 70 attendees toured the riparian restoration and water access ramp at the East Falls River Landing along the Schuylkill and the Brewerytown Community Garden. The 2024 SRRF grant recipients for projects that enhance the Schuylkill Watershed were also announced by Schuylkill River Greenways. PWD also used the forum to highlight both its research into freshwater mussels to benefit water quality and the start of its increase in annual funding, with its contribution to the SRRF increasing from $100,000 to $250,000 beginning in 2024.

PWD actively works to champion the Schuylkill River Restoration Fund and work with SAN partners to draw in more funders. In recent years, private water utilities were engaged through the work of the Restoration Fund. In 2021, a new private water supplier committed to providing funds for the 2022 grant round and continued to provide funding through 2024. PWD hopes its own increase in funding to the SRRF this year inspires its water utility partners to follow suit.

4.4.3 Other Watershed Outreach

PWD helped plan and implement the Schuylkill Action Network Annual Meeting, held on November 1, 2024. The event was held in person at Albright College in Reading, PA. The 2024 meeting drew 74

attendees, who represented both returning and novel faces to the SAN. Discussion topics included addressing community challenges at the county level, the Delaware River Watershed Initiative, and workgroup updates highlighting the activities and progress completed over the prior year.

In addition to presentations and networking, a highlight of the event was the recognition of DRBC's Steve Tambini and PA DEP's Joe Hebelka as the 2024 SAN MVP awards for their dedication to improving the Schuylkill watershed and their service to the SAN.

PWD is an active participant in watershed partnerships and plans to reinvigorate Philadelphia Watershed partnerships. In 2020, a contract was conformed with the Partnership for the Delaware Estuary to work collaboratively with PWD and other key city partners to deepen and expand current outreach programming and develop diverse educational campaigns centered on the prevention of non-point source pollution and source water protection in the Philadelphia portion of the Delaware River Watershed. PDE will also lay the groundwork for the development of stronger partnerships with watershed groups and other stakeholders in the city to increase future engagement in clean water initiatives. At the end of calendar year 2020, PDE was also awarded a $57,044 Growing Greener grant by PA DEP towards the establishment of a water quality collaborative for the lower Delaware River watershed. In 2021, PWD began working with PDE to engage potential partners through preliminary focus groups, gauging interest in the upcoming collaborative and determining shared goals in the region. PDE was awarded a second Growing Greener grant of $149,802 for expansion of the Delaware River Innovation Partnership for Water Quality Improvement in Delaware River. Progress towards the development of a Delaware River Watershed Collaborative is further detailed below in Section 4.4.1.5.

4.4.4 Philadelphia Stables Partnerships

In 2020, a comprehensive stormwater improvement and paddock restoration project at Northwestern Stables was completed with the help of $50,000 in PWD funding towards the SRRF grant award. The SRRF award helped the non-profit Northwestern Stables, Inc. leverage $143,000 in additional funding and in-kind support towards the project's completion. This project was showcased during the annual Schuylkill River Restoration Fund press event on September 17, 2021. More information on the Northwestern Stables project is in Section 4.2.2.1.3.

4.4.5 Delaware River Watershed Collaborative Development

Throughout 2023, PWD met with Partnership for the Delaware Estuary (PDE) staff on a monthly basis to develop an initial framework for a water quality collaborative focused on the lower Delaware River watershed, as outlined in the 2020 Watershed Control Plan Update. PDE staff is already tasked with coordinating and facilitating the Schuylkill Action Network (SAN), which will serve as a model for the future Delaware River collaborative.

PWD worked with PDE to create a list of potential partners within the lower Delaware River watershed, and PDE began conducting outreach to those entities in 2022. PDE received immediate interest from conservation districts and other stakeholders in replicating the SAN's Agriculture workgroup for the purposes of soliciting technical assistance and discussing potential project funding mechanisms. Agricultural BMPs tie directly into PWD's Watershed Control Plan *Cryptosporidium* reduction goals and

the SAN Agriculture workgroup currently acts as the primary conduit for the Schuylkill River Restoration Fund's (SRRF) agricultural projects. With the hope of building relationships with stakeholders in the lower Delaware River watershed and creating a queue of potential projects that could be supported by an SRRF-style funding mechanism in t

he future, initial agriculture-focused meetings consisting of lower Delaware River watershed stakeholders began in 2023. Four quarterly meetings were held in 2024, attended by water suppliers, county conservation districts, and non-profits interested in agriculture and/or water quality. Initial meetings identified partner needs and interests and began to develop a strategic plan with which to move forward. "Farm Forward" will continue to meet in 2025 with the goal of assisting stakeholders in improving agricultural management practices to improve water quality of the lower Delaware River watershed.

Collaboration among regional water utilities in the lower Delaware River watershed was also identified as a high priority. Strengthening these connections should promote opportunities for open dialogue focused on shared regional concerns and create forums to discuss regulatory updates and impacts. PWD began outreach to water utilities in the Baxter area of influence in 2023, holding an in-person meeting with Lehigh County Authority (LCA) in October to discuss watershed protection, source water monitoring, and the Delaware Valley Early Warning System. Dialogue between PWD and LCA remains ongoing, as does PWD's outreach to Delaware River water and wastewater utilities. In 2024, DRBC formally approved and convened a Source Water Protection subcommittee, on which PWD holds the position of reserved member. PWD attended DRBC's inaugural Source Water Protection Subcommittee meeting on November 14, 2024, and accepted the position of chair of the new subcommittee. The initial meeting convened nearly one dozen water and wastewater utilities along the lower Delaware River, along with regulatory partners. This initial meeting focused on available spill modeling and coordinated spill response for future events. The next meeting is expected to be held in spring 2025.

In 2024, PWD and PDE also expanded the existing SAN Water Utility Forum by rebranding it as a "Southeastern PA" forum to better promote engagement with Delaware River partners. Delaware River utilities were invited to the forum for the first time this year and may be invited to be event planning committee partners for the next iteration in 2026. Similarly, the SAN Pathogens & Point Source workgroup may be rebranded as "regional" or as a "Utility Forum" workgroup to encourage participation from utilities outside of the Schuylkill River watershed. In the longer-term, these forums can be used to explore opportunities to implement a Delaware River grant funding program with peer water utilities, modeled after the continuously successful SRRF.

4.5 Expectations for 2025

Although the second round of LT2 compliance sampling resulted in an average *Cryptosporidium* concentration within 'Bin 1' range, the Queen Lane intake will remain a 'Bin 2' facility based on the results from the first round of compliance sampling as mandated by PA DEP regulations. The PWD Queen Lane Water Treatment Plant will continue to employ options from the 'Microbial Toolbox,' including achieving individual and combined filter effluent performance requirements to maintain

compliance with LT2 regulations. Additionally, PWD will continue ongoing initiatives outlined in the WCP through its existing Source Water Protection Program framework.

In 2025, PWD will maintain programs and activities that allowed it to accomplish its LT2 goals as outlined in the Watershed Control Plan Update, approved June 2021. These include continuing to address WWTP effluent, agricultural land runoff, and animal vectors as priority sources of *Cryptosporidium*, as well as expanding education and outreach in the watershed through source water protection program initiatives. It also includes completing WCP actions that specifically reduce *Cryptosporidium* in the watershed. Specific focus will continue to be on the following:

- Continued partnership with SAN and PDE for project facilitation and collaboration
- Continued funding toward SAN administration and the SAN Coordinator position
- Participation as a reserved member and chair of DRBC's Source Water Protection subcommittee
- A contribution of ~$250,000 to the SRRF for 2025 project grants
- Involvement with the SAN Pathogens and Point Source Workgroup to track wastewater discharge related changes in the watershed
- Involvement with the SAN Agriculture Workgroup to identify and contribute to agricultural BMP and CNMP implementation in the watershed
- Involvement and promotion of Farm Forward, including at the planning and steering levels
- Wildlife management at Fairmount Park properties and PWD facilities

The Watershed Control Plan efforts will be expanded into the Delaware River watershed as outlined in the 2020 WCP update. Continued efforts to coordinate and collaborate among area stakeholders will be a primary aim for the next year.

5.0 References

American Society of Agricultural Engineering. 2003. *Manure Production and Characteristics*. ASAE D384.1, St. Joseph, MI.

Carroll Engineering Corporation. 2013. *Municipal Wasteload Management North Wales Water Authority Wastewater Treatment Plant Annual Report Calendar Year 2012.*Print. Obtained through communication with PA DEP Southeast Regional Office.

Cox, Peter; Griffith, Merran; Angles, Mark; Deere, Daniel; & Ferguson, Christobel. (2005) *Concentrations of Pathogens and Indicators in Animal Feces in the Sydney Watershed*. Applied Environmental Microbiology. 71 (10):5929.

Crockett, C.S. 2007. "The Role of Wastewater Treatment in Protecting Water Supplies Against Emerging Pathogens." *Water Environment Research* 79.3: 221-32. Print.

Duzinski, Phil. 2008. *Schuylkill Action Network Pathogens Workgroup Study of Cryptosporidium Occurrence in Wastewater Treatment Plants.* Rep. Print.

Environmental Engineering & Management Associates, Inc. 2013. *Upper Gwynedd Township, Chapter 94 Municipal Wasteload Management, Annual Report 2012.* Print. Obtained through communication with PA DEP Southeast Regional Office.

Fayer, Ronald; Santin, Mónica; Trout, James M.; Greiner, Ellis. 2006. Prevalence of species and genotypes of *Cryptosporidium* found in 1–2-year-old dairy cattle in the eastern United States. Veterinary Parasitology, 135(2):105-112.

Jellison, Kristen L., Amy E. Lynch, and Joseph M. Ziemann. 2009. "Source Tracking Identifies Deer and Geese as Vectors of Human-Infectious *Cryptosporidium* Genotypes in an Urban/Suburban Watershed." *Environmental Science and Technology* 43.12: 4267-272. Print.

Jellison, Kristen. 2010a. *Detection and Genotyping of Cryptosporidium Spp. Oocysts in Water and Geese Faces in the Wissahickon Watershed: September 2008-May 2010*. Rep. Lehigh University, Department of Civil and Environmental Engineering, Bethlehem, PA. Print.

Johnson, E.; Atwill, E.R.; Filkins, M.E.; & Kalush, J. 1997. *The prevalence of shedding of Cryptosporidium and Giardia spp. Based on a Single Fecal Sample Collection from each of 91 Horses used for Backcountry Recreation*. Journal of Veterinary Diagnostic Investigation. 9.1:56-60. Print.

Fleetwood Borough. 2013. Fleetwood Borough Council Meeting Minutes. Web. www.fleetwoodboro.com/page3.html.

R.H. McCuen. 2004. *Hydrologic Analysis and Design*. Prentice Hall, Upper Saddle River, New Jersey, 07458, 3rd edition.

Philadelphia Water Department (PWD). 2002. *Belmont & Queen Lane Treatment Plant Source Water Assessment Report (PWSID #1510001)*. Publication.

Philadelphia Water Department (PWD). 2006. *The Schuylkill River Watershed Source Water Protection Plan, Belmont & Queen Lane Surface Water Intakes (PWSID#1510001)*. Publication.

Philadelphia Water Department (PWD). 2011. *Long Term 2 Enhanced Surface Water Treatment Rule Watershed Control Program Plan*. Publication.

Philadelphia Water Department (PWD). 2014. *2013 Watershed Control Plan Annual Status Report.* Publication. www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports

Philadelphia Water Department (PWD). 2015a. *2014 Watershed Control Plan Annual Status Report.* Publication. www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports

Philadelphia Water Department (PWD). 2015b. *Watershed Sanitary Survey.* Publication.

Philadelphia Water Department (PWD). 2015c. *Philadelphia's Wet Weather Management Programs Combined Sewer Management Program Annual Report and Stormwater Management Program Annual Report. Publication.* phillywatersheds.org/doc/FY15CSO_MS4AnnualReport.pdf

Pennsylvania Department of Environmental Protection (PA DEP). 2016. *2016 Draft Pennsylvania Integrated Water Quality Monitoring and Assessment Report: Clean Water Act Section 305(b) Report and 303(d) List.* http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-13014

United States Environmental Protection Agency (US EPA). 2006. *Federal Register: 40 CFR Parts 9, 141, and 142 National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule; Final Rule*. 3rd ed. Vol. 71. Print.

United States Department of Agriculture (USDA). 1993. *Cryptosporidium* is Common in Dairy Calves: National Dairy Heifer Evaluation Project. Web.

http://www.aphis.usda.gov/animal_health/nahms/dairy/U.S. Department of Agriculture (USDA). 2002. *2002 Census of Agriculture.* Publication.

World Climate. "Hamburg, Berks County, Pennsylvania USA Average Rainfall." Web. http://www.worldclimate.com/cgi-bin/data.pl?ref=N40W075+2300+363632CS