PHILADELPHIA'S WET WEATHER MANAGEMENT PROGRAMS

COMBINED SEWER MANAGEMENT PROGRAM ANNUAL REPORT

National Pollutant Discharge Elimination System (NPDES) Permits
Nos. PA0026689, PA0026662, PA0026671

STORMWATER MANAGEMENT PROGRAM ANNUAL REPORT

National Pollutant Discharge Elimination System (NPDES) Permit
No. PA 0054712

Reporting Period July 1st 2017 to June 30th 2018

Submitted to:

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Water Quality Management

And

ENVIRONMENTAL PROTECTION AGENCY – REGION III
Water Protection Division

Combined Sewer Management Program Annual Report

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Errata

1. The errata submitted on September 30th, 2019 includes the replacement of Table 2 of Appendix D.

I. Management and Control of CSOs

This report is submitted pursuant to meeting the requirements of NPDES Permits #'s PA0026662, PA0026671, and PA0026689; PART C, I. Other Requirements, Combined Sewer Overflows (CSOs), III. Implementation of the Long Term CSO Control Plan, C. Watershed-Based Management, IV. Monitoring and Assessment. This section requires that the permittee submit an Annual CSO Status Report. The purpose of this report is to document the status and changes made to programs implemented by the City of Philadelphia (City), during Fiscal Year 2018 (FY18), which encompasses the period of July 1st, 2017 through June 30th, 2018, to manage and reduce the combined sewer overflows (CSOs) permitted to discharge to waters of the Commonwealth of Pennsylvania.

II. Implementation of the Nine Minimum Controls

The Philadelphia Water Department (PWD) submitted an Updated Nine Minimum Control Report to the Department on June 1, 2013 to supplement the 1995 report and describe current activities as a result of new technology or practices. The nine minimum controls (NMCs) are low-cost actions or measures that can reduce CSO discharges and their effect on receiving waters, do not require significant engineering studies or major construction, and can be implemented in a relatively short time frame.

II.A NMC 1 - Proper Operation and Regular Maintenance Programs for the Sewer System and the CSOs

II.A.1 Implement a Comprehensive Geographic Information System (GIS) of the City Sewer System

To ensure PWD's investment in GIS is as accurate and up to date as possible, edits and improvements are made to data on a daily basis. PWD utilizes the GIS coverages as the foundation for many of their operations including maintenance management, capital improvements, and hydraulic modeling. During FY18, GIS layers have continued to be updated and maintained to ensure the accurate tracking and reporting of PWD assets and infrastructure. In addition, the GIS platform was updated to a newer version to take advantage of new functionality.

II.A.2 Implement a Comprehensive Sewer Assessment Program (SAP)

PWD continues to implement a comprehensive SAP to provide inspection of the collection system using closed circuit television (CCTV) and sonar. The SAP is a critical tool for operations and maintenance as it provides information on existing pipe conditions and helps to locate where repairs are needed. The program is also used to guide the capital improvement program to ensure that the existing sewer systems are adequately maintained, rehabilitated, and reconstructed. SAP inspections are conducted by PWD's Flow Control group. During the second half of FY17, a contract was awarded for additional CCTV and sonar inspections. The contracted work will benefit the department by increasing the number of inspections and mileage of inspected pipe. For the period of July 2017 – June 2018, the PWD inspected 51.44 miles in length of sewer via CCTV and Sonar, averaging about 4.43 miles a month as shown in **Table II.A.2-1 Monthly TV Inspections.** The CCTV group started doing post construction and preventative maintenance inspections for green infrastructure. The unit completed 395 post construction and 1187 preventative maintenance inspections in FY18.

Table II.A.2-1 Monthly TV Inspections

Date	Collector Systems (Miles Inspected)
Jul-17	2.69
Aug-17	4.58
Sep-17	4.57
Oct-17	7.57
Nov-17	8.51
Dec-17	5.88
Jan-18	3.82
Feb-18	3.22
Mar-18	2.30
Apr-18	2.81
May-18	2.60
Jun-17	2.89
Average	4.43
Total	**51.44**

II.B NMC 2 - Maximum Use of the Collection System for Storage

II.B.1 Continue to Institutionalize a Comprehensive Monitoring and Modeling Program

Monitoring

PWD continues to maintain an extensive monitoring network throughout the combined sewer system including rain gages, pump stations and connections from adjacent outlying communities. Information on the monitoring network with an updated listing of the monitors, rain gages, and pumping stations can be found in **Appendix B - Flow Monitoring**.

Modeling

The hydrologic and hydraulic models will be updated as needed to support Nine Minimum Controls implementation and reporting.

II.B.2 Continue to Operate and Maintain a Network of Permanent and Temporary Flow Monitoring Equipment

PWD continues to maintain a CSO permanent monitoring network and temporary monitoring programs to support planning for CSO control projects and to minimize dry weather overflows and tidal inflows.

Permanent Flow Monitoring Program

PWD uses a network of permanent flow monitors that are connected to a newer data acquisition system (TELOG) which uses cellular-based telemetry and improved enterprise data management software. As of FY18, the Collector System Monitoring Network is connected to over 320 sites at various locations including CSO regulators, rain gauges, pump stations, interceptors, chemical feed tanks and hydraulic control points which collect over 720 individual measurements with over a ninety percent operational status. All monitoring devices deployed throughout the PWD Collector System continually store data and periodically communicate monitoring information back to the Collector Systems Headquarters for review and use by staff. The listing of permanent flow monitors can be found in **Appendix B – Flow Monitoring.**

Temporary Flow Monitoring Program

PWD maintains its temporary flow monitoring program, initiated in July 1999, which consists of deploying portable flow meters throughout targeted Philadelphia sewershed areas to quantify sanitary and combined flow from the sewer system and characterize the tributary sewersheds. During FY18, PWD monitored 98 sites for the purposes of model calibration, inflow/infiltration (I/I) identification and design support. The listing of all temporary flow monitors, their location, and the deployment projects can be found in **Appendix B – Flow Monitoring: Table 6 – Listing of all Temporary Flow Monitors Deployed by Projects.**

II.B.3 Continue to Evaluate the Collection System to Ensure Adequate Transport Capacity for Dry and Wet Weather Flow

Long Term Control Plan Update

System-wide hydrologic and hydraulic models have been developed in support of the Long Term CSO Control Plan Update (LTCPU). Model evaluations have been performed to evaluate the system performance benefits of various system improvement scenarios.

The evaluations of the system-wide models were completed in FY08 to support the LTCPU. Since 2008 EPA SWMM models have been converted to be executed using Stormwater Management Model (SWMM) 5. PWD continues to update the hydrologic and hydraulic models as needed to support planning and regulatory reporting needs.

PC-30 Extreme Wet Weather Overflow

PWD continues to monitor PC-30. For additional information on other efforts conducted for this site, please refer to **Section III.B.2.: Table III.B.2-1** on page 37.

Storm Flood Relief

Throughout its history, PWD has sustained a storm flood relief program to analyze and reduce property damage from flooding and basement backups. Aspects of this program include sewer system inspection and maintenance, property data collection, implementing individual property solutions when appropriate, and sewer system hydraulic and hydrologic (H&H) analysis to understand flood prone areas.

Flood Relief Project Summary

More recently, the focus of storm flood relief effort includes: South Philadelphia, Northern Liberties, Germantown, and Eastwick. The goal of these efforts has been to improve the conveyance of stormwater by targeting peak flow and volume reduction and reducing the potential for flooding. Hydrologic and hydraulic modeling indicates that sewer system improvements or source reduction can sometimes reduce the frequency and/or severity of flooding events. However, the potential benefits of structural improvements to the City's drainage infrastructure must always be counterbalanced by the financial, economic, and social impacts of implementation. Through the Storm Flood Relief program, PWD continues to refine and optimize mitigation solutions to minimize negative impacts to the communities.

South Philadelphia

In FY18, PWD completed several tasks associated with the Pennsport Storm Flood Relief Project. The H&H SWMM baseline model was updated to include more recent impervious coverage as well as sea level rise scenarios in the 2020s, 2050s, and 2080s. The Alternatives Evaluation and Recommended Outcome (AERO) Report will be completed in FY19.

Northern Liberties

SFR sewer projects continue to move forward for Northern Liberties which also impact combined sewer neighborhoods in Fishtown, Port Richmond and Lower Kensington. **Table II.B.3-1** demonstrates the status of the Northern Liberties SFR program at the end of FY18:

Table II.B.3-1 Northern Liberties SFR Sewer Improvement Projects

Project Name	Location	Project Status
Northern Liberties Phase 1	Delaware Avenue and Laurel Street	Construction Complete (2011)
Northern Liberties Phase 2	Canal Street Chamber	Construction Complete (2016)
Northern Liberties Phase 3	Delaware Ave to River (Undertaken by Sugar House)	Construction Complete (2016)
Northern Liberties Phase 4	Canal & Laurel Sts. to Germantown Ave. &Wildey St.	Construction Complete (2016)
Northern Liberties Phase 5	Germantown Ave. from Wildey St. to Girard Ave.	Under Construction
Northern Liberties Phase 6	Germantown Ave. & Thompson St. to Master & Randolph Sts.	In Design

Germantown

The East Germantown section of Philadelphia was impacted by flooding from intense rainstorms, such as Hurricane Irene (8/27/11) and Tropical Storm Lee (9/7/11). In FY18, PWD, with support from a consultant completed the Flood Damage Analysis Model to estimate expected damages for existing conditions and to estimate reductions in damages that may be achieved for a variety of system improvements. The Alternative Identification Memorandum (AIM2) analyzed 1600 different system improvement scenarios throughout the sewershed and selected two high performing alternatives to move into the AERO phase of capital planning.

Eastwick

The Eastwick neighborhood is located in a naturally low-lying area in southwest Philadelphia. The neighborhood has experienced severe riverine flooding from multiple storms including Hurricane Floyd, Hurricane Irene, and Tropical Storm Lee. The City acting through PWD was given the Federal Interest Determination through the Continuing Authorities Program Section 205 in April 2018 to pursue a feasibility study. A Federal Cost Share Agreement between the City and United States Army Corp of Engineers (USACE) has yet to be signed to move forward with the feasibility study.

II.B.4 Fully Integrate the Real-Time Control Facility into the Operations of PWD

Real Time Control Evaluation

Several projects were previously evaluated for Real Time Control; for additional information on these projects, please refer to Section 2.1 Evaluate Real Time Control in LTCP on page 10 of the 1996 Annual CSO Status Report and Section II.B.3.4 Real Time Control Evaluation on page 26 of the CSO-Stormwater FY 2010 Annual Report. For details regarding the current operational statuses of the City's Tacony Creek Park computer controlled CSO regulator (T-14) and Rock Run Relief CSO regulator (R-15) see **Section II.B.5** below.

The D-05 regulator is being examined as a potential location for additional CSO capture through the installation of a new enlarged interceptor connection with real-time controlled sluice gate. As of FY18, this project is in the early stages of design.

II.B.5 Operate and Maintain In-Line Collection Storage System Projects Contained within the LTCP

Main Relief

The Main Relief project is operating as designed with a 7.5-foot static dam.

Construction and Implementation of Tacony Creek Park (T-14)

The T-14 storage sewer provides combined sewer overflow capture in the Northeast Drainage District (NEDD). The T-14 storage sewer system is operating under automated controls and reducing overflow volume during wet weather events. T-14 is operating at the full design level.

Construction and Implementation of Rock Run Relief (R-15)

The Rock Run Relief Sewer provides flood relief to combined sewer areas upstream of regulator T-8 in the Northeast Drainage District (NEDD). An inflatable dam was constructed in the Rock Run Relief Sewer to allow for utilization of in-system storage to retain combined flows during wet weather events. The Rock Run storage facility is operating under automated real-time controls at the full design capacity.

Computer-Controlled CSO Regulators

PWD has eight computer-controlled CSO regulators that are configured to maximize storage during wet weather. All the computer-controlled regulators are in the northeast drainage district (NEDD). Five of the eight computer-controlled regulator sites had control upgrades installed in FY17. The remaining three computer-controlled regulators are scheduled for upgrade in FY19.

II.C NMC 3 - Review and Modification of Pretreatment Requirements to Assure CSO Impacts Are Minimized

II.C.1 Expand the Pretreatment Program to Include Significant Industrial Users (SIUs) Whose Facilities Contribute Runoff to the Combined Sewer System

The City of Philadelphia's Pretreatment Program regulates all significant industrial users (SIUs) that discharge into PWD's service area, which includes SIUs in both separate and combined sewer systems. The City continually reevaluates the Pretreatment Program to determine if improvements can be made. Through annual monitoring and inspection activities, PWD's Industrial Waste & Backflow Compliance Unit (IWBC) currently regulates 128 SIUs that discharge to the sanitary system. IWBC conducts SIU program and inspections on a calendar year cycle, having inspected all 128 permitted facilities during the 2017 calendar year.

IWBC also maintains a website to inform the public and industries of permitting regulations, requirements and other information that may benefit or impact industrial users. The Industrial Waste group's website is located at the following web address: http://www.phila.gov/water/IWU.html.

II.C.2 Incorporate Guidance on BMPs for Industrial Stormwater Discharges into Stormwater Management Regulations Guidance

A revised version of the Philadelphia Stormwater Management Guidance Manual was released on July 1, 2015 as a web-based resource. The manual assists developers in meeting the requirements of the Stormwater Regulations and can be updated when necessary to incorporate new information. The current version of the manual is available at http://www.pwdplanreview.org/manual/introduction.

Please refer to the MS4 Annual Report **Section F.5.g - Stormwater BMP Handbook and Construction Site BMP Sediment & Erosion Control Checklist** on page 34 for additional information on the updated manual.

II.C.3 Continue to Serve as a Member of the Philadelphia Inter-Governmental Scrap and Tire Yard Task Force

The Scrap Yard Task Force (SYTF) was created to address numerous complaints about the operation of scrap metal and auto salvage businesses, which may cause polluted runoff to enter the City's sewers, blight in City neighborhoods, and contribute to short dumping and other environmental hazards to area waterways.

The SYTF is in its tenth year of operation since it was reorganized in September of 2008. Inspections and meetings normally take place once a month, inspecting about four scrap facilities each month, in an effort to bring more scrap yards into compliance. The SYTF will occasionally inspect facilities that do not fit the strict definitions of either junkyard or metal recycler but present the potential for negative impact on the environment and surrounding area. Some of these sites are: tire accumulations, overflow lots, other recycling facilities, and shipping operations. The SYTF also responds to community complaints having to do with facilities or properties that are considered a nuisance or problematic in a given neighborhood.

The core agencies involved in the SYTF are PWD, PADEP's Solid Waste division, Department of License and Inspections (L&I), Philadelphia Police Auto Squad and the Philadelphia Fire Dept. Hazmat Administration Unit. Each attending agency performs specific tasks as dictated by their primary regulatory mission. For example, PWD also inspects sites for water and sewer violations, as well as violations that may be referred to the PADEP Clean Water division. PWD is the coordinating entity that designates the facilities to be visited.

During FY18, the SYTF held 10 meetings resulting in 40 facilities being inspected. Inspection results are shown in **Table II.C.3-2: SYTF FY18 Inspections** on page 8, while locations are displayed in **Figure II.C.3: SYTF Sites Inspected in FY18** on page 11. The vast majority of the sites inspected in FY18 resulted in minor infractions such as improper labeling and storage, blocked fire lanes and missing business/special work licenses which typically can be addressed shortly after identified. Very few of the inspections during FY18 resulted in water quality concerns, as most facilities are graded in such a way that there is no runoff from the property. Water flows toward the center of the parcel rather than towards surrounding storm drains and local waterways. In addition, less than 25% of facilities inspected have water or sewer service.

All instances where during an inspection the SYTF observes potential water quality concerns, the sites are referred to PWD's IWBC. The large majority of sites inspected in FY18 were found to be in compliance, while the sites listed below required further action:

- Five sites were discovered to be no longer active scrapyards, the SYTF team will continue to monitor these sites as these areas often reestablish as new scrapyards as ownership changes.
- Two sites were turned over to the PPD's Auto Squad due to stolen vehicles on site.
- One site was further investigated by PFD for a major potential fire hazard due to exposed cylinders.
- One site was turned over to the Pennsylvania Boat and Fish Commission for concerns about the property's embankment filled with tires and debris.

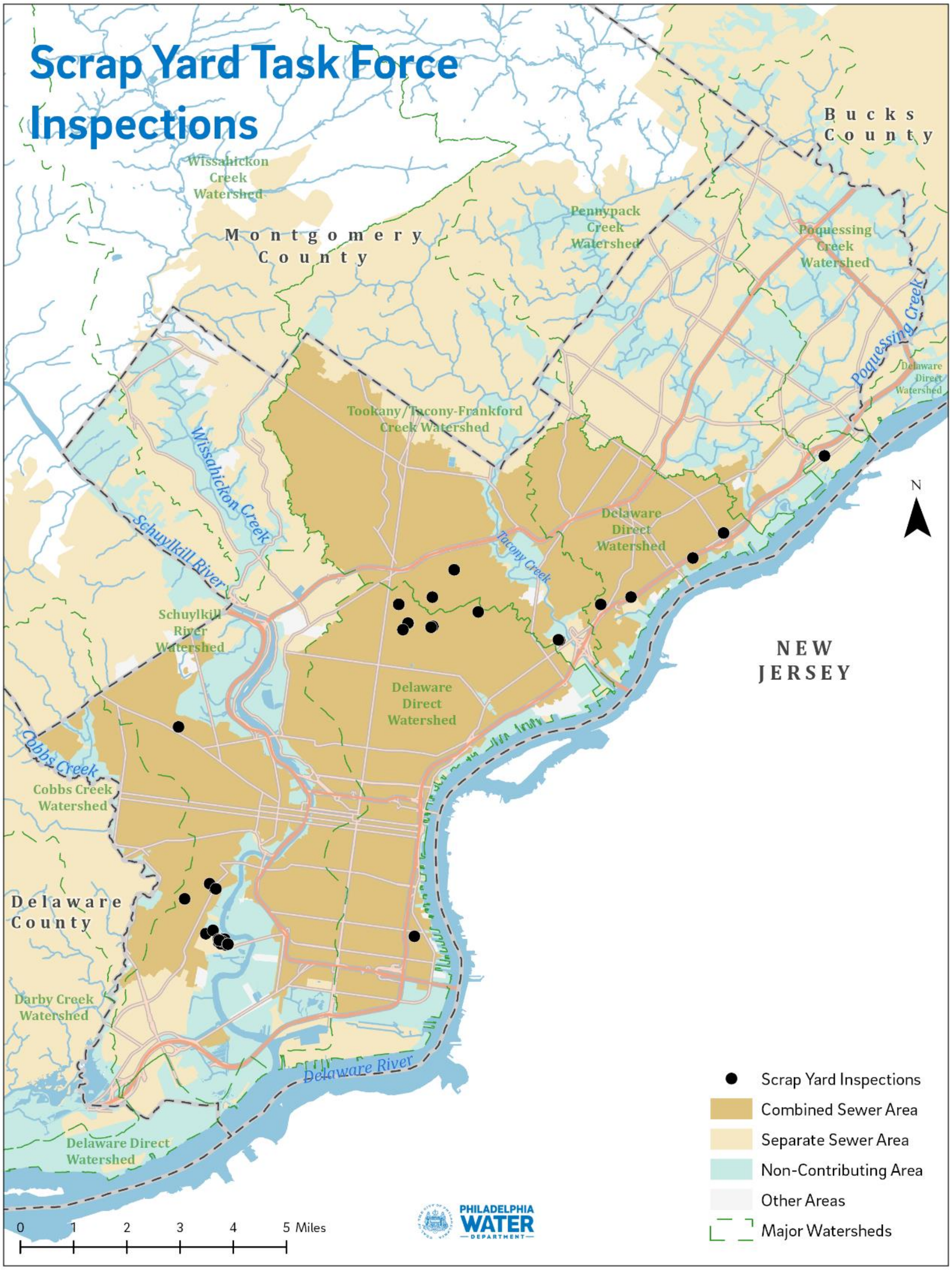
Table II.C.3-2: FY18 SYTF Inspections

Address	Facility Name	Date Inspected	Notes & General Findings
9200 James St	A&B Scrap Metal Company	7/13/2017	no major issues, excess weeds, improper storage of extinguisher powder
7342 James St	STO Auto Parts	7/13/2017	ground contamination, needs to renew hazmat license, needs to install sub pump, improper storage in rafter area
6701 State Rd	Venango Auto Parts	7/13/2017	no major issues, improper labeling
2251 Fraley St	Martin Recycling Co LLC	7/13/2017	heavy ground contamination, needs hot works permit, empty containers on property
2335 Wheatsheaf Lane	Green Dog Recycling	9/12/2017	need electrical permit, exposed cylinder "necks", no effective fire lanes,
2335 Wheatleaf Lane	TDI Towing Inc	9/12/2017	ground contamination on eastern portion, stolen vehicle found on property
2251 Fraley St	Absco	9/12/2017	no major issues, minor ground contamination
4750 James St	Shaws Auto Part	9/12/2017	no issues
3737 D St	Philly Auto II	10/5/2017	no emergency information container (EIC)
900 West Tioga St	Tioga Recycle and Parts	10/5/2017	improperly stored tires, improper storage (esp. of oil/battery), improper labeling, lack of fire lane, electrical hazards, no EIC
910 West Tioga St	Tioga Used Auto Parts	10/5/2017	roof structure might be comprised
3344 N 10th St	N/A	10/5/2017	no longer operating as scrap yard.
5823 Woodlands Ave	Tonys Auto	11/11/2017	no fire lanes, encroachment (trash to industrial materials), structural issues
5300 Paschall Ave	Salvage 1	11/11/2017	refused entry, reschedule visit
5334 Lindbergh Blvd	Southwest Metals	11/11/2017	no manager on site, need to reschedule visit
2200 Weccacoe St	F&J Recycling	11/11/2017	no issues, not typical scrapyard
423 W Luzerne St	Partz	12/7/2017	improper tire storage
325 W Glenwood St	G&G	12/7/2017	storm inlet without oil water separate, gas cylinders not secured or labelled
403 W Glenwood	Amparos	12/7/2017	no major issues, EIC is mounted too high

Address	Facility Name	Date Inspected	Notes & General Findings
4501 Rising Sun Ave	Rodriguez	12/7/2017	junk cars on site, lack of fire lanes.
5300 Paschall Ave	Salvage 1	2/15/2018	encroachment of cars on sidewalk, need hot works permit and auto-wrecking permit, excessive tires
5300-34 Lindberg Blvd	Southwest Metals	2/15/2018	clogged drain in the center of property, industrial runoff entering the sewer system from property, improper storage of cylinders, need to renew all licenses
1560-84 N 52nd St	IMP Auto Repair	2/15/2018	no major issues, paint booth out of inspection
3735-37 Old York Rd	Reuben's Auto	2/15/2018	Site was closed upon arrival
3404 S 61 St	B&L Auto Glass + Parts	3/14/2018	Minor issues with improper labeling and missing licenses at time of inspection
3300 S 61st	Philly Auto Repair	3/14/2018	heavy ground contamination in rear of property, painting outside of spray booth, storage area for auto parts is not structurally stable
3246-66 S 61st St	Philly Scrap Metal	3/14/2018	improper storage of liquids, potential runoff
3268 S 61st St	4 A's Auto Parts	3/14/2018	recently ceased operations and changed owner. Visited facility on 3/14/2018, but no inspection occurred.
3100 S 61st St	Sonny's Auto Parts and Car Sales	4/5/2018	minor issues with improper labeling and lack of fire lanes
3101 S 61st St	Century	4/5/2018	improper storage of batteries, lack of fire lanes, no EIC on site
3511 S 61st St	B&B	4/5/2018	recently ceased operations and changed owner. Visited facility on 4/5/2018, but no inspection occurred.
3340 S 61st St	Phil's	4/5/2018	scrapyard recently went out of business. Visited facility on 4/5/2018, but no inspection occurred
3323 S 61st St	Mann's Auto Service	5/5/2018	needs EIC, missing auto repair license
3501 S 61st St	Philly Auto Salvage & Parts	5/5/2018	heavy ground contamination, improper storage of tires and cylinders, improper labeling, no EIC or fire lanes, cars stacked too high, municipal trash, missing hot works permit

Address	Facility Name	Date Inspected	Notes & General Findings
3401-5 S 61st St	East Coast Salvage	5/5/2018	no EIC, improper labeling, moderate ground contamination, lack of fire lanes, tires were found on the embankment forwarded to PA Boat and Fish Commission
3331 S 61st St	Steve's Auto Parts II	5/5/2018	missing licenses, improper storage, municipal trash and excess weeds
3350 S 61st St	LKQ Venice Auto Parts	6/7/2018	No issues found.
3517-55 S 61st St	Jack's	6/7/2018	minor ground contamination, crusher area is not clean, improper storage, excess tires, no EIC, improper labeling
3507 S 61st St	JT's	6/7/2018	property was purchased by Big Heads
3511 S 61st St	Big Heads	6/7/2018	heavy ground contamination, improper labeling, cars stacked too high, improper storage, excess tires, no EIC, stolen motorcycle found on property

Figure II.C.3: SYTF Sites Inspected in FY18



II.D NMC 4 - Maximization of Flow to the Publicly Owned Treatment Works (POTW) for Treatment

II.D.1 Continue to Analyze and Implement Non-Capital Intensive Steps to Maximize the Wet Weather Flow to the POTW

Modified Regulator Plan

The Modified Regulator Plan (MRP) was designed to deliver more flow to the WPCPs more frequently and enable greater pollutant removals. The projected flow increase associated with the MRP was completely implemented by the submission of the 1997 Annual Combined Sewer Overflow Status Report. Additional plan implementation efforts were included in the Updated Nine Minimum Controls Report which can be found online by accessing the following link: http://phillywatersheds.org/doc/Updated%20NMC%20Report.pdf.

Maximization of Wet Weather Treatment in the LTCPU

PWD completed and submitted a comprehensive Wet Weather Facility Plan on June 1, 2016, which provides details including schedule, cost and anticipated performance for each project presented in and supersedes the FCPs. More details on these plans can be accessed at the following link: http://phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan.

II.D.2 Continue the Program Which Requires Flow Reduction Plans in Agreements to Treat Wastewater Flows from Satellite Collection Systems Where Violations of Contractual Limits are Observed

PWD provides wastewater service to some of its neighboring communities. Communities that exceed their contractual limits must develop flow reduction plans, under PWD review. In FY18, there were no significant updates to the Wholesale Wastewater Customer contracts. The list of outlying community contracts can be found below in **Table II.D.2-1: Listing of Wholesale Wastewater Customer Contracts and Capacities.**

Table II.D.2-1 Listing of Wholesale Wastewater Customer Contracts and Capacities

Customers	Average Annual Daily Flow Maximum (MGD)	Maximum Daily Flow (MGD)	Instantaneous Maximum Rate (Cubic ft./sec)	Maximum Annual BOD Loadings (1,000's lbs.)	Maximum Annual SS Loadings (1,000's lbs.)
Northeast Plant					
Abington	2.97	4.45	9.54	2,102	2,481
Bensalem	6.13	-	11.74	5,340	3,734
Bucks	24	33.00	74.26	13,400	13,400
Cheltenham	-	-	26	-	-
Lower Moreland	1.90	2.85	5.88	729	966
Lower Southampton	7.14	9.28	15.79	5,500	6,000
Southwest Plant					
DELCORA	50.00	75.00	155.00	21,771	19,487
Lower Merion	14.50	-	31.57	6,871	7,250
Springfield (Erdenheim)	3.20	-	6.65	3100	3300
Upper Darby	17.00	-	35.00	6,831	7,348
Southeast Plant					
Springfield (Wyndmoor)	1.00	-	1.93	300	400

II.D.3 Use Comprehensive Monitoring and Modeling Program to Identify Suburban Communities where Excessive Rainfall-dependent I/I Appear to be Occurring

The US EPA's SWMM was used to develop the watershed-scale model for the combined and separate sewer systems. Suburban communities are modeled as separate sanitary sewersheds that load to the PWD sewer network. The rainfall response from these sheds is calibrated to flow monitoring data collected at each respective connection to PWD sewer network (if the sewershed is not monitored then a reference shed is used to obtain the rainfall response). Presently, permanent flow monitors are installed at 57 connections and 1 connection is unmonitored at this time. **Appendix B – Flow Monitoring: Table 2** contains the list of all known connections, their location and whether the connection is permanently monitored.

Since the FY17 annual report submission, two updated versions of the model that included changes to hydrology and hydraulics have been used to generate **Table 2 in Appendix D** for the FY18 annual report. Q3 and Q4 of 2017 were simulated with a model version that reflected systemwide and local-scale refinements to hydrologic and hydraulic parameters made between October 2016 and June 2017. Q1 and Q2 of 2018 were simulated with a model version that incorporated systemwide and local-scale refinements to hydrologic and hydraulic parameters made between June 2017 and November 2017. All modeling work is performed using EPA Stormwater Management Model Version 5.

Since the FY17 annual report submission, some minor changes have been made to the SWMM5 model to include operational and structural changes to the collection system. Modifications include the following:

- R-07: Stop logs that had been installed to divert flow to support collection system operations on 1/13/2017 were removed on 8/19/2017.
- R-15 (H-37): Automatic control of the DWO gate was turned off and it was locked open at 12%. This change was implemented in the model beginning 1/1/2018.
- Central Schuylkill Pump Station: One pump at a time has been taken out of service for replacement. The pump curve in the model was changed to reflect this on 1/1/2018.

Appendix D – FY18 NPDES Annual CSO Status Report: Table 3 shows the CSO overflow volume, duration and frequency. The typical year rainfall and the SWMM model used to support the 5-year Evaluation and Adaptation Plan (EAP) submitted in October 2016 is used to generate this.

II.E NMC 5 - Prohibition of CSOs during Dry Weather

II.E.1 Optimize the Real-Time Control Facility to Identify and Respond to Blockages and (non-chronic) Dry Weather Discharges

Regular inspections, reactive inspections, and maintenance of CSO regulators are performed throughout the City to ensure that sediment accumulations and/or blockages are identified and corrected immediately to avoid dry weather overflows. PWD utilizes a remote monitoring network system daily to help identify locations showing abnormal flow patterns.

CSO Regulator Inspection & Maintenance Program

PWD maintains 175 CSO regulator chambers with regulator devices that control the diversion of wastewater flow to the interceptor system and twenty-six storm relief diversion chambers that allow excess flow during storm events to be diverted to storm relief sewers. These chambers discharge through 164 NPDES permitted point sources which make up the CSO outfalls. The maintenance of the chambers is critical to the performance of the system in that they control the frequency, duration and quantity of CSO discharges. Annual summaries of the comprehensive and preventative maintenance activities completed in the combined sewer system over the past year are detailed in **Appendix D - FY18 NPDES Annual CSO Status Report** and any changes are discussed below.

PWD continues to implement its policy of conducting next day follow-up inspections at sites that experience a dry weather discharge. Ongoing assessment of all inspection scheduling continues to ensure that CSO regulators are inspected at the frequency required to ensure timely response to operational issues and minimize the likelihood of dry weather discharges. During FY18, Flow Control crews completed 5,465 inspections on 201 CSO regulator sites and storm relief diversion chambers. The crews cleared 185 CSO regulator blockages to prevent possible discharges from developing. There were nineteen dry weather discharges total during this fiscal year. The S-22 CSO regulator accounted for seven of those dry weather discharges due to mechanical issues with a flow regulating shutter gate. To resolve these issues, the gate was chained permanently open on July 30, 2018. Details of the inspections during the past fiscal year can be found beginning on page 13 of **Appendix C – FY18 CSO Program Maintenance Annual Report.**

Tide Gate Inspection and Maintenance Program

Eighty-nine tide gates are located at approximately half of the CSO regulator chambers in the City's system and prevent tidal inflow into the combined sewer system from the estuary receiving water body. Maintenance of the gates is critical to system performance because inflow from the receiving water body can adversely affect the combined sewer system and treatment facilities by reducing system capacities, potentially causing dry weather discharges. In FY18, CSO tide gate preventative maintenance was completed at nineteen of the tidally-affected CSO regulator sites. Summaries of the tide gate inspection and maintenance completed during the past fiscal year are on page 23 of **Appendix C – 2018 CSO Maintenance Program Annual Report**, which documents the locations of tide gate preventative maintenance performed in FY18.

Somerset Grit Chamber Cleaning

During FY14, the Somerset grit chamber was removed from service because the upstream regulator was being relocated. This relocation project was completed during FY16.

Central Schuylkill Pumping Station Grit Pocket Cleaning

During FY18, the two grit pockets at the CSPS siphon were cleaned two times, and a total of 45 cubic yards of grit with an approximate weight of 76 tons were removed to ensure proper functionality of the site. Additional information on the CSPS cleaning activities conducted in FY18 is available on page 24 of **Appendix C – FY18 CSO Maintenance Program Annual Report**.

Routine Grit Cleaning

PWD regularly inspects regulators, pump stations, junction chambers and sewers which are known to accumulate grit. These sites are scheduled for flushing and vacuuming on as-needed basis.

II.F NMC 6 - Control of Solid and Floatable Materials in CSOs

II.F.1 Control the Discharge of Solids and Floatables by Cleaning Inlets and Catch Basins

PWD’s Inlet Cleaning Unit (ICU) is responsible for inspecting and cleaning stormwater inlets within the City. When fully staffed, there are thirty-seven inlet cleaning crews whose primary duties include cleaning, removing and properly disposing of debris (solids and floatables) from inside City inlets as well as street level cleaning in the vicinity of inlets to prevent debris from entering the collection system. Other duties include inspection of inlet conditions and referral of structural defects to the Sewer Maintenance Unit for repair to ensure proper function. Furthermore, dedicated crews are responsible for cleaning high volume traffic areas, retrieving and installing inlet covers, replacing missing inlet covers, installing locking covers, and unclogging choked inlet traps and outlet pipes so inlets can take water. A high level of focus is placed on responding to customer complaints of flooding, blockages, and foul odors.

During FY18, the ICU was responsible for maintenance of approximately 71,500 stormwater inlets connected to the City's combined and separate storm sewer systems (gray inlets). Additionally, during the fiscal year, the ICU began taking responsibility for cleaning of pretreatment on stormwater inlets connected to green stormwater infrastructure (green inlets). By the end of the fiscal year, ICU was responsible for preventative maintenance of approximately 350 green inlets monthly. Fiscal year totals for work on GSI connected inlets included 3,318 inlet inspections and 3,261 pretreatment cleanings. Moving forward, ICU will accept responsibility for pretreatment maintenance of all green inlets city-wide.

Statistics related to the ICU's work productivity during FY18 and the previous two fiscal years can be found in **Table II.F.1-1**. Short staffing during the second half of FY18 largely attributes to the slight decrease in productivity, where at the lowest point the ICU was under-staffed by approximately nine crews. Unlike previous fiscal years, work conducted at both gray and green inlets were included in quantities for inlets inspected, inlets cleaned, debris removed, and pounds per inlets during FY18. The process of dewatering debris at a central location has increased cleaning efficiency and decreased disposal weight. For more information on litter control please refer to the FY18 MS4 Annual Report **Section F.8.d – Public awareness of litter** on page 38.

Table II.F.1-1: Inlet Cleaning Statistics

	FY 16	FY 17	FY 18
Total Inlets Inspected	129,218	134,256	132,699
Total Inlets Cleaned	98,147	107,638	106,796
Total Covers Replaced	64	103	124
Total Covers Retrieved	23	28	14
Total Covers Chained	6,180	3,106	2,685
Debris Removed (tons)	9,407	7,405	6,286
Avg. Lbs./ Inlet	192	138	118

II.F.2 Continue to Fund and Operate the Waterways Restoration Team (WRT)

PWD's Waterways Restoration Team (WRT) is a multi-crew force dedicated to performing stream examinations and cleanup work throughout the city including large trash and debris removal and restoration of eroded streambanks and streambeds. WRT's stream examinations consist of assessing a variety of field conditions including waterway, infrastructure, site access and sewage discharge assessments. WRT waterway maintenance work involves debris removal, stream restoration work, and assisting with sewer maintenance work to help provide a safe work environment while protecting stream ecosystems. WRT works in partnership with Philadelphia Parks and Recreation (PPR) staff and various Park Friends groups to maximize resources and build positive relationships with our communities.

In FY18, WRT conducted 272 stream examinations and removed a total of 1,582 tons of debris from the City's waterways (**Table II.F.2-1**). Of the total debris removed, a majority of the weight can be attributed to large organic material (e.g. trees) that have fallen into the waterways and restricted flow, thus increasing the potential for bank erosion and/or damage to infrastructure.

Table II.F.2-1 Waterways Restoration Team – Annual Activity Summary FY09-FY18

Activity	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
Total Tons Removed	657	1438	750	741	1416	710	918	1130	817	1582
Cars Removed	15	12	11	14	4	4	9	2	2	1
Tires Removed	924	1062	1392	1256	4756	1428	427	1069	1153	859
Shopping Carts Removed	268	102	89	50	27	20	67	38	87	74
# of Stream Site Cleanups	375	335	459	434	467	686	645	721	872	933
# of Stream Site Exams	*	*	*	*	*	438	369	378	374	272

*This metric was not available until FY14

II.F.3 Continue to Operate and Maintain a Floatables Skimming Vessel

The skimming vessel is used as a control measure, capable of managing debris at various locations in open water after the debris and floatables have bypassed static control methods (e.g., debris screens). Also, these traditionally large vessels provide increased public awareness and education of floatables impacts to Philadelphia receiving waterways. The PWD currently has three skimming vessels; a large marine vessel, the R.E. Roy, a smaller pontoon vessel, and a small general workboat.

Large Floatables Skimming Vessel – R.E. Roy

The 39-foot skimmer vessel is operated for approximately five days per week, for about seven months out of the year, or more as appropriate conditions allows (i.e. weather). The vessel's main purpose is to perform general debris collection and removal on both these rivers, while also serving as a mechanism for public relations events. During the 153 days of on-water operation in FY18, a total of 8.71 tons (200 cubic yards) of debris and floatables material were removed from the Delaware and Schuylkill Rivers (**Table II.F.3-1**). Also during the FY18 season, PWD continued sorting and separating recyclable material, which equated to 8,720 lbs. In addition, the PWD continued their partnership with Bridgestone through their Tires4ward Program to recycle the tires collected from skimming operations to be reused for rubberized asphalt, construction materials, landscaping mulch, consumer products and as tire-derived fuel for energy. At the end of the reporting period, PWD has recycled 101 tires through the Bridgestone Tires4ward Program.

Table II.F.3-1 Debris Collected and Days of Operation by R.E. Roy Skimming Vessel

Date	Total Tons Removed*	Cubic Yards Collected	Recyclables Collected (lbs.)	Days in Operation	Days on Schuylkill	Days on Delaware
July 2017	2.04	20	1152	20	14	6
August 2017	-	30	1888	23	17	6
September 2017	1.99	25	1200	21	14	7
October 2017	-	30	1216	18	11.5	6.5
November 2017	-	20	800	18	16	2
December 2017	2.78	5	192	4	3	1
January 2018	RE Roy Dry-Docked for Winterization Period					
February 2018						
March 2018						
April 2018	-	20	416	9	6.5	2.5
May 2018	1.90	20	800	21	13	8
June 2018	-	30	1056	19	14	5
FY18 Total	**8.71 tons**	**200 yd^3**	**8720 lbs.**	**153 days**	**109 days**	**44 days**

* *Tons removed* is not a monthly metric and is only calculated when floatables/debris are removed from the shipyard and transported to the weigh station at the trash collection facility. Additional focus on the recycling of tires and wheels has decreased the total tons of debris removed.

Small Skimming Vessels

PWD operates and maintains a small pontoon skimming vessel and recently added a small general workboat. Both types of vessels are used along the Schuylkill and Delaware River within Philadelphia to retrieve floating trash and debris from the waterways. The smaller skimming vessels are effective because they can be utilized in tight spaces found in marinas, among piers, and in near shore (shallow) areas. During the boating season, the pontoon skimming vessel is docked at a municipal dock in the non-tidal portion of the Schuylkill where it is primarily used. With the addition of the general workboat in May 2016, PWD has begun to deploy skimming operations and other activities in the tidal portions of the Delaware and Schuylkill rivers, specifically in areas not desirable or accessible by PWD's other skimming vessels. In both vessels, the marine flotsam and floatables are hand netted from the water surface by PWD employees standing on the vessel deck. The nets are emptied into ten 44-gallon debris containers on the deck and the containers are then offloaded.

In FY18, the small skimming vessels were operational from July – October 2017 and April- June 2018, equating to 40 deployments. During this period, the PWD removed a total of 31.1 cubic yards (2.3 tons) of material, comprised of 18.5 cubic yards (0.98 tons) of recyclable material including bottles, plastic, paper; 12.6 cubic yards (1.1tons) of mixed trash and 14 tires (350lbs) (Table II.F.3-2). The small skimming vessels were in active operation for a total of 180 hours in FY18.

The pontoon vessel has been discussed in detail in previous reports; please refer to Section II.F.3 Floatables Pontoon Vessel on page 38 of the CSO-Stormwater FY12 Annual Report for additional information on the vessel.

Table II.F.3-2 FY18 Small Skimming Vessels Collection Metrics

Date	# of Collections Events	Total Volume Collected (gal)	Total Weight Collected (lbs) not including tires	Total Volume of Recyclables (gal)	Total Volume of Mixed Trash (gal)	Tires Collected
July 2017	3	584	357.5	342	242	1
August 2017	7	1324	784	756	568	0
September 2017	5	600	450	364	236	3
October 2017	6	1061	702	660	401	1
November 2017	Skimming Vessels Dry-Docked for Winterization Period					
December 2017						
January 2018						
February 2018						
March 2018						
April 2018	5	612	558.5	286	326	5
May 2018	7	931	510	645	286	2
June 2018	7	1168	834	684	484	2
Total	**40**	**6,280 Gal**	**4,196 lbs**	**3,737 Gal**	**2,543 Gal**	**14 Tires**
Total Yd^3/Tons	**40 Events**	**31.1 Yds^3**	**2.1 tons**	**18.5 Yds^3**	**12.6 Yds^3**	**~325 lbs**

II.F.4 Other Floatables Control Activities

There is a tremendous amount of other activities that happen within the City that are not conducted with the intention of managing floatables but these initiatives provide integral components by ensuring additional floatable and solids do not make their way into the City's waterways and surrounding areas. In FY18, these activities have resulted in over 230 events; 2,734 volunteers; 962 tires collected, and 44.4 tons of trash and debris being removed. Some of these activities are described below.

Volunteer Water Adjacent Cleanups

The City has embraced the value of supporting and conducting volunteer water adjacent land-based cleanups with local partners and communities in areas in Philadelphia and surrounding region.

These volunteer cleanup events provide an opportunity to make significant difference in a given area within a few hours with the help of people willing to volunteer their time. The cleanup events also serve as opportunities to provide important information and public outreach about PWD's and the City's programs and how the volunteers' efforts are beneficial not only on an environmental/ecological standpoint but also helps promote social behavior changes.

United By Blue Cleanups

In 2016, PWD began to partner with United By Blue (UBB), a Philadelphia-based sustainable outdoor apparel company who conducts annual stream cleanups programs. Part of the company's business model includes the amiable mission, "*For every product sold, United By Blue removes one pound of trash from oceans and waterways through company organized and hosted cleanups.*" PWD partners with UBB by recommending litter-prone locations that are adjacent to Philadelphia waterways, promoting and supporting volunteer based cleanup events hosted by UBB, and helping coordinate pick up of event collections by PWD's Waterways Restoration Team (WRT) or the PWD staff. Much of the work conducted by UBB are often in locations under the purview of PWD's floatables control and pollution prevention programs. In FY18, UBB conducted 12 clean up events in Philadelphia with over 1,274 volunteers collecting 44,394 lbs. of trash.

Schuylkill Scrub

The Schuylkill Scrub is a program that encourages and supports cleanup events taking place during the spring (from March 1st through May 31st) throughout the entire Schuylkill watershed- from the headwaters in Schuylkill County down to its confluence with the Delaware River in Philadelphia. The Schuylkill Action Network coordinates the initiative, along with multiple partners, with a shared goal to cleaning as many miles of road, stream, and parkland in the Schuylkill watershed. Their efforts help prevent trash from making its way into our drinking water sources and keep our land and waters clean, litter-free, and beautiful. At the time of this report, the total amount of debris removed from the Schuylkill Scrub effort was not available.

Tookany/Tacony-Frankford Trash Task Force

In recent years, more targeted efforts to focus on litter have been initiated in the corridors surrounding the Tacony Creek watershed. PWD gathered members of different City agencies including Streets and PPR, as well as representatives from the Tookany/Tacony-Frankford (TTF) Watershed Partnership, SEPTA, United by Blue, and Keep Philadelphia Beautiful (KPB), to initiate discussions and coordinate efforts to alleviate the litter problem and its impact on Tacony Creek. The Task Force decided to invest into the T-04 outfall drainage area, due to its small area drainage and diverse land use.

The goal of the study is to establish trash resources and transport methods and then experiment with trash management practices which can then be applied to other drainage areas. The Task Force is continuing to research and explore methods for reducing the trash problem in the Tacony Watershed. During FY18, the TTF Watershed Partnership launched their Creekmobile, a traveling environmental education cart, and tested a variety of engagement strategies. The TTF Watershed Partnership continued to lead and coordinate trash clean-up efforts, working with PowerCorps PHL, United By Blue, TCP Keepers, and other groups on clean-ups. In addition, the park maintenance work of PowerCorps PHL has been enhanced this summer with the addition of two Delaware River Watershed Fellows through the Alliance for Watershed Education. In addition, TTF Watershed Partnership continued working with the Zero Waste and Litter Initiative and Keep Philadelphia Beautiful to share resources and efforts. During FY18, the TTF Watershed Partnership engaged approximately 1,527 participants/volunteers through its thirteen community events, 103 cleanups resulting in the collection of 673 bags (+5 tons) of trash being removed from the park area.

Friends of the Wissahickon Cleanups

The Friends of the Wissahickon (FOW) have conducted park cleanups within the Wissahickon Valley Park for many years. The Wissahickon Creek is a treasure to many Philadelphians and visitors to the area, who are searching for an escape to nature, providing a stunning green space for hiking, biking, and fishing. Devil's Pool, in particular, is one of the most beautiful places in the park – an iconic spot along the Cresheim Creek, just before it flows into the Wissahickon. Due to the popularity of this location, an excess of trash is sadly left behind by many of its visitors. This not only looks terrible but is dangerous to the fish and other wildlife that live in our watershed. Each year, FOW volunteers work over 12,000 hours to help FOW perform duties and complete projects including park cleanups that are essential for the Wissahickon to thrive, and the skills they learn can be transferred to the work sector. Last year (2017), FOW started weighing the trash following every clean rather than collecting the standard metric (number of bags). The total trash removal from the park in 2017 was 12,891 lbs (over 6 tons, with 5 tons coming from Devil's Pool alone). In 2018, with the help of PPR's District 4, FOW started to separate recycling from trash to further ensure the waste collected from the park is managed appropriately.

Circular Free Program

Philadelphia residents or businesses that do not wish to receive hand delivered advertising circulars or handbills or local newspapers at their property can fill out a form for a "Circular Non-Delivery" decal to notify advertisement distributors to refrain from delivering advertisements to their property. Per Chapter 10-700 of the Philadelphia Code, the Department of Licenses and Inspections maintains a commercial handbill "Non-Delivery" list identifying all properties whose owners request non-delivery. If the property continues to receive circulars or advertisements from businesses, they can contact L&I to fine violators. This helps prevent litter across the City by limiting the number of unwanted circulars from ending up in the street. During FY18, 562 households registered to receive a "Circular Non-Delivery" decal. Since the inception of the program, over 11,742 households have signed up for the Circular Free Program.

Bridgestone Tires4ward Partnership

In the summer of 2016, PWD established a partnership with Bridgestone, a tire manufacturer, to recycle tires collected from PWD-sponsored cleanup events including efforts conducted by the Waterways Restoration Team(WRT), Floatables Skimming Vessels and other cleanup activities. Bridgestone or one of their associated partners collects these tires at one of PWD's maintenance facilities as part of their Tires4ward program. This program was initiated to support Bridgestone's goals of ensuring that one spent tire or any tire been taken out of use goes on to another valuable purpose such as for "use as material in rubberized asphalt, construction materials, landscaping mulch and as tire-derived fuel for energy" for every tire sold. During FY18, a total of 833 tires (approximately 20,825 lbs.) were collected in Philadelphia for the Bridgestone Tires4ward program.

Terracycle Partnership

In Summer of 2018, PWD also established a partnership with Terracycle, a mission-based company focused on eliminating trash, to recycle rigid plastics collected from PWD's Skimming vessel and cleanup events. Recyclables are collected in 55 in. tall by 35 in. wide "super sacks" that, when full, weigh approximately 150 to 200 lbs. The sacks are picked up by Terracycle or their partners. During FY18, PWD filled seven "super sack" of plastics, in total weighing 574.3 lbs.

Repair, Rehabilitation, and Expansion of Outfall Debris Grills and Grit Cleanings

Debris grills are maintained regularly at sites where the tide introduces large floating debris into the outfall conduit. This debris can become lodged in a tide gate, causing inflow from the receiving water. Additionally, debris grills provide entry restriction and some degree of floatables control.

Standard operating procedures require the inspection of debris during all regulator inspections unless the outfall is submerged at the time of inspection. During FY18, 12 debris grill maintenance cleanings were completed at various outfalls throughout the city.

PWD also regularly monitors the sediment accumulation in the grit trap at the D-25 Chamber, the Central Schuylkill Pumping Station Siphon and in locations downstream to determine appropriate cleaning intervals for the grit trap and downstream interceptor. Driven by the monitoring program, the grit basin is cleaned periodically and debris quantities tracked to further refine the frequency of cleaning necessary to maintain adequate capacity in the sewer. During FY18, 25 tons of grit was removed from the D-25 Chamber and 45 cubic yards was removed from the Central Schuylkill Pumping Station Siphon as reported in Section II.E.1.

The list of the debris grill and grit trap preventative maintenance activities is available on page 24 of **Appendix C – 2018 CSO Maintenance Program Annual Report**.

II.G NMC 7 - Pollution Prevention

II.G.1 Continue to Develop and Share a Variety of Public Information Materials Concerning the CSO LTCP

The Public Outreach and Participation conducted in FY18 for the *Green City, Clean Waters* program has been provided in **Section 6.0 - Public Outreach and Participation** starting on page 25 of **Appendix A – Green City, Clean Waters FY18 Annual Report** and **Section II.G.3 Continue to Provide Annual Information to City Residents about Programs via Traditional PWD Publications** on page 27 of this report.

II.G.2 Continue to Maintain Watershed Management and Source Water Protection Partnership Websites

Phillywatersheds.org

Phillywatersheds.org is an important website which acts as a hub for much of PWD's watershed-based programs and partnership information. The website provides information to the public on issues that are currently problematic for the City's watersheds, what PWD is doing to address these issues, and what residents of Philadelphia can do to help improve watershed health. It also includes educational tools, public meeting materials, maps and reports generated by PWD or partners. According to Google Analytics, the website received more than 85,500 visitors in FY18.

The website features interactive mapping for green stormwater infrastructure projects, traditional infrastructure projects, waterways restoration projects, and community partnership projects. There are also maps for each of the seven major watersheds within Philadelphia. One of the main uses of the mapping system is the Combined Sewer Overflow Public Notification System, known as CSOcast. CSOcast shows CSO outfall overflow information retrieved from PWD's sewer monitoring network. More information on CSOcast is described in further detail in **Section II.H.2** of this report on page 31.

The website also hosts information for various PWD initiatives and programs related to Green Stormwater Infrastructure (GSI). The pages for the Soak It Up GSI Adoption Program, for example, allow Registered Community Organizations (RCO) to check if their organization is eligible to participate, complete the program applications, and schedule training. Additionally, once groups are active in the program they can report issues and log their adoption activities.

In May 2018, PWD incorporated watershed protection projects and program information onto the City of Philadelphia's official website at http://www.phila.gov/water/sustainability/protectingwaterways/. This provides an alternate channel for PWD customers and the public to learn about watershed protection initiatives. The website contains key plans and reports as well as detailed information on watershed partnerships, planning, public communication, and technology-based planning and assessment tools.

Watersheds Blog

The Watersheds Blog covers a wide variety of topics including current programs and events, relevant partner initiatives, and programs that support GSI, the City's waterways, parks and the urban landscape. During FY18, the Watersheds Blog was redesigned and moved to http://water.phila.gov/blog/. The new blog website allows users to obtain information faster and more directly than the previous website. The new blog simplifies customer outreach by using the PWD Twitter handle, PhillyH2O, and streamlines PWD communications by incorporating Department-wide information. In FY18 there were a total of 33 highly-trafficked blog posts.

RiverCast

Philly RiverCast (http://www.phillyrivercast.org) is the first operable web-based recreational warning system in the United States. Using near real-time flow, precipitation, and turbidity data, the RiverCast algorithm translates predicted bacteria levels in the Schuylkill River into one of three ratings, each of which corresponds to suggested guidelines for safe recreation. RiverCast guidelines offer tools for the public to make informed decisions about recreation, and thus helps protect the public against illnesses caused by bacteria. Ultimately, RiverCast will help ensure continued safe recreational use of the Schuylkill River, while promoting public awareness of water quality concerns and indirectly engaging support for source water protection measures. More than 1.1 million users have visited the Philly RiverCast website since it launched in June 2005.

Schuylkill Action Network

The Schuylkill Action Network (SAN) was established as a permanent watershed-wide organization charged with identifying problems, prioritizing projects, and securing funding sources to bring about real water quality improvement in the Schuylkill River watershed. The SAN is organized into a number of focused workgroups. One of the workgroups, the SAN Stormwater workgroup was formed to identify a cost-effective approach to stormwater management through project prioritization and planning. The workgroup is a partnership of representatives from PWD, PADEP, EPA, DRBC, conservation districts, watershed organizations, municipalities, and other groups throughout the Schuylkill River watershed. The SAN website supports the SAN's Stormwater Workgroup by providing project and event information, SAN publications, and public messaging about restoring and protecting the Schuylkill River. The SAN Stormwater Workgroup's ultimate goal is to prevent or maximize reduction of stormwater runoff pollution. During its 15 years of existence, the workgroup has served as an advisory committee for state and local governments, an ordinance review board for municipalities, and a support group for large and small projects throughout the Schuylkill River watershed. During the last year, SAN projects have addressed important pollution sources including agriculture, abandoned mine drainage and stormwater. In FY18, the SAN Stormwater Workgroup has made Schuylkill Watershed-specific storm drain markers to prevent dumping and increase awareness of stormwater drainage. Efforts from SAN partners in the last calendar year are documented in the following table (**Table II.G.2-1**):

Table II.G.2-1: 2018 Schuylkill Action Network Partner Progress

Agriculture	Abandoned Mine Drainage (AMD)	Stormwater
• Implemented 25 Comprehensive Nutrient Management Plans • Constructed 11 manure storage facilities • Completed 14 barnyard repairs or heavy use area construction • Installed 2 stream crossings • Planted 37.4 acres of riparian buffers on agricultural lands • Received a $4,000 Land Transaction Assistance Grant Award for a Conservation Easement on a 74-acre agricultural property in the headwaters of Hay Creek, a tributary to the Schuylkill River	• Received $80,000 Schuylkill River Restoration Fund Grant Award to improve water quality in two tributaries of the Schuylkill River • Continued to improve water quality with maintenance and monitoring at existing treatment system sites • Stocked over 2,000 trout fish eggs in an existing stream and habitat restoration project • Hosted educational tours of AMD treatment systems with interested watershed partners and academic groups • Coordinated a week-long Schuylkill Acts and Impacts outreach program for high school students to foster interest in environmental and watershed-science related careers	• Hosted a Going Green Workshop for businesses to learn stormwater best management practices • Designed storm drain markers for municipalities and community organizations to use throughout the Schuylkill River Watershed to increase awareness of stormwater drainage into waterways • Organized a Schuylkill Street Art Contest for students in Berks, Chester, Montgomery, and Schuylkill Counties for storm drain art sticker installations • Worked with municipalities to provide stormwater education to residents and targeted businesses, which included the installation of stream crossing signage on roads

During its 15 years of existence, the SAN has grown to include nearly 350 organizational and individual partners working together to protect the Schuylkill River watershed. To communicate the accomplishments of the SAN Stormwater workgroup to stakeholders as well as other SAN workgroups, the SAN routinely updates their website, http://www.schuylkillwaters.org, with input from PWD, the SAN Planning Committee and Education and Outreach workgroup. The website was redesigned in February 2018 and includes an internal component that allows for improved communication among SAN workgroup members and facilitates on-the-ground work. The SAN website, together with http://phillywatersheds.org and http://www.phila.gov/water, provide data and reports from the source water assessments for the Schuylkill River.

Delaware Valley Early Warning System

The Delaware Valley Early Warning System (EWS) is an integrated monitoring, notification, and communication system designed to provide advanced warning of surface water contamination events to subscribing water suppliers, industrial surface water users and partner government agencies in the Schuylkill and Lower Delaware River Watersheds. The Delaware Valley EWS covers the entire length of the Schuylkill River as well as the Delaware River from the Delaware Water Gap to just below Wilmington, Delaware.

The EWS monitoring network is comprised of nearly 90 online water quality data stations throughout the watershed. Access to this real-time data allows EWS users to identify changes in water quality associated with both natural and accidental contamination events. The user can also access historical data from these stations with the data query wizard. Real-time and historic flow data are applied to a time of travel model that generates a range of estimated arrival times for each intake in the system. This time of travel model is also incorporated into a spill simulation tool that can be used for planning and training purposes.

When a responding agency reports a water quality event via the EWS website or telephone hotline, the entire user base is notified almost instantaneously via email. In the case of a high-risk event, supplemental phone notifications are placed using CodeRed technology, allowing all users to receive an automated telephone notification in less than three minutes. EWS users can log in to the secure website to view additional event details, spill routing, and predicted arrival times to their intakes. Additionally, a sophisticated tidal modeling component has been developed to better predict and communicate the arrival times of spills on the tidal Delaware River with a user-friendly spill trajectory animation. The EWS received the Governor's Award for Environmental Excellence and is nationally recognized for its use of stakeholder partnerships to meet regional source water protection objectives. In 2016, the EWS was featured as a case study in EPA's publication *Online Source Water Quality Monitoring: For Water Quality Surveillance and Response Systems*.

During FY18, a total of 29 unique water quality events were reported to the EWS. Additional outreach events throughout FY18 expanded the EWS user base, which is currently comprised of more than 300 individual users from 50 organizations.

Other PWD Related Websites and Social Media

PWD Main Web Site

http://www.phila.gov/water

The official website for PWD provides another on-ramp to CSO LTCPU information and uses language suitable for the typical Philadelphia Water Department customer. This information is accessed from pages that explain the impacts of stormwater in the city and region and introduce the key concepts of stormwater management. The pages at http://www.phila.gov/water/wu/stormwater/ received more than 25,000 (25,468) active visitors during FY18. Among these is our Stormwater Grants page with information for non-residential property owners interested in receiving grants to construct stormwater retrofit projects. This page received 5599 visits in FY18.

The stormwater parcel viewer (http://www.phila.gov/water/swmap) continues to be one of the most visited stormwater resources. There were over 150,000 sessions in FY18. This map-based application shows the stormwater charges for every property in Philadelphia and links to helpful documents and forms regarding the stormwater fees. Customers are encouraged to explore and get more information about their stormwater charges and about PWD's Appeals, Credits or Credit Assistance Program (CAP). This information can help property owners reduce the amount of storm water entering the sewer system and lower their stormwater bill.

Development Review Program Website

The Development Review Program website (http://www.PWDPlanReview.org) provides project management tools for Philadelphia developers that trigger stormwater regulations. This includes a streamlined project initiation form and a web-based Philadelphia Stormwater Management Guidance Manual. The updated website was designed to be responsive across multiple devices, allowing for full functionality and optimized display. This site is often consistently one of the most active City websites and served 18,958 users over 36,659 sessions in FY18.

For more information on the activities conducted by the Development Review Program please refer to the MS4 Annual Report **Section F.5 – Monitor and Control Stormwater from Construction Activities** on page 25.

PWD Department on Social Media

Social Media has become an essential tool for disseminating departmental messaging about stormwater management, pollution prevention and programs which improves the City's water resources. Additionally, social media has expanded the reach of partner programming and strengthened PWD's connections with other institutions around the City. The sections below describe the City's social media:

PWD maintains two Facebook pages to keep residents informed on any news and events at or hosted by the Water Department. These pages can be accessed at: http://www.facebook.com/PhillyH2O and http://www.facebook.com/phillywatersheds.

Fairmount Water Works (FWW) also maintains a Facebook page that extends the reach of departmental messaging. The page can be accessed at https://www.facebook.com/28309557520. Between these three Facebook pages, the department reaches over 4,500 followers.

Twitter

Twitter is a valuable communications channel for resolving customer complaints, providing customer information, and delivering news concerning the Department, education and water in general. The PWD twitter is found at https://twitter.com/PhillyH2O The @PhillyH2O account activity is consistent, averaging 60 tweets per month. The @PhillyH2O account now has 8113 followers, up from 6095 in FY17.

PWD Department Videos

PWD hosts videos on Vimeo and YouTube which provide information and news on its programs and vision for Philadelphia. The videos can be accessed at the following links:

- http://www.vimeo.com/phillywatersheds
- http://www.youtube.com/pwdepartment

Between the two platforms, the videos have been viewed over 15,000 times between July 1, 2017 and June 30, 2018. This is up from 13,000 views in FY17. The increase can be attributed to a more robust distribution strategy with partners and across social media platforms.

II.G.3 Continue to Provide Annual Information to City Residents about Programs via Traditional PWD Publications

The Philadelphia Water Department develops numerous publications for the public that are distributed throughout the City at advisory committee meetings, public meetings and other public events, in addition to being distributed through the water\sewer\stormwater bill to PWD customers. The following publications, meetings and events have been shared with and/or involved the public during FY18:

Billstuffers

- Your Bill Will Reflect New Rates – July 2017

  Distributed to explain to customers about the first of a two-phase change to rates spread over a two-year period.
- We have new ways for more customers to get help – August 2017

  Distributed to alert customers about a new, income-based Customer Assistance Program that began on July 1, 2017 to help customers pay their water bill.
- Act Now to Prevent Frozen Pipes – January 2018

  Distributed that provided tips for customers to prevent frozen pipes and steps to take in case their pipes were already frozen.
- Keep your water service flowing! – March 2018

  Distributed to alert customers that the moratorium (or suspension) for water shutoffs ends on April 1, 2018; the different methods of payment, locations of approved WRB payment centers and customer's rights and responsibilities as water customers.
- PWD Customers Can Win $100, Improve Services with Survey – April 2018

  Distributed to get feedback from Philadelphia residents on PWD and the services it provides.
- RainCheck – April 2018

  Distributed that provided customers with information on how to help Philadelphia residents pay for special landscaping tools that improve the environment and beautify their homes and properties.
- Fairmount Water Works–Art in the Open – April 2018

  Distributed to highlight featured artists and their relationships with the Schuylkill River, one of the sources of Philadelphia's drinking water.

Publications

- Community Meeting in One Feltonville – February 2018

  A flyer was created to alert residents in Feltonville about a community meeting to learn and provide input on significant green stormwater improvements coming to their neighborhood.
- A Guide for Customers – February 2018

  A reference booklet was created to provide guidance to customers on how to access PWD programs and services. It was also made available in Spanish.
- 2017 Water Quality Report (published Spring 2018) – May 2018

  Annual consumer confidence report mandated by the federal Safe Drinking Water Act to be published each year to PWD wholesale and retail account customers, and other consumers of the city's water. PWD now makes this report available electronically at http://phillyh2o.info/2017-water-quality.

Fact Sheets

- December, 2017 – Customer Assistance Application Checklist

Media Advisories

- July 24, 2017 – City of Philadelphia Names Children's Hospital of Philadelphia's Buerger Center for Advanced Pediatric Care a Stormwater Pioneer; Award Recognizes Excellence in Stormwater Management and Green Design
- October 10, 2017 – City of Philadelphia Celebrates Community Role in Sustainable Infrastructure Milestone; Mayor Kenny Recognizes Community and Private Partners as City Achieves 1,000 Greened Acres
- November 29, 2017 – Philadelphia's Schuylkill River Trail Water Stations Closed for Winter
- June 26, 2018 – City of Philadelphia Recognizes Private Investment in Clean Water; Green stormwater system created with PWD grant funds soaks up millions of gallons of runofff

Press releases

- July 26, 2017 – Philadelphia Water Department Recognizes Children's Hospital of Philadelphia as Pioneer in Stormwater Management; CHOP designed the Buerger Center for Advanced Pediatric Care to provide an ideal patient experience. Beautiful, green stormwater systems advance that mission and protect local waterways.
- July 28, 2017 – Water Department Receives Affirmation of Existing Bond Ratings and a Stable Outlook Rating Reflects Consistent, Strong Management and Sound Financial Operations
- September 29, 2017 – The Sewer Connection Process in Philadelphia is Changing New Regulations Designed to Reduce Street Cave-Ins and Infrastructure Repairs
- September 18, 2017 – Residents Can Get Preview of Germantown's Greener Future at October Happy Hollow Open House Event with Philadelphia Water Department
- October 12, 2017 – City of Philadelphia Celebrates Community Partners: We Owe You 1,000 (Green) Thank Yous
- March 14, 2018 – Water Department Requests Rate Change to Replace and Maintain Critical, Aging Infrastructure

- April 19, 2018 – Philadelphia Water Department Customers Invited to Speak at Upcoming Rate Change Hearings
- June 29, 2018 – City Partnership with 20 Local Businesses Creates Massive Green Infrastructure System

Events/Campaigns

- Stormwater Pioneers Award Ceremony - CHOP
  July 26, 2017 – Mayor Jim Kenney, PWD Commissioner Debra McCarty and City Councilwoman Jannie Blackwell joined executives from Children's Hospital of Philadelphia (CHOP) for a rooftop ceremony recognizing sustainable design and cutting-edge green stormwater management systems at the Buerger Center for Advanced Pediatric Care.
- Heston Rain Garden Ribbon Cutting and Mural Dedication
  October 12, 2017 – Mayor Kenney, Managing Director Michael DiBerardinis and the US EPA recognized the crucial contributions community groups, nonprofits, businesses and residents are making toward the continued growth of *Green City, Clean Waters*, with a ceremony marking the completion of 1,000 greened acres, a feat that keeps nearly 28 million gallons of polluted runoff out of local rivers and creeks each time the city gets an inch of rain.
- Water Treatment Plant Open House
  April 14, 2018 – PWD held a water treatment plant Open House to provide the public with a tour of how drinking water is treated and information on how to save on their water bill and other programs and services available to the public.
- Wastewater Treatment Plant Open House
  April 21, 2018 – PWD held a wastewater treatment plant Open House to provide the public with a tour of how wastewater is treated and information on how to save on their water bill and other programs and services available to the public.
- Wissinoming Park Ribbon Cutting
  June 8, 2018 – The Philadelphia Water Department partnered with Councilwoman Sanchez, Councilman Bobby Henon, the Fairmount Park Conservancy and the Philadelphia Horticultural Society in the Wissinoming Park Ribbon Cutting contributing two rain gardens as part of the Green City, Clean Waters Program.
- Centennial Commons Ribbon Cutting

  June 13, 2018 – The Philadelphia Water Department, along with Mayor Kenney, Councilwoman Sanchez, Councilwoman Jannie Blackwell, State Representative Vanessa Lowery Brown and other city officials, participated in a ribbon cutting in the Centennial Commons Park Ribbon Cutting contributing rain gardens and an underground stone trench as part of the Green City, Clean Waters Program.
- Waterloo Playground Groundbreaking
  June 18, 2018 – The Philadelphia Water Department partnered with Councilwoman Sanchez, Philadelphia Eagle Connor Barwin, Mural Arts and Waterloo Girl Scouts in the Waterloo Groundbreaking contributing stormwater management features as part of the Green City, Clean Waters Program.
- Sandmeyer Regional Stormwater Facility Ribbon Cutting
  June 28, 2018 – Managing Director Michael DiBerardinis, Councilman Brian O'Neill and other city officials recognized the completion of the Sandmeyer Regional Stormwater System with a

ribbon cutting. Working with a private firm and Water Department staff, 20 Northeast Philadelphia businesses used a $1.6 million stormwater grant to build a green infrastructure installation that reused spent tires and will keep nearly 60 million gallons of polluted runoff from entering the Pennypack Creek watershed annually.

Advertisements

- Paid advertisements were placed in the following newspapers to alert customers of PWDs Notice of Proposed changes in Water, Sewer and Stormwater Rates and Charges
    1. Philadelphia Inquirer and Daily News – March 12, 2018
    2. Legal Intelligencer – March 12, 2018
    3. Philadelphia Tribune – March 13, 2018
    4. Al Dia – March 14, 2018
- March 25, 2018 – Paid advertisements were placed in the Philadelphia Inquirer to inform the public that PWD was offering two Open Houses at one of its water treatment plants and wastewater treatment plants.
- April 3, 2018 – A paid advertisement was placed in the Water Resources Association's Awards Program highlighting the PWD's Rain Check Program.
- Paid advertisements were placed in the following newspapers to alert customers of the Philadelphia Water Rate Board's Public Hearings on PWD's Proposed Rate Change:
    1. Philadelphia Tribune – April 3, 2018
    2. Philadelphia Inquirer and Daily News – April 4, 2018
    3. Legal Intelligencer – April 4, 2018
    4. Al Dia – April 4, 2018
    5. Philadelphia Tribune – April 10, 2018
    6. Philadelphia Inquirer and Daily News – April 11, 2018
    7. Legal Intelligencer – April 11, 2018
    8. Al Dia – April 11, 2018
- Paid advertisements were placed in the following newspapers to alert the public that the 2017 Water Quality Report (published Spring 2018) was available electronically at phillyh2o.info/2017-water-quality
    1. Philadelphia Daily News – June 4, 2018
    2. The Philadelphia Metro – June 4, 2018

II.G.4 Continue to Support the Fairmount Water Works

As detailed in **Table II.G.4-1**, during FY18, more than 23,000 visitors attended the Fairmount Water Works which consisted of general visitors, school groups, community groups, and attendees for special exhibits, visiting authors and lecturers. An additional 3,161 adults and children were reached as part of the center's outreach efforts.

Table II.G.4-1 Fairmount Water Works – FY18 Education Center Attendance

Types of Attendance	Number Attended
General FWW Visitors	11,266
School Groups, Camps and Recreational Center	5,752
Tours	1,390
Special Events	1,760
Outreach Efforts	3,161
FY18 Total Visitors	**23,329**

II.H NMC 8 - Public Notification to Ensure that the Public Receives Adequate Notification of CSO Occurrences and CSO Impacts

PWD has developed and will continue to develop a series of informational brochures and other materials about its CSO discharges and the potential effects these discharges have on the receiving waters. In addition, PWD has enlisted watershed organizations and partnerships to assist in this endeavor to raise the level of citizen awareness about the function of CSO and stormwater outfalls through a variety of educational mediums.

II.H.1 Launch a Proactive Public Notification Program Using Numerous Media Sources

PWD is advancing a proactive public notification program that uses print, internet, outfall signage, and other media to distribute information on the locations of CSOs, information on hazards, and potential public actions.

CSO Outfall Signage

In summer 2007, PWD initiated a pilot project to install 13 signs at CSO outfalls throughout the City. During a follow-up survey in October 2007 it was found that 5 of the 13 signs had been either removed or vandalized. During FY18, a working group continued to analyze the feasibility of installing updated informational signage at the City's CSO outfalls. During FY18, the working group has undergone outfall assessments for both land and boat accessible outfalls, which includes materials and mounting assessments for signage. Currently each CSO outfall location, except for 8 inaccessible locations, has an identification sign installed which helps the public to accurately identify an outfall when reporting a problem.

Other Notification Measures

PWD continues to develop informational materials and maintain websites to educate the public about its CSO discharges and the potential effect on receiving waters. PWD has found that one of the best ways for public notification of CSOs is through the traditional public outreach programs described in NMC7: Pollution Prevention Program, please refer **Section II.G – NMC 7- Pollution Prevention** on page 22.

II.H.2 Expand the Internet-Based Notification System (RiverCast) to the Tidal Section of the Lower Schuylkill River

In order to expand the web-based water quality forecasting system for the Schuylkill River, RiverCast, PWD developed another internet-based notification system called CSOcast in 2008, which reports on the overflow status of outfalls in every CSO shed.

The website is built using the Google Maps API which allows for the dynamic loading of geographically referenced data that can be viewed with a familiar and user-friendly interface. The map is available 24 hours a day and displays the most up-to-date data available. PWD is constantly updating and improving the notification system as well as the flow monitoring network to deliver the best information possible to the public. During FY18, CSOcast reported on the 164 CSO outfalls twice a day, with 2,956 unique page views. The CSOcast notification system can be accessed through: http://www.phillywatersheds.org/what_were_doing/documents_and_data/live_data/csocast.

II.I NMC 9 - Monitoring to Effectively Characterize CSO Impacts and the Efficacy of CSO Controls

II.I.1 Report on the Status and Effectiveness of Each of the NMCs in the Annual CSO Status Report

The CSO Annual Report, combined with the Stormwater Annual Report, will be submitted in September of each year, documenting the previous fiscal year activities.

III Implementation of the LTCP

Table III.B-1: Summary of 1997 CSO LTCP Capital Projects

Project	Status
Real Time Control (RTC) Program	
RTC - Main Relief Sewer Storage (R-7 through R-12)	Complete
RTC - Tacony Creek Park Storage (T-14)	Complete
RTC - Rock Run Relief Sewer Storage (R-15)	Complete
Establish RTC Center	Complete
RTC & Flow Optimization (Southwest Main Gravity Interceptor, Cobbs Creek Cut-Off, and Lower Schuylkill West Side)	Complete
Targeted Infiltration/Inflow Reduction Programs	On-Going
Solids & Floatables Control Program	On-Going
85% CSO Capture Pennypack Watershed (P1 through P5)	Complete
Eliminate Outfalls: Dobson's Run Phase I	Complete
Eliminate Outfalls: Dobson's Run Phase II & III	Complete
Eliminate Main & Shurs Overflow (R-20)	Complete
Eliminate 32nd & Thompson Outfall (R-19)	Complete
Collection System Improvements	
Upgrade Frankford Siphon	Complete

Project	Status
Somerset Interceptor Sewer Conveyance Improvements	Complete
Cobbs Creek Low Level Conveyance Improvements	Complete
Cobbs Creek Low Level Control Project	Complete
Water Pollution Control Plant (WPCP) Wet Weather Treatment Maximization Program	Complete

III.A CSO LTCP Update

The full Philadelphia Combined Sewer Overflow LTCPU report can be found at the following address: http://www.phillywatersheds.org/ltcpu.

Please refer to **Appendix A – Green City, Clean Waters FY18 Annual Report** for an update on implementation progress.

III.B Capital Improvement Projects

Table III.B.1-1 – Status updates for On-going Capital Improvement Projects

Project	Status	Update / Reference
Completion and Operation of the Real-time Control Center and Rehabilitate and Maintain the Monitoring Network	RTC Completed in 2003 Maintain Monitoring Network - Ongoing	For details on FY18 maintenance of monitoring network please refer to page 3 of this report.
WPCP Wet Weather Treatment Maximization (NE)	Evaluated and implemented options from the Jan. 2000 Stress Testing Report	Refer to Section III.B.1.2 WPCP Wet Weather Treatment Maximization (NE) on page 66 of the CSO-Stormwater FY 2012 Annual Report
Evaluate Stress Test Report Options in the LTCPU	Completed March 2009 (all three WPCPs)	Refer to Section III.B.1.2.1 Evaluate Stress Test Report Options in the LTCPU on page 69 of the CSO-Stormwater FY 2012 Annual Report
Implement Options 1, 2, and 4 from the Stress Test Report (NE)	Completed January 2006	Refer to Section III.B.1.3.2 Implement Options 1, 2, and 4 from the Stress Test Report on page 91 in the CSO-Stormwater FY 2010 Annual Report.
Plan, Design, and Construct Options 5 & 7 of the Stress Test Report to Increase the Secondary Plant Capacity to 435 MGD	Completed February and August 2012	Refer to Section III.B.1.2.3 Plan, Design, and Construct Options 2 & 6 from the Stress Test Report on page 70 in the CSO-Stormwater FY 2012 Annual Report.
Explore increasing the preliminary treatment, primary treatment, and final effluent disinfection treatment capacities in excess of the existing secondary treatment capacity at the NE WPCP	A Wet Weather Facility Plan was submitted to PA DEP on June 1, 2016 which supersedes the FCP.	These plans are available on-line through the following website: http://phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan. FY18 progress on the projects specified in the Wet Weather Facility Plan can be found in Appendix A: *Green City, Clean Waters* FY18 Annual Report.
Initiate the Facility Planning and Design for the By-Pass Conduit	PADEP approved on April 1, 2009, the bypass of secondary treatment for 100 MGD of additional wet weather flow at NE WPCP	As described in the LTCPU, PWD committed to the expansion of the NE WPCP to include a 215 million gallon/day secondary treatment bypass. Facility planning and design for the bypass are complete. In FY18, the bypass of the plant secondary processes is currently under construction.
Report to the DEP the Status of these Projects in the Annual Status Reports when Major Work Elements Are Completed	N/A	The Annual Report continues to include information in the WPCP wet weather treatment maximization at the NE WPCP
85% Capture (NE) - 85% Flow Capture Technical Report	Completed August 2008	Refer to Section III.B.1.3 85% Capture (NE) on page 71 of the CSO-Stormwater FY12 Annual Report.

Project	Status	Update / Reference
In-Line System Storage Projects (NE)	N/A	Reported on in Section II.B.5 Operate and Maintain In-line Collection Storage System Projects Contained Within the LTCP of this report, starting on page 5.
Implementation of the Southwest Plant Stress Test Report Option 1	Option 1, to inspect and repair leaking weirs and concrete surfaces in the final sedimentation tanks at the Southwest Plant, was completed in April of 2002	Option 1 and other improvements were also discussed in further detail within the Facility Concept Plan for the Southwest Water Pollution Control Plant that was submitted to the PADEP on June 1, 2013. This plan is available on-line through the following website: http://phillywatersheds.org/doc/SW%20Facility%20Concept%20Plan%20-%20Final_FINAL.pdf. The Wet Weather Facility Plan was submitted on June 1, 2016, which highlights the three wastewater plants and can be viewed on-line at: http://phillywatersheds.org/doc/Wet_Weather_Facility_Plan_website.pdf.
Real Time Control (RTC) and Flow Optimization for the Southwest Drainage (SW) - Implementation of Projects for Real Time Control (RTC) and Flow Optimization for the Southwest Drainage District	Completed April 2010	Refer to Section III.B.1.8 Real Time Control and Flow Optimization for the Southwest Drainage on page 74 of the CSO-Stormwater FY 2012 Annual Report.
RTC/Main Relief Sewer Storage (SW) - Construction and Implementation of Main Relief Sewer Storage and Real-time Control		Refer to Section II.B.5 Main Relief on page 5 of this report
Eliminate CSO/Dobsons Run Project (SW) - Construction and Implementation of the Dobson's Run Project	Phases I completed in 1998; Phases II and III were completed by 2011.	Refer to Section III.B.1.10 Eliminate CSO/Dobsons Run Project on page 95 of the CSO-Stormwater FY 2011 Annual Report
Eliminate CSO/Main and Shurs Off-Line Storage (SW) - Construction and Implementation of the Main and Shurs Off-line Storage Project	Please see subsection below, page 36 for status.	

III.B.1 On-going Capital Improvement Projects

Eliminate CSO/Main and Shurs Off-Line Storage (SW) - Construction and Implementation of the Main and Shurs Off-line Storage Project

The Upper Schuylkill East Side Interceptor Sewer (USES) is located along the Schuylkill River adjacent to the Manayunk Canal in the northwest section of Philadelphia. It conveys sewage from collection systems which serve the northwest section of the City. During extreme wet weather events, the USES exceeded its capacity and overflows occurred at relief point R-20 into a storm sewer upstream of storm water outfall S-052-5. To abate the hydraulic overload conditions in the USES, PWD finished construction of a four-million-gallon offline storage tank in May of 2013, which captures and stores excess flows. The tank would serve to eliminate surcharges and prevent overflow conditions at the R-20 relief location.

The Venice Island Storage Facility is currently in service and operating as designed. In FY2018, the facility took on water for 11 major storms storing a total of approximately 5.16 MG of sanitary wastewater. In FY18 the relief window at R-20 remained at 65 inches. During FY18, there were no overflows at R-20.

Grit accumulation is a known USES issue that reduces interceptor capacity and the effectiveness of the Venice Island storage tank. PWD performs periodic grit surveys of the USES to better understand grit type and accumulation frequency. In FY18, PWD performed two sonar inspections the lower reach of the USES interceptor. CCTV inspections and repairs are ongoing in storm and sanitary sewer sheds with high levels of observed infiltration and inflow. Additionally, real-time control capabilities were implemented at the Venice Island Pump Station, so the station can be controlled from remote locations.

III.B.2 New Capital Improvement Projects to be Included in LTCPU

Table III.B.2-1 – Status updates for New Capital Improvement Projects to be included in LTCPU

Project	Status	Update / Reference
Asset and Capacity Management Program		
Geographic Information System	Ongoing	Refer to Section II.A.1 Implement a Comprehensive Geographic Information System (GIS) of the City sewer system on page 1
Sewer Assessment Program	Ongoing	Refer to Section II.A.2 Implement a Comprehensive Sewer Assessment Program (SAP) on page 1
Monitoring and Modeling Program	Ongoing	Refer to II.B.1 Continue to Institutionalize a Comprehensive Monitoring and Modeling Program on page 2
Inflow/Infiltration (I/I) Controls		
Tide Inflow	Completed in 1999	PWD continues to inspect and maintain all tide gates to ensure their correct performance. Refer to Section 2.1.2 Corrective Actions – Tide Inflow on page 28 of the 2001 CSO Annual Status Report
Sewer Assessment Program		Refer to Section II.A.2 Implement a Comprehensive Sewer Assessment Program (SAP) on page 1 of this report
Infrastructure Assessments	Completed in 2008; PWD continues to monitor and inspect for problem areas	Refer to Section III.B.2.2 Infrastructure Assessments on page 82 of the CSO-Stormwater FY 2008 Annual Report
Interceptor Relining	Planning and design is underway	Additional details on the progress of interceptor relining occurring in the Cobbs Creek and Tookany/Tacony-Frankford Watersheds are discussed in the Appendix A – Green City, Clean Waters FY18 Annual Report on page 7
PC-30 Parallel Relief Sewer	COA stipulations completed on 12/27/11. Operating as designed as of July 2013.	During FY18, there were no overflow events at manhole PC-30.
Sewer Separation		
	Sewer separation was studied and modeled as one of the options in the LTCPU and deemed cost prohibitive. No sewer separation projects have been identified or implemented during the reporting period.	
New Storage Facilities		
	PWD is continuing to investigate opportunities to construct off-line CSO storage facilities to maximize existing sewer treatment capacity and increase the volume of CSO captured and treated. No new storage facility projects have been identified or implemented during the reporting period.	

III.C Watershed-Based Management - Continue to Apply the Watershed Management Planning Process and Produce and Update the Watershed Implementation Plans

Watershed Alliance of Southeastern Pennsylvania

In 2013, PWD and its designated watershed partnership facilitator, the Pennsylvania Environmental Council (PEC), initiated the Watershed Alliance of Southeastern PA to unite the watershed partnerships in the Philadelphia area. In FY18, PEC continued its support of the implementation of the Upstream Philadelphia Cluster. These efforts resulted in the award of $100,000 in National Fish and Wildlife Foundation funding (with another $271,485 in associated matching funds) for stormwater management at the Curtis Arboretum in Cheltenham Township, PA (Tookany/Tacony-Frankford Watershed).

Tookany/Tacony-Frankford Watershed Partnership

In FY18, the TTF Watershed Partnership held 53 outreach events in Philadelphia County with approximately 2,580 participants in attendance. For more information on the activities conducted by TTF Watershed Partnership please refer to Section II.F.4 on page 20.

Darby – Cobbs Watershed Partnership

During the past fiscal year, the Partnership focused on outreach and education, to implement previously identified project opportunities through the William Penn Foundation's Delaware Watershed Protection Initiative. Also during FY18, the partnership continued work on implantation of projects funded through the Delaware River Watershed Initiative. Additionally, PWD utilized the partnership to aid in public outreach and municipal approval for ecological restoration projects along the Cobbs Creek including a partial removal of the Woodland Ave. Dam.

Pennypack Creek Watershed Partnership

The Partnership continues to organize activities to involve the community in improving the watershed. In FY18 the partnership continued education and outreach towards implementing the projects identified under the William Penn Foundation's Delaware Watershed Protection Initiative. The partnership also conducted workshops on rain gardens, citizen stream monitoring, Mowing to Meadows and municipal MS4 compliance.

Poquessing Creek Watershed Partnership

The Poquessing Creek Watershed Partnership holds a range of public education and outreach activities and events every year for residents. The Poquessing Partnership also participates in the Upstream Philadelphia Cluster of the William Penn Watershed Initiative developing programs for citizen monitoring and identification of stormwater projects in the watershed.

Delaware Direct Watershed Partnership

Throughout FY18, the Partnership continued its work acquiring grant funding to support restoration projects throughout the watershed. The Kensington and Tacony Trail, an abandoned riverfront rail line, continued to move forward in FY18 with the expansion of new trail segments. PWD also continued a successful partnership with sustainable retailer United by Blue (UBB). For more information, please refer to **Section II.F.4 United By Blue Cleanups** on page 19.

Wissahickon Creek Watershed Partnership

PWD continued its participation in the Wissahickon Partnership throughout FY18. A key component of these efforts was the continuation of an alternative TMDL program for phosphorous in the watershed. The City of Philadelphia is one of 16 regional municipalities cooperating in this program with assistance from the Pennsylvania Department of Environmental Protection, the Wissahickon Valley Watershed Association and the Pennsylvania Environmental Council (PEC). The Wissahickon Partnership is also actively participating in components of the Delaware River Watershed Initiative, including citizen monitoring as well as project identification and implementation.

Schuylkill River Watershed Partnership (Philadelphia-Based Partnership)

PWD continued to support the efforts of the Schuylkill Action Network (SAN), a regional watershed partnership dedicated to improving the water resources of the Schuylkill River Watershed through strategic implementation of protection measures. More information on the SAN can be found in **Section II.G.2** on page 22 of this Annual Report. Also in FY18, PWD continued to build on the successful partnership with the Schuylkill Navy of Philadelphia. This partnership led to the Head of the Schuylkill Regatta, becoming the first national rowing event to ban the use of plastic water bottles. To support these efforts PWD again donated 12,000 reusable water bottles to athletes participating in the event.

Implementation Planning - Development of Target Approach for Meeting Goals and Objectives

The culmination of the watershed management planning process often results in an Integrated Watershed Management Plan (IWMP), or a watershed-specific planning document. The process for developing watershed planning documents has evolved and depends on the interests of the partnerships. **Table III.C.1-2** contains the status of the various plans in each of Philadelphia's watersheds. Information on the each of the watersheds and the completed plans can be found at www.phillywatersheds.org/your_watershed. Many of the recommended management options in the TTF and Cobbs Creek IWMPs have been institutionalized a city-wide basis and continue to be implemented.

The watersheds in the MS4 section of the City have undergone a slightly different process. In these watersheds (Pennypack, Poquessing, and Wissahickon), the stakeholder goals and objectives were established through the development of Rivers Conservation Plans and Act 167 Plans. PWD has decided to work with the watershed partners through these existing watershed-based planning efforts. Details on the Act 167 Plans can be found in **Section III.C.3.7 Basin-Specific Stormwater Management Plans (ACT 167)** on page 49**.** The Act 167 process has met PWD's goal to have watershed-wide commitment to the watershed planning process, and allows the process to be partner-driven and focus on implementation.

Table III.C.1-2 – Planning by Watershed

Watershed	Preliminary Reconnaissance	Watershed Monitoring Program	River Conservation Plan	Watershed Management Plan	Implementation Commitment Status
Delaware River (tidal, non-tidal)	Monitoring Only		Completed in 2011	PWD continues to work with watershed partners on implementing specific projects.	Philadelphia commitment documented in the LTCPU and its supplements.
Cobbs-Darby Creeks	2003	2003	Darby RCP completed in 2005 by Darby Creek Valley Association	Completed 2004	Philadelphia commitment documented in the LTCPU and its supplements.
Tacony-Frankford Creek	2000/2001	2004	Completed in 2004	Completed 2005	Philadelphia commitment documented in the LTCPU and its supplements.
Pennypack Creek	2002	2007-2008	Completed in 2005	Act 167 Stormwater Management Plan approved in July 2013	Philadelphia is implementing the Act 167 Plan through the Philadelphia Stormwater Management Regulations.
Schuylkill River (tidal, non-tidal)	Monitoring Only		Completed in 2001 by the Academy of Natural Sciences, Natural Lands Trust, and the Conservation Fund	PWD continues to work with watershed partners on implementing specific projects.	Documented in the LTCPU and its supplements.
Poquessing Creek	2001	2008-2009	Completed in 2007	Act 167 Stormwater Management Plan approved August 28, 2013.	Philadelphia is implementing the Act 167 Plan through the Philadelphia Stormwater Management Regulations.
Wissahickon Creek	2001	2005-2006	Completed in 2000 by FPC	Act 167 Stormwater Management Plan approved on July 10, 2015	A Wissahickon TMDL Implementation Plan was submitted in 2012. Implementation plan depends on watershed partnership support for a watershed-wide initiative.

III.C.1 LAND: Wet-Weather Source Control

Watershed management fosters the coordinated implementation of programs to control sources of pollution, reduce polluted runoff, and promote managed growth in the City and surrounding areas, while protecting the region's drinking water supplies, fishing and other recreational activities, and preserving sensitive natural resources such as parks and streams.

PWD is committed to a balanced "land-water-infrastructure" approach to achieve its watershed management and CSO control goals. Where appropriate, this method includes infrastructure-based approaches, but focuses on implementation of a range of land-based stormwater management techniques and physical reconstruction of aquatic habitats where appropriate. The ultimate goal of PWD's approach is to regain the resources in and around streams that have been lost due to urbanization, both within the City of Philadelphia and in the surrounding counties, while achieving regulatory compliance objectives in a cost-effective manner. Central to all of these planning programs is a commitment to greening, sustainability, open space, waterfront revitalization, outdoor recreation, and quality of life.

The wet-weather source controls have been formalized in the LTCPU and its supplements, including the Consent Order and Agreement signed on June 1, 2011, which formally approved the *Green City, Clean Waters* program. Detailed information on the land-based wet-weather source controls can be found in **Appendix A – Green City, Clean Waters FY18 Annual Report.**

III.C.1.1 Ordinance and Regulations Modifications - Continue to review and revise stormwater management regulations for development and redevelopment

PWD's Stormwater Management Regulations became effective in Philadelphia on January 1, 2006, which provided PWD with an opportunity to ensure development/redevelopment that protects our water resources, reduces neighborhood flooding, and improves the quality of life in our communities. The Stormwater Management Regulations are triggered when a project disturbs 15,000 or more square feet of earth. Effective July 1, 2015, the Stormwater Regulations were updated to improve and strengthen PWD's stormwater programs. For more information on PWD's Regulations, please see the MS4 Annual Report **Section F.5.b – Post-Construction Stormwater Management in New Development and Redevelopment** on page 31.

III.C.1.2 Conduct workshops on LID

PWD staff in charge of Stormwater Regulation implementation holds weekly walk-in hours, encouraging the development community to attend to discuss general and technical details regarding their projects. Guidance is provided by PWD staff as it relates to regulatory applicability as well as stormwater management implementation and approach without the need to schedule an appointment.

III.C.1.3 Implementation of Stormwater BMPs and LID - Continue to implement best management and LID demonstration

PWD continues to implement stormwater BMPs and LID, now referred to as Green Stormwater Infrastructure (GSI) through the Green City, Clean Waters program. Please refer to **Appendix A – Green**

City, Clean Waters FY18 Annual Report for a detailed description on the City's implementation of GSI during FY18.

III.C.1.4 Catch Basin Control Program - Continue to maintain the trapped inlets

PWD continues to maintain all City-owned inlets and catch basins to ensure they are clear and operating correctly. For a full description of the activities conducted by inlet cleaning programs during FY18, please refer to **Section II.F.1 Control the Discharge of Solids and Floatables by Cleaning Inlets and Catch Basins** on page 15.

III.C.1.5 Impervious Cover Disconnection - Evaluate the feasibility of separating the stormwater runoff from large impervious land tracts for management and direct discharge

PWD is working to separate stormwater runoff from large impervious tracts of land using incentives and regulatory-based approaches. Projects that apply for PWD's grant programs, Stormwater Management Incentives Program (SMIP) and Greened Acre Retrofit Program (GARP), are evaluated for disconnection potential and encouraged to construct connections to available separate storm sewer or private stormwater outfalls where feasible. To date, PWD has awarded a number of projects where this potential exists, and in the last year, three projects successfully disconnected from the combined sewer system.

III.C.1.6 Reforestation - Work to implement reforestation demonstration projects to provide additional tree canopy

Green Stormwater Infrastructure Projects

Community greening and tree planting is a key component of green stormwater infrastructure and the *Green City, Clean Waters* plan. PWD has been planting trees as part of the GSI projects. Please refer to **Appendix A – Green City, Clean Waters FY18 Annual Report** for information on trees planted as part of GSI projects implemented in the City.

Street Tree Planting

As part of supporting the City's GreenWorks goals, PWD has partnered with PPR to conduct street tree plantings. PPR contracted trees to be planted in the right-of-way in front of properties and on public lands. During FY18, 709 trees were planted through this contract.

TreePhilly Yard Tree Program

TreePhilly is an urban forestry community engagement initiative led by PPR, in partnership with the Fairmount Park Conservancy. TreePhilly directly engages all Philadelphians in improving their communities by planting and maintaining trees. Through TreePhilly's Yard Tree Giveaway program, Philadelphia residents can sign up for free yard trees for their private property (front, back, and side yards). In the FY18 the Yard Tree Giveaway program distributed approximately 2,600 trees, and TreePhilly also engaged corporate and community volunteers to plant 25 large trees at McPherson Square.

Pennsylvania Horticultural Society's Tree Plantings

PWD is an active partner and supporter of *TreeVitalize* and PHS's other tree planting programs. TreeVitalize was developed by the Pennsylvania Department of Conservation and Natural Resources to increase the tree canopy in the five-county Philadelphia area. TreeVitalize partners with numerous community Tree Tenders groups throughout this area in order to plant trees in neighborhoods lacking sufficient tree canopy. During FY18, PHS tree planting events resulted in 1,550 trees planted in Philadelphia.

Table III.C.1.6 -1 Pennsylvania Horticultural Society's FY18 Tree Plantings in Philadelphia

# of Trees	Pennsylvania Horticultural Society's Tree Plantings
566	TreeVitalize Watersheds riparian plantings in Phila (Schuylkill River planting with Phila City Rowing, Schuylkill Center for Env. Education, and Awbury Arboretum)
797	Philadelphia TreeVitalize & Tree Tenders street and yard trees (includes Olney Elementary School, Northeast High School, Lawncrest Rec Center, Andorra Reservoir, Parkway Northwest High School, and the neighborhoods of Hunting Park, East Parkside, and Point Breeze)
87	Philadelphia Public Landscapes (Wissinoming Park, Carrol Park, June 5th Memorial Park, Navy Yard Sports Complex, Delaware River Waterfront)
100	Philadelphia LandCare vacant lands
1,550	**TOTAL TREES (FY18)**

III.C.2 Water Ecosystem Restoration and Aesthetics

III.C.2.1 Waterways Restoration Team - Continue the assignment of a dedicated clean-up team to remove cars, shopping carts, and other debris, from CSO receiving waters

During FY18, the Waterways Restoration Team has continued their program which includes removal of cars, shopping carts, and other debris from receiving waters. Please refer to **Section II.F.2 Continue to Fund and Operate the Waterways Restoration Team** on page 16 for information pertaining to the Waterways Restoration Team's activities during FY18.

III.C.2.2 Waterways Restoration Team - Evaluate the capabilities of this crew in performing minor stream bank and bed repair around outfall pipes and to remove debris at these outfalls

During FY18, the Waterways Restoration Team continued their program, which includes conducting minor stream bank and bed repairs around outfalls and removing debris around them. Please refer to **Section II.F.2 Continue to Fund and Operate the Waterways Restoration Team** on page 16 for information pertaining to the Waterways Restoration Team's activities during FY18.

III.C.2.3 Stream Habitat Restoration - Propose and implement demonstration projects to address habitat degradation by engineering the stream channels to modern day flows and directly reconstructing the aquatic habitat

PWD is currently employing natural stream channel design (NSCD) and associated stormwater management BMPs as a means to improve the health of aquatic communities in receiving waters with degraded flow and habitat alterations due to stormwater runoff.

Cobbs Creek Stream Restoration

This project has been placed on hold due to the property issues encountered along the City border. Cobbs Creek serves as the City border in this area and working out agreements with individual landowners has proved to be an obstacle in moving the project forward.

Tacony Creek Stream Restoration

During FY18, PWD has reviewed the design plan for the restoration of about a mile of Tacony Creek. The design was adjusted to address issues in the stream channel that have evolved during the design process. The new design will provide a more stable stream channel, protect trees along the stream bank, create sustainable aquatic and riparian habitat, provide more wetland area for stormwater management and baseflow recharge, and repair and protect critical water utility infrastructure to ensure better water quality for Tacony Creek.

Indian Creek Stream Daylighting & CSO Storage Project

During FY18, PWD continued to monitor the site. Biological studies of macro-invertebrates and fish species in the Indian Creek daylighted stream channel have been conducted and PWD’s Collectors Unit has provided the flow data for the Combined Sewer Overflow storage facility. PWD will continue to conduct monitoring research on this daylighted project site and enhance the stream corridor when possible.

Wissahickon TMDL Stream Restoration Projects

As part of the Wissahickon Sediment TMDL Implementation Plan, PWD has proposed and implemented multiple stream restoration projects. These projects include:

- Carpenter's Woods (Construction Completed in 2009)
- Cathedral Run (Construction Completed in 2006)
- Cresheim Creek at St. Martins (Construction Completed in 2011)
- Hartwell Lane (Construction Completed in 2009)
- Rex Avenue (Construction Completed in 2010)
- Bells Mill Run (Construction Completed in 2012)
- Wises Mill Run (Construction Completed in 2012)
- Gorgas Run (Construction Completed in June 2018)

During FY18, PWD conducted studies and developed data to display the sustainability of these projects and sediment load reduction to the Wissahickon Creek. Because these projects were completed as part of the Wissahickon Sediment TMDL Implementation Plan, a more detailed description of PWD's efforts have been provided in the **Section D - Wissahickon Sediment TMDL Monitoring plan implementation** on page 1**.** A monitoring report was submitted to PADEP in FY18.

III.C.2.4 Wetland Enhancement and Construction

Three stormwater treatment wetlands facilities were designed and implemented to remove pollutants and mitigate peak flows, while providing aesthetic and ecological benefits. These projects are:

- Saylor's Grove (Construction Completed in 2006)
- Wise's Mill (Construction Completed in 2012)
- Cathedral Run (Construction Completed in 2012)

In total, these three facilities receive and treat stormwater from more than 300 acres of the MS4 service area. Because these projects were completed as part of PWD's Wissahickon Sediment TMDL Implementation Plan, a more detailed description of the Department's efforts has been provided in **Section D - Wissahickon Sediment TMDL Monitoring plan implementation** on page 2. PWD is working to maintain these project sites, and new stormwater and floodplain wetland creation projects are being planned in the coming years that will help satisfy PWD's regulatory requirements and improve the health and habitat of Philadelphia watersheds.

Watershed Mitigation Registry

PWD has continued investigating projects and partnerships that could potentially be suited for the state's mitigation banking program.

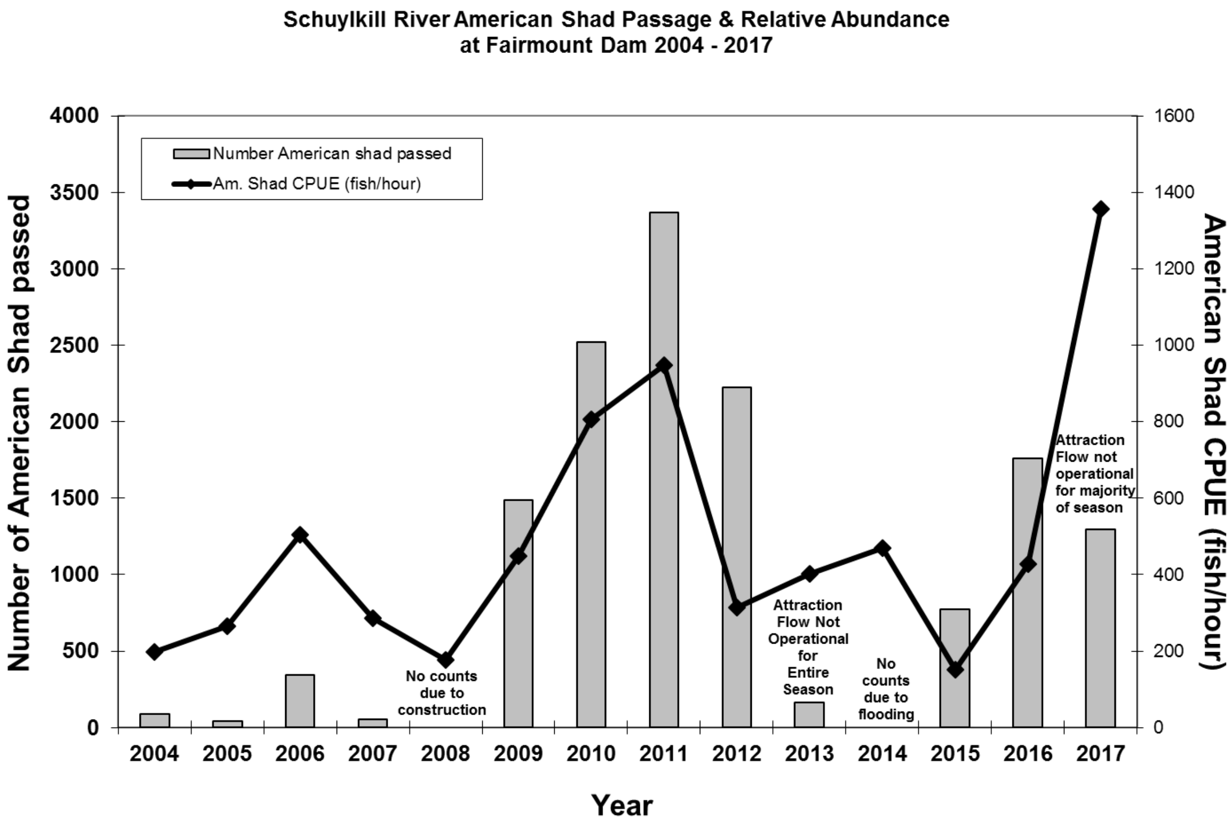
III.C.2.5 Fish Passage Projects

Schuylkill River: Fairmount Fishway

The Fairmount Dam Fishway located on the western side of the Fairmount Dam, was completed in 1979. In 2009, through a joint cooperative agreement with the United States Army Corps of Engineers (USACE), the City of Philadelphia upgraded many features of the fishway to improve hydraulics and overall fish passage efficiency.

Adult American Shad relative abundance (number of Shad per hour of electrofishing) in the Schuylkill River in 2017 was the highest ever recorded in the 16-year time-series (2002-2017), based on standardized daytime boat electrofishing Catch-Per-Unit-Effort (CPUE) sampling. The 2017 CPUE at Fairmount Dam (1355.8 Shad/hour) was more than 3-times greater than the 16-year time series average (2002 – 2017) and more than double the 5-year average and 10-year average (462.4 Shad/hour). Conversely, 2017 American Shad passage at Fairmount Fishway (1297 Shad) decreased from the previous year (1759 Shad in 2016), however passage was still greater than the 14-year time series average (1086.5 shad). The 2017 Shad passage at Fairmount was the 6th highest recorded in the time-series (2004 to 2017). Despite record high relative abundance below Fairmount Dam, passage through the Fairmount Fishway was lower than expected for several reasons. First, an electrical outage for several days near the peak of the shad migration resulted in loss of video monitoring equipment, therefore, we could not count fishes passing through the fishway for almost three days. Second, an instrumentation failure of the water-level sensors for the attraction flow tide gate system resulted in excessive hydraulic jump (water surface elevation drop) at the fishway entrance, which made fish passage nearly impossible during certain tidal stages. Third, PWD missed the first couple weeks of the migration because we could not open the gate due to a mechanical problem with the motor that controls exit gate movement. For the reasons mentioned above, shad passage may have been greater than reported (due to video outage), as well as lower than expected (due to mechanical failure).

Figure III.C.2.5 -1 Catch-Per-Unit-Effort and Fish Passage of American Shad



Pennypack Creek: Rock Ramp Fishway at Sanitary Sewer Crossing

A rock ramp fishway was constructed in Pennypack Creek in 2007 in an attempt to alleviate the excessive drop in water surface elevation caused by the sanitary sewer crossing of the creek which prevented fish from moving upstream of this site. PWD electrofishing surveys of the tidal Pennypack Creek have documented a limited spawning population of anadromous Alewife and Blueback Herring several miles downstream of the rock ramp fishway. Both juvenile and adult Striped Bass have been collected in the tidal portion, but not above the rock ramp. No adult Hickory Shad have been collected above or below the rock ramp; no larvae were stocked 2016 to 2018 by PA Fish and Boat Commission, who had been stocking larvae for several years in an attempt to establish a self-sustaining wild population, which has yet to have been realized.

Dam Removal Projects

Juniata Golf Course Dam Removal

PWD completed the pre-dam removal monitoring of the site in December 2016. A field meeting was held in February 2017 to discuss the staging/storage areas, the limits of disturbance, and stream channel access. The construction access route and staging/storage areas will be revised for the 100% submission. Philadelphia Parks & Recreation (PP&R) conducted a structural inspection of the superstructure of the bridge and had concerns in a few areas. PP&R and PWD will be meeting to discuss the project path for the repairs either through interfund or a separate project before the dam removal. The Joint Permit application was submitted in October 2016.

Woodland Dam Removal

PWD has encountered significant property access barriers that have prevented this project from moving to construction. The Army Corps of Engineers has put this project on hold indefinitely and will pick up an alternative project (Boulevard Dam Removal) in its place.

Boulevard Dam Removal

PWD has developed a design to lower the dam upstream of the Roosevelt Boulevard (Route 1) Stream Crossing to address recurrent flooding of a sewer access trail. This design includes a rock ramp fishway to improve upstream and downstream habitat connectivity. PWD has preliminarily coordinated with the Army Corps of Engineers to fund the project through a cost-sharing program.

III.C.2.6 Riparian Buffer Creation and Enhancement

Environment, Stewardship & Education Division

PWD continues to support Philadelphia Parks and Recreation, which undertakes a broad range of environmental restoration activities throughout the park system. Restoration activities have been ongoing since 2008. These efforts have been discussed in previous years; for more details and a full list of these activities, please refer to Section III.C.2.6 Environment, Stewardship & Education Division on page 121 of the CSO-Stormwater FY 2012 Annual Report.

Riparian Buffer component of Stream Restorations

Riparian buffer enhancement will be evaluated in all stream restorations that are completed. Typically, riparian buffer enhancement activity includes invasive species management, live-stake planting, tree and shrub planting, and native seed mix application. Invasive species management usually begins one to two years prior to construction. Once the construction of the stream restoration project is complete, a landscaping plan is implemented which includes all of the applications mentioned above. Please refer to **Section III.C.2.3 Stream Habitat Restoration** on page 44 and **Section III.C.2.4 Wetland Enhancement and Construction** on page 45 in this report for more information on these topics.

Natural Lands Team

The Natural Lands Team, initiated in 2011, is a group comprised of members from PWD's Ecological Restoration Unit, Waterways Restoration Team, Public Affairs, PWD Design Branch and staff from Philadelphia's Department of Parks and Recreation. Bi-monthly meetings are held to coordinate a wide range of projects that affect the City's stream corridors and natural areas. Through centralizing the myriad of ongoing and upcoming projects, this group works to improve efficiency and communication. Projects include but are not limited to stream restoration, wetland creation, stormwater management, infrastructure protection and invasive species management. During FY18, the Natural Lands Team convened four times to discuss upcoming projects and potential issues that could be addressed by the team members.

III.C.3 Other Watershed Projects

III.C.3.1 River Conservation Plan - Continue to work in partnership with local partners to complete and implement River Conservation Plans (RCPs)

All River Conservation Plans (RCPs) are available for viewing at:
http://www.phillywatersheds.org/your_watershed/ under each respective watershed's key documents.

Table III.C.3-1: River Conservation Plan References

River Conservation Plans	Complete Date	Previous Reference
Darby Creek	2005	Page 121 of the CSO-Stormwater FY 2008 Annual Report.
Tacony-Frankford	2004	Page 74 of the FY 2005 Stormwater Annual Report.
Pennypack	2005	Page 122 of the CSO-Stormwater FY 2008 Annual Report.
Poquessing	2007	Page 155 of the CSO-Stormwater FY 2010 Report.
Delaware Direct	2011	Page 151 of the CSO-Stormwater FY 2011 Annual Report

III.C.3.2 Watershed Information Center - Create a website to serve as a Watershed Information and Technology Center

The City maintains several websites that provide information on our watersheds and activities within them, please refer to **Section II.G.2 Continue to Maintain Watershed Management and Source Water Protection Partnership Websites** on page 22 and **Section II.H.2 Expand the Internet-Based Notification System (River cast) to the Tidal Section of the Lower Schuylkill River** on page 31 for additional information on the websites.

III.C.3.3 Integrated Water Use Status Networks - Pilot a communication and water quality monitoring network that supports the identification and analysis of water quality events

PWD has two communication and water quality monitoring networks. RiverCast supports the identification and analysis of water quality events to support recreational water use status decisions (swimming, triathlons, rowing, etc.) and makes this information available in real time to the public. EWS is used to monitor water quality and notify water utilities about such events as hazardous substance spills or sudden changes in water quality.

Please refer to **Section II.G.2 Continue to Maintain Watershed Management and Source Water Protection Partnership Websites** on page 22 for details about these communication and water quality monitoring systems.

III.C.3.4 Integrated Water Use Status Networks - Evaluate the technical and fiscal needs to expand the network into additional receiving waters where recreational uses are taking place.

Please refer to Section II.H.2 **Expand the Internet-based Notification System (Rivercast) to the Tidal Section of the Lower Schuylkill River** on page 31 for information pertaining to this topic.

III.C.3.5 Interpretive Signage - Continue to implement interpretive signage

Green Stormwater Infrastructure and Restoration Locations Signage

Information on the *Green City, Clean Waters* Signage Program can be found within **Appendix A- Green City, Clean Waters FY18 Annual Report** on page 27.

III.C.3.6 Interpretive Centers - Continue to support existing educational interpretive centers to educate citizens about their community and the water environment

PWD supports several existing educational centers including FWW and many public outreach efforts conducted by partners. Please refer to **Section II.G.3 Continue to Provide Annual Information to City Residents about Programs via Traditional PWD Publications** on page 27 and **Section II.G.4 Continue to Support the Fairmount Water Works** on page 30 for more information on activities done in FY18 by the FWW and partner sponsored events.

III.C.3.7 Basin-Specific Stormwater Management Plans (Act 167) - Continue to support the State Act 167 Storm water Management Planning process and integrate the results of these efforts into the watershed management plans and implementation plans

As of July 10, 2015, all Act 167 plans have been approved. Please refer to **Table III.C.1-2 Planning by Watershed** on page 40 for more information.

III.C.3.8 Sewage Facility Planning - Continue to review sewage facility planning modules and downstream sewage conveyance and treatment facilities to ensure that adequate capacity exists within these systems to accommodate flow

During FY18, PWD reviewed 1,084 “Sewage Facilities Planning Module Application Mailers” for projects requiring building permits within Philadelphia County. During the same period, PWD issued 44 sanitary sewer capacity certifications for projects in tributary municipalities.

III.C.4 Monitoring and Assessment

III.C.4.1 NPDES – Quarterly Special Discharge Monitoring Report

PWD is committed to submitting the Quarterly Special Discharge Monitoring Report (DMR) documenting the Department’s CSO discharges during the specified time periods. This report is due 45 days after the end of each quarter, and is submitted by February 15, May 15, August 15, and November 15 of each year. During FY18, four DMRs were submitted within the 45-day timeframe, these reports are also referred to as Quarterly Combined Sewer Overflow Status Reports.

III.C.4.2 NPDES - Annual CSO Status Report

Monitoring and characterization of CSO impacts from a combined wastewater collection and treatment system are necessary to document existing conditions and to identify water quality benefits achievable by CSO mitigation measures. The tables included in **Appendix D** and other information provided within this annual report represent the average annual CSO overflow statistics for period July 1 2017 – June 30 2018 as required in the NPDES Permit. Please refer to **Table 1 in Appendix D – NPDES – FY18 CSO Status Report** on page 2 for a listing of all CSO permitted outfalls. The tables have been reorganized to present overflows by the specific receiving water into which the CSOs from a given interceptor system discharge. In order to be consistent, the column headings are presented in the same format found in the System Hydraulic Characterization (SHC) and NMC Documentation.

III.C.4.3 Rotating Basin Approach to Watershed Monitoring - Continue to implement a rotating basin approach to watershed monitoring in CSO receiving waters in order to characterize the impact of CSO discharges and other pollutant/pollution sources and the efficacy of CSO controls and watershed restoration practices.

The Rotating Basin Approach has been replaced with a “Comprehensive Watershed Monitoring Program”, a 2010-2016 monitoring strategy developed by PWD to comply with both the City’s stormwater and CSO permit requirements and to assist with the Source Water Protection Program’s objectives.

Please refer MS4 Annual Report **Section F.2.Step 1.b – Preliminary physical, chemical and biological quality assessment** on page 8 for information about Comprehensive Watershed Monitoring Program.

Stormwater Management Program
Annual Report

National Pollutant Discharge Elimination System (NPDES) Permit
No. PA 0054712
Reporting Period July 1, 2017 to June 30, 2018

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TABLE OF CONTENTS

LIST OF TABLES

Section F

LIST OF FIGURES

Part I Permit Conditions

Section A Applicability and Limitation on Coverage

The City will comply with the permit language on what are authorized and unauthorized stormwater discharges.

Section B Legal Authority

In accordance with the National Pollutant Discharge Elimination System (NPDES) regulations contained in 40 C.F.R. Sections 122.26(d)(1)(ii) and (d)(2)(i), the City maintains adequate legal authority to enforce the Stormwater Management Program through the Philadelphia Code (Code) and the Water Department (PWD) Regulations.

Code Section 13-603 regulates discharges into the storm sewer system and includes penalties for violations. Code Section 13-603(4)(a) grants PWD and the Department of Licenses and Inspections (L&I) the authority to require compliance, including issuing regulations, and investigating, inspecting, and monitoring all premises. Under the City's zoning provisions in Code Sections 14-301(10) and 14-704(3), PWD has the authority to regulate stormwater management on a City-wide basis. Code Section 14-306(1) grants PWD and L&I specific enforcement authority for zoning violations. The Code can be accessed at http://www.amlegal.com/library/pa/philadelphia.shtml.

PWD Regulations further provides PWD legal authority to enforce the Stormwater Management Program. Chapter 5 prohibits cross connected sewer laterals and Chapter 6 implements the authority to regulate stormwater management for new and redevelopment in the City. PWD Regulations can be accessed at http://www.phila.gov/water/wu/ratesregulationsresp/Pages/Regulations.aspx.

This Annual Report is submitted to the Pennsylvania Department of Environmental Protection (PADEP) and the US EPA, in accordance with requirements of the City of Philadelphia's NPDES Stormwater Management Permit No. PA 0054712. The report documents the Fiscal Year 2018 (FY18) progress completed in order to comply with the requirements during the reporting period from July 1, 2017 to June 30, 2018.

Section D Sediment Total Maximum Daily Load (TMDL) for Wissahickon Creek

Wissahickon Sediment TMDL Monitoring Plan Implementation

PWD's commitment to meeting the Wissahickon Sediment TMDL was initiated in 2005 through detailed monitoring and assessment of the Wissahickon Creek Watershed. The goal of PWD's implementation is to reduce the amount of sediment reaching the Wissahickon Creek using a multi-faceted approach. In addition to continuing street sweeping and implementing and strengthening stormwater management regulations, the PWD has implemented three stormwater wetland facilities and seven stream restoration and stabilization projects. In November 2013, PWD completed the Sediment TMDL Baseline Monitoring Report that was based on the TMDL Monitoring Plan. This report was submitted with the FY 2014 CSO-MS4 Annual Report. The baseline monitoring report documents the data collected following the implementation of the stormwater wetland facilities and stream restoration projects. This information will be used to measure sediment reductions as a result of the implemented projects. The initial phase of this effort included baseline monitoring to measure the effectiveness of the stream restoration and stormwater treatment wetland facilities projects in meeting the targeted sediment reductions and hydraulic and hydrologic (H&H) modeling and topographic survey monitoring to confirm sediment reduction estimates presented in PWD's Implementation Plan.

During FY18, PWD continued analyzing the data collected over a four-year period (2012-2016) for the seven stream restoration sites and three constructed stormwater wetlands. PWD submitted a Wissahickon Sediment TMDL Monitoring Status Report to DEP in March 2018. The report includes surveyed cross-section overlays, photomonitoring, in-stream structure evaluation, and wetland hydraulic and hydrologic modeling.

Section E Pollutant Minimization Plan for Polychlorinated Biphenyls in the City's MS4

During the eleventh year of the PCB PMP, the following tasks were accomplished:

- 81 of the 337 remaining sites listed by EPA or other agencies as housing PCB containing devices were inspected.
- Wet-weather PCB sampling and analysis of the three WPCPs' effluent was performed as required by the WPCP NPDES permits.
- PWD continued monitoring outlying township connections using EPA Method 680.
- PWD Continued monitoring of groundwater discharged from new construction and remediation sites to ensure compliance with PWD's published PCB limit of "non-detection by EPA Method 608". PWD issued 12 groundwater discharge permits in calendar year 2017. Every permit was compliant with PWD's published PCB limit of "non-detection by EPA Method 608."
- PWD wet and dry weather WPCP effluent data have been entered into the DRBC PCB database.
- Significant reductions in WPCP effluent PCB loadings were seen over the course of the PMP

Additionally, the following initiatives were undertaken:

- PWD's PCB database was developed in 2017 and is now being populated. The database was utilized to track and report the 2017 inspections.
- Each location has been given a unique ID and has been geocoded in PWD's GIS database. Maps of PCB sites inspected in 2017 were created to show inspections by water pollution control plant drainage area
- Generation of interactive GIS maps which could assist in identifying areas of concern and planning any additional efforts to identify potential sources.

Section F Stormwater Management

F.1. Source Identification

A description of PWD's MS4 Infrastructure, including; stormwater outfalls, lengths of sanitary sewer, and lengths of stormwater sewer within Philadelphia are shown in **Table 1-1**. The 205 "Non-PWD Owned" outfalls listed in the table are owned by other City agencies, private entities, or individuals. The PWD-owned stormwater outfall locations and MS4 areas are shown in **Figure F.1-1**.

Table F.1-1: Description of MS4 Infrastructure

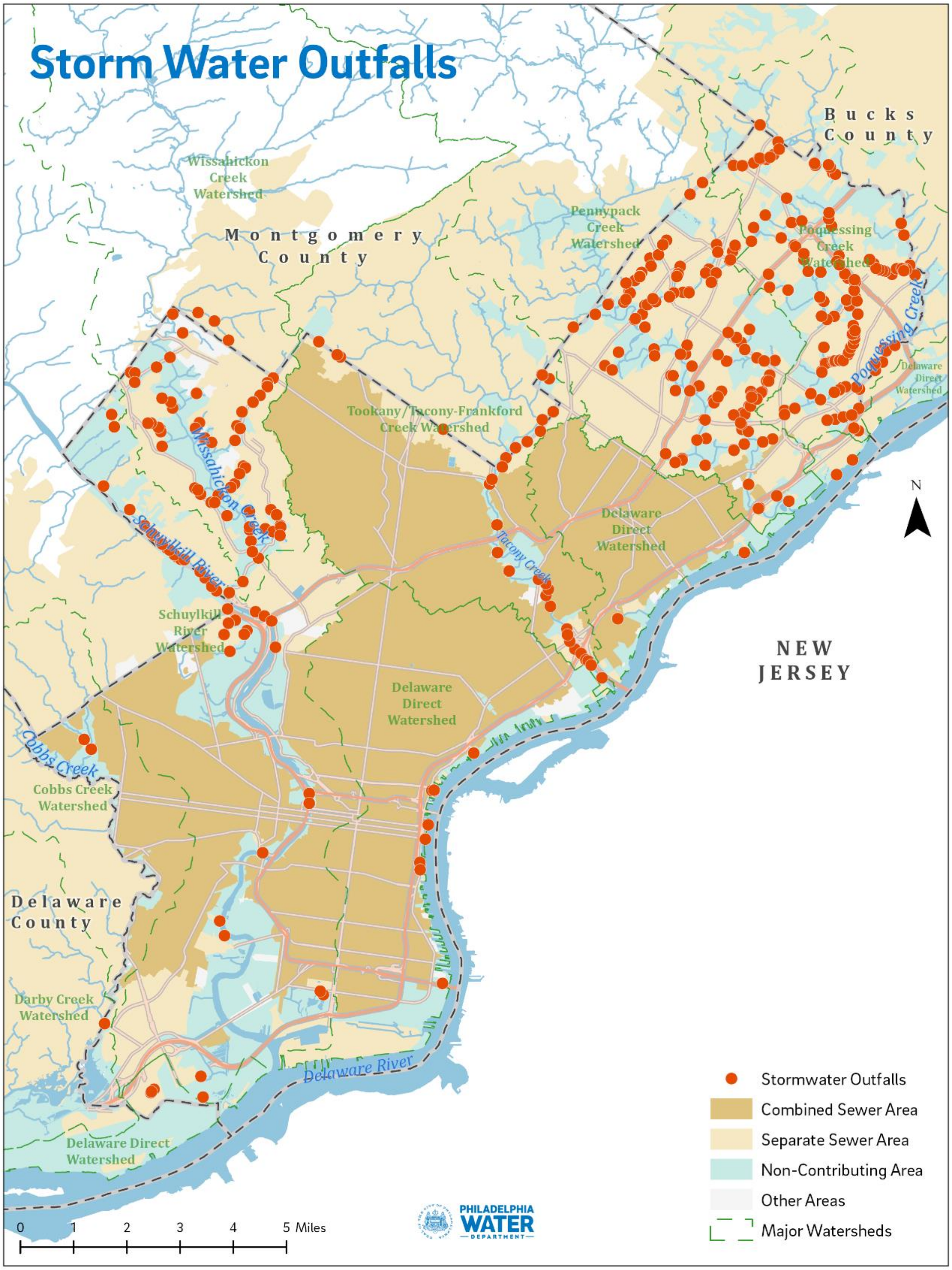
Watershed	Drainage Area (Square Miles)	Miles of Pipe			MS4 Outfalls Count	
		Stormwater	Sanitary	Total MS4	PWD Owned	Non-PWD Owned
Darby-Cobbs	-	1.02	0.81	1.82	3	-
Delaware Direct	3.15	79.81	52.68	132.49	18	122
Pennypack	11.67	234.93	234.03	468.96	130	14
Poquessing	8	154.71	156.52	311.23	141	19
Schuylkill	8.48	153.43	156.82	310.26	45	47
Tacony	2.47	54.46	59.02	113.48	34	1
Wissahickon	5.79	95.18	104.86	200.03	63	2
Total	**39.56**	**773.53**	**764.74**	**1538.27**	**434**	**205**

GIS Data Layers have been submitted within a geodatabase, **PWD_Annual_Report_GIS_Data_2018.mdb** which can be found on the **Supplemental CD.** The GIS Data Feature class filenames within the geodatabase are provided in **Table F.1-2.**

Table F.1-2: GIS Data Feature Classes within Geodatabase named - PWD_Annual_Report_GIS_Data_2018.mdb

• All_PWD_Monitoring_FY18	• PCB_Locations_Known_Historical
• GSI_Monitored_Locations_FY18	• NPDES_Permitted_Dischargers_FY18
• Public_GSI_Projects_Completed_FY18	• Detention_Basins_Philadelphia
• Public_GSI_Projects_Planned_FY18	• Impervious_Surfaces_Planimetric_2004
• Pollution_Migration_Events_FY18	• Major_Watersheds_Full_Extent
• Active_Construction_Sites_FY18	• Major_Watersheds_Philadelphia_Clip
• Verified_Regulations_FY18	• Sewersheds_FY18
• Verified_Retrofits_FY18	• Census_Blocks_2010_Philadelphia
• New_Project_Submissions_FY18	• Stormwater_Outfalls
• Technical_Approvals_FY18	• Stormwater_Outfalls_with_DrainageArea_Summary
• Sanitary_Infiltration_Events_FY18	• Stormwatersheds_Pennypack
• Hydrology_Centerline	• Stormwatersheds_Poquessing
• Hydrology_Polygon	• Stormwatersheds_Wissahickon
• Land_Use_PCPC_2018Land_Use_PCPC_2018	• Point_Sources_Wissahickon
• PCB_Locations_Known_Historical	• Scrap_Yard_Inspections_FY18

Figure F.1-1 City of Philadelphia Stormwater Outfalls



Descriptions of the GIS layers referenced in **Table F.1-2** are provided below:

All_PWD_Monitoring_FY18

This layer presents the locations of PWD's chemical, fish, macroinvertebrate, and algae sampling sites. The contents of this feature class are discussed in **Section F.2.Step.1.b** on page 8.

GSI_Monitored_Locations_FY18

This layer presents the locations of existing green stormwater infrastructure projects actively monitored by PWD in Philadelphia County.

Public_GSI_Projects_Completed_FY18

This layer presents the locations of completed publicly implemented green stormwater infrastructure projects sorted by their current status within Philadelphia County.

Public_GSI_Projects_Planned_FY18

This layer presents the locations of planned publicly implemented green stormwater infrastructure projects sorted by their status within Philadelphia County.

Pollution_Migration_Events_FY18

This layer presents the locations of spills documented by PWD Industrial Waste Unit within Philadelphia in FY17. The contents of this layer are discussed in **Section F.7.a – Pollutant Migration/Infiltration to the MS4 System** on page 34.

Active_Construction_Sites_FY18

This layer presents the locations of active construction private development projects within Philadelphia in FY17. The contents of this layer are discussed in **Section F.5 – Monitor and Control Stormwater from Construction Activities** on page 25.

Verified_Regulations_FY18

This layer presents the locations of constructed and verified private development projects subjected to stormwater regulations within Philadelphia in FY17. The contents of this layer are discussed in **Section F.5 – Monitor and Control Stormwater from Construction Activities** on page 25.

Verified_Retrofits_FY18

This layer presents the locations of constructed and verified private retrofit development projects subjected to stormwater regulations within Philadelphia in FY17. The contents of this layer are discussed in **Section F.5 – Monitor and Control Stormwater from Construction Activities** on page 25.

New_Project_Submissions_FY18

This layer presents the locations of new project submissions for conceptual stormwater plan review in FY17. The contents of this layer are discussed in **Section F.5.b – Post-Construction Stormwater Management in New Development and Redevelopment** on page 30.

Technical_Approvals_FY18
This layer presents the locations of projects issued technical approvals by PWD in FY17. The contents of this layer are discussed in **Section F.5.b – Post-Construction Stormwater Management in New Development and Redevelopment** on page 30.

Sanitary_Infiltration_Events_FY18
This layer presents the locations of Sewage Pollution Incidents documented by PWD within Philadelphia in FY17. The contents of this layer are discussed in **Section F.8.g – Sanitary Infiltration Controls** on page 39.

Hydrology_Centerline
This layer presents the surrounding watershed hydrology in a polyline based feature class.

Hydrology_Polygon
This layer presents the surrounding watershed hydrology in a polygon based feature class.

Land_Use_PCPC_2018
This layer presents Philadelphia land use as ascribed to individual parcel boundaries or units of land. Land use is the type of activity occurring on the land such as residential, commercial or industrial. Each unit of land is assigned to one of nine major classifications of land use (2-digit codes) and where possible more narrowly defined into one of 70 sub-classifications (3-digit codes).

PCB_Locations_Known_Historical
This layer presents the location of all known and historical PCB locations within Philadelphia. The contents of this layer are discussed in **Section E – Pollutant Minimalization Plan for Polychlorinated Biphenyls in the City's MS4** on page 2.

NPDES_Permitted_Dischargers_FY18
This layer presents the location within Philadelphia of all NPDES Industrial Stormwater permitted Discharger. The contents of this layer are discussed in **Section F.2.Step 1.c** on page 15 and a list of permitted facilities can be found in **Appendix K – NPDES Industrial Stormwater Permitted Sites – Philadelphia County.**

Detention_Basins_Philadelphia
This layer presents the location of all stormwater detention basins within Philadelphia County.

Impervious_Surfaces_Planimetric_2004
This layer presents percent imperviousness and the amount of impervious area in Philadelphia County.

Major_Watersheds_Full_Extent
This layer presents the delineation of the Philadelphia County and surrounding counties' watershed boundaries including Darby-Cobbs, Delaware-Direct, Pennypack, Poquessing, Schuylkill, Tacony-Frankford, and Wissahickon watersheds.

Major_Watersheds_Philadelphia_Clip

This layer presents the delineation of the Philadelphia County's watershed boundaries including Darby-Cobbs, Delaware-Direct, Pennypack, Poquessing, Schuylkill, Tacony-Frankford, and Wissahickon watersheds.

Sewersheds_FY18

This layer presents the boundaries of the MS4, combined sewer, un-sewered, non-contributing, and stormwater only areas within Philadelphia County and the neighboring contributing areas.

Census_Blocks_2010_Philadelphia

This layer presents the results of the 2010 Census in Philadelphia County on a block level.

Stormwater_Outfalls

This layer presents locations of all permitted stormwater outfalls within Philadelphia County and the neighboring contributing areas.

Stormwater_Outfalls_with_DrainageArea_Summary

This layer presents locations of all permitted stormwater outfalls within Philadelphia County and the neighboring contributing areas. Drainage area analysis values are appended in the attribute table to display outfall metrics including total drainage area, total impervious drainage area, percent impervious, and runoff coefficient.

Stormwatersheds_Pennypack

This layer presents the stormwater drainage areas to receiving waterways and stormwater outfalls within the Pennypack Watershed.

Stormwatersheds_Poquessing

This layer presents the stormwater drainage areas to receiving waterways and stormwater outfalls within the Poquessing Watershed.

Stormwatersheds_Wissahickon

This layer presents the stormwater drainage areas to receiving waterways and stormwater outfalls within the Wissahickon Watershed.

Point_Sources_Wissahickon

This layer presents permitted Point source locations within the Wissahickon Watershed.

Scrap_Yard_Inspections_FY18

This layer presents locations of scrap yards inspected during the fiscal year.

GIS Stormwater Data Conversion Geodatabase Layers

The City has previously submitted additional GIS data layers that will not be included this year. These layers include outfalls, manholes, inlets, and various pipe as listed in **TABLE F.1-3**. The reason for their removal is the City's policy to not release these data layers to the general public due to concerns over redistribution and security. These data layers would be made available for viewing by the Department, should it be necessary.

Table F.1-3 GIS Data Feature Classes within Geodatabase named -StormwaterDataConversion.mdb

DataConv_GISAD_stBasin	DataConv_GISAD_stInletPipe
DataConv_GISAD_stBoring	DataConv_GISAD_stMeterChamber
DataConv_GISAD_stCasin	DataConv_GISAD_stOffsetAccess
DataConv_GISAD_stChamber	DataConv_GISAD_stOpenChannel
DataConv_GISAD_stCulvert	DataConv_GISAD_StormNetwork_Junctions
DataConv_GISAD_stDisconnectedInlet	DataConv_GISAD_stOutfall
DataConv_GISAD_stFitting	DataConv_GISAD_stPointFeature
DataConv_GISAD_stFlare	DataConv_GISAD_stPump
DataConv_GISAD_stForceMain	DataConv_GISAD_stRainGauges
DataConv_GISAD_stGravityMain	DataConv_GISAD_stStructure
DataConv_GISAD_stHostPipe	DataConv_GISAD_stTunnel
DataConv_GISAD_stManhole	DataConv_GISAD_stVentPipe
DataConv_GISAD_stManholeOther	DataConv_GISAD_stVirtualLink
DataConv_GISAD_stInlet	DataConv_GISAD_stVirtualNo

F.2. Discharge Management, Characterization, and Watershed-based Assessment and Management Program

Step 1. Preliminary Reconnaissance: Permit Issuance through end of Year 2

a. Land use and resource mapping

PWD has conducted extensive mapping of information relevant to stormwater management planning. Previously discussed in **Section F.1 – Source Identification** of this document on page 3, the GIS files include MS4 outfalls and contributing drainage areas, land use, population, monitoring locations, and other relevant layers. The maps and supporting GIS layers are included in the **Supplemental CD.**

b. Preliminary physical, chemical, and biological quality assessment

Comprehensive Watershed Monitoring Program

Comprehensive assessment of our waterways is integral to planning for the long-term health and sustainability of our water systems. By measuring all factors that contribute to supporting fishable, swimmable, and drinkable water uses, appropriate management strategies can be developed for each watershed land area that Philadelphia shares.

PWD has carried out extensive sampling and monitoring programs to characterize conditions in seven local watersheds**,** both within the county boundaries and outside counties/municipalities. From 1999 to 2018, PWD has implemented a comprehensive watershed assessment strategy, integrating biological, chemical and physical assessments to provide both quantitative and qualitative information regarding the aquatic integrity of the Philadelphia regional watersheds. This information is published in

Comprehensive Characterization Reports (CCRs) and used to plan improvements to watersheds in the Southeast Region of Pennsylvania.

Monitoring Timeline Strategy

Prior to the creation of PWD's Comprehensive Watershed Monitoring Program, baseline assessments were conducted in all of the Philadelphia regional watersheds to assess the degree, location and type of impairments occurring within each system. Baseline assessments, encompassing benthic, fish, habitat and discrete water quality monitoring, were routinely completed on a watershed within one year. With the addition of continuous and wet-weather water quality monitoring, periphyton assessments, and specialized physical assessment programs (e.g., FGM assessments), CCRs were typically accomplished on a two-year timeline.

PWD conducted benthic macroinvertebrate and physical habitat monitoring activities in the Pennypack Creek Watershed tributaries in spring and summer 2017. This data will be processed and analyzed with results presented in an Integrated Watershed Management Plan indicator status update. Assessments targeting sites in the Poquessing Creek Watershed were completed in spring of 2018 (**Table F.2-1**).

As described in PWD's Comprehensive Watershed Monitoring Program: Proposed Strategy 2010-2015, the scale of watershed stressors is so expansive and the BMP program is still in its introductory phase that full implementation is limited but will increase once the program is established. Therefore, PWD is focusing its monitoring efforts at maintaining a "sentinel" monitoring presence in each of the City's watersheds rather than dedicating monitoring efforts to individual watersheds. This regional monitoring approach has been greatly enhanced through a partnership with USGS. Continuous water quality data are collected from 11 USGS gaging stations, and quarterly baseflow water samples are analyzed for microbial and nutrient parameters of concern. PWD also continues to assess performance of stormwater BMP projects as they are constructed.

Table F.2-1 Overview of PWD Proposed Watershed Monitoring Activities 2010-2018

Watershed/Geographic Area	Activity	Period
PWD/USGS Gages	Continuous Water Quality Monitoring	2010-2017
PWD/USGS Gages	Quarterly Water Quality Grab Samples	2010-2017
Philadelphia Area Watersheds	Stormwater BMP Monitoring	2010-2017
Philadelphia Area Watersheds	Stream Restoration Project Monitoring	2010-2017
Cobbs Creek Watershed	Watershed-wide Comprehensive Assessment	2012-2013
Tookany-Tacony/Frankford Watershed	Watershed-wide Comprehensive Assessment	2013-2014
Wissahickon Creek Watershed	Tributary Assessment	2014-2015
Wissahickon Creek Watershed	Watershed-wide Comprehensive Assessment	2015-2016
Pennypack Creek Watershed	Tributary Assessment	2016-2017
Poquessing Creek Watershed	Watershed-wide Comprehensive Assessment	2018

Monitoring Timeline 2010-2018

Allowing 10 years before re-assessment will potentially allow for a greater number of projects to be implemented. It allows PWD to focus monitoring efforts on evaluating the performance of stormwater BMPs and restoration projects, as well as the tidal Schuylkill and Delaware rivers (which have not been assessed), as well as smaller wadeable streams. As described in the *Comprehensive Watershed*

Monitoring Program: Proposed Strategy 2010-2015, PWD's current proposed strategy for watershed assessments also includes a less intense, but ongoing monitoring effort within each watershed, primarily through a partnership with the USGS. It should be noted that although the monitoring plan nominally covers 2010-2015, the assessments of the Wissahickon, Pennypack and Poquessing watersheds are continuations of that plan and are thus included here.

The proposed strategy for watershed assessments 2010-2018 includes resuming watershed-scale bioassessment activities at several stations within targeted watersheds. (**Table F.2-2 Proposed Watershed Monitoring Timeline 2008-2018**). These watershed scale reassessments should complement the "adaptive management" approach favored by the IWMP implementation process and allow for the locations and methods of assessment to be changed, depending on the number of projects implemented and their spatial distribution within the watershed. It is hoped that these data will be useful as a long-term record of water quality changes in the region, more appropriate for assessing the goals of a City-wide distributed green infrastructure program than an approach that focuses on individual watersheds.

Table F.2-2 Proposed Watershed Monitoring Timeline 2010-2018

Watershed	BMP Monitoring	Quarterly WQ Grab sampling	Continuous WQ Monitoring	Annual WQ Summary	Bioassessment	Bioassessment Data Analysis
Cobbs	2010-2018	2010-2018	2010-2018	2010-2018	2012	2012-2013
Tacony-Frankford	2010-2018	2010-2018	2010-2018	2010-2018	2013	2013-2014
Wissahickon	2010-2018	2010-2018	2010-2018	2010-2018	2014-2016	2014-2016
Pennypack	2010-2018	2010-2018	2010-2018	2010-2018	2016-2018	2016-2018
Poquessing	2010-2018	2010-2018	2010-2018	2010-2018	2018	2018-2019

Water Quality Sampling and Monitoring

Guiding Principles of Urban Water Chemistry Assessment

PWD's water quality assessment strategy has been designed to facilitate separate analyses of dry weather (i.e., baseflow) and wet weather water quality conditions. This program has evolved over time, as personnel and technological improvements have improved our abilities to collect more data from an increasing number of sampling locations in a more efficient manner. Automated sampling, in particular, has greatly increased the temporal resolution of stormwater sampling at multiple sampling locations for a single storm event.

In order to comply with the State-regulated stormwater permit obligations, PWD worked with USGS to record continuous water quality data at 10 gage stations in the Philadelphia region from July 2017 through November 2017 and March 2018 through June 2018. The sampling and monitoring sites are presented in **Appendix F – Monitoring Locations.** Four types of sampling were performed as discussed below. Parameters were chosen based on state water quality criteria, or because they are known or suspected to be important in urban watersheds.

Discrete Water Chemistry Assessment

To characterize conditions throughout the Philadelphia region and build a long-term record of water quality, PWD initiated a quarterly baseflow water quality sampling program at ten USGS gage stations. Each USGS/PWD cooperative monitoring gage site was sampled once during a few hours, to allow for travel time and sample processing/preservation. Samples are collected during dry weather and parameters were chosen based on the conclusions from baseline sampling that indicated dry weather problems are primarily related to bacteria and nutrients. Results of samples collected to date are presented in **Appendix G – PWD Quarterly Dry Weather Water Quality Monitoring Program**. Previous annual reports describe PWD's extensive surface water grab sampling efforts dating back to 2002.

Grab samples were also collected from seven locations in the Delaware Estuary by boat in July, September and October 2017. Samples are collected at low tide to ensure that water samples adequately represent spatial variability in water quality that may be present. PWD has collected 49 samples from the Delaware River by boat since 2011. Results from quarterly dry weather grab sampling thus far are generally similar to data collected during the CCR data collection periods. For this reason, PWD will re-evaluate whether additional water quality sampling is needed to characterize water quality in targeted watersheds on a case-by-case basis.

Continuous Water Quality Assessment

In order to characterize conditions throughout the Philadelphia region and build a long-term record of water quality, PWD initiated a continuous water quality monitoring program at ten USGS gage stations. Each USGS/PWD cooperative monitoring gage site records water quality data for dissolved oxygen, temperature, flow, pH, and specific conductance. Selected locations are also instrumented for turbidity, precipitation and photosynthetically active radiation (PAR). These data are made available to the public in near real-time on the internet at http://pa.water.usgs.gov/pwd/. The monitoring results from FY 2018 are presented in **Appendix H – PWD-USGS Cooperative Water Quality Monitoring Program Annual Summary**.

In addition to continuously monitoring water quality at USGS gaging stations, PWD continued deployments of *in situ* self-contained data logging continuous water quality monitoring sondes (YSI Inc. Model EXO2) in the tidal Schuylkill River and Frankford Creek from June-November of 2017. Tidal sondes were deployed again in June 2018, with the intention of collecting data through November 2018.

Long-term continuous monitoring for TMDL compliance and building a long-term water quality data record for the aforementioned watersheds will be accomplished in 2010-2018 through a partnership with the USGS. Results from city-wide continuous monitoring thus far are generally similar to data collected during the CCR data collection periods. For this reason, PWD will re-evaluate whether additional water quality sampling is needed to characterize water quality in targeted watersheds on a case-by-case basis. Continuous water quality instruments will also be utilized in evaluating the performance of certain stormwater BMPs and assessing conditions in tidal portions of the Schuylkill and Delaware Rivers as well as Frankford Creek.

Groundwater Monitoring

A City-wide groundwater level monitoring network will provide long-term monthly data documenting current water levels and trends in groundwater elevations throughout the City, helping to track the impacts of widespread implementation of stormwater management practices (SMPs) and global climate change. Data from the groundwater monitoring network will also be used to calibrate a Philadelphia groundwater model and update the USGS groundwater contour map of Philadelphia (Paulachok 1984).

PWD and USGS identified existing wells that would be suitable for the network and obtained permission for site access. Once wells were identified and accessible, well condition and suitability for inclusion in the monitoring network were investigated by continuous water level monitoring and remote video camera inspection when accessible. Wells that met acceptance criteria were added to the monitoring network. After examining readily available information about existing wells, PWD elected to drill additional wells to provide better spatial distribution of wells in the monitoring network. The current status of the groundwater monitoring network and a summary of data collected through June 30, 2018 are presented in **Appendix I – PWD/USGS Groundwater Monitoring Program**.

Biological Monitoring

The biological monitoring protocols employed by PWD are based on methods developed by the US EPA (Barbour *et al*. 1999) and the PADEP. These procedures are as follows:

- Rapid Bioassessment Protocol III (Benthic Macroinvertebrate Sampling)
- Rapid Bioassessment Protocol V (Fish Sampling)
- Periphyton Assessment (Algae Monitoring)

Macroinvertebrate Assessments

As described in the PWD *Comprehensive Watershed Monitoring Program: Proposed Monitoring Strategy 2010-2015*, PWD's approach is intended to be a compromise, recognizing not only the benefits of collecting data from randomly selected sites but also the importance of maintaining a monitoring effort at consistent locations over time. This plan is based on a similar monitoring program that USGS has implemented in Chester County (Reif 2002, Reif 2004). The plan reflects the manpower constraints of collecting and processing samples with the PADEP ICE protocol. It is hoped that this approach will achieve some of the benefits of a randomized approach, while providing periodic re-evaluation of our watersheds required to inform the watershed planning process and comply with environmental mandates. Targeted watershed assessments resumed in the Wissahickon Creek Watershed mainstem in spring 2015. See **Table F.2-3** for benthic invertebrate monitoring timeline. .

Table F.2-3: Benthic Invertebrate Monitoring Timeline 2010-2018

Period	Monitoring Activity (number of samples*)
2010	Stream Restoration Monitoring (3)
2011	USGS gage samples (9); Randomly selected sites (16)
2012	Cobbs Creek (6**); USGS gage samples (9); Random (10)
2013	Tookany/Tacony Creek (10**) USGS gage samples (9); Random (6)
2014	Wissahickon Creek Tributaries*** (15); USGS gage samples (9); Random (1)
2015	Wissahickon Creek (10**); USGS gage samples (8); Random (4)
2016	Pennypack Creek Tributaries (11**); USGS gage samples (9); Random (5)
2017	Pennypack Creek (12**); USGS gage samples (9); Random (4)
2018	Poquessing Creek (12**); USGS gage samples (9); Random (4)

* Number of samples estimated, actual number of samples may vary

** Number of monitoring sites excludes USGS gage sites in target watershed

*** See section 7 for more information on Wissahickon Creek tributary samples

During March 2017, PWD conducted Rapid Bioassessment Protocols (RBP III) at 24 (n=25) locations within Philadelphia area watersheds. Sampling was conducted at eight USGS gages in the PWD/USGS Cooperative Monitoring program, twelve mainstem sites in the Pennypack Creek Watershed, and four randomly selected sites. These data are presented in **Appendix J – PWD Wadeable Streams Benthic Macroinvertebrate and Physical Habitat Assessments**. In spring 2018, PWD sampled nine USGS gages, twelve sites in the Poquessing Creek Watershed, and four randomly chosen sites.

Fish Assessments

Fish were not assessed in 2017 or 2018 due to a shortage of resources and staffing (**Table F.2-4 Proposed Fish Monitoring Timeline 2010-2018**). All surveys were conducted using electrofishing gear as described in EPA RBP V (Barbour, et al. 1999). Results of these fish assessments will be presented in Integrated Watershed Management Plan Indicator Status Updates.

Table F.2-4: Proposed Fish Monitoring Timeline 2010-2018

Period	Monitoring Activity (number of samples*)
2012	Cobbs Creek Watershed Assessment (4)
2013	Tookany/Tacony Creek Watershed Assessment (8)
2015	Wissahickon Creek Watershed Assessment (10)
2016	Fish not assessed; tributaries targeted in 2016.
2017	Fish not assessed
2018	Fish not assessed

* Number of samples estimated, actual number of samples may vary

Algae Assessments

Algal biomass and nutrient ratio data may be used to provide information for the parameterization of water quality models. From 2011-2014 and resuming in 2016, PWD collected monthly (when feasible) phytoplankton samples from three monitoring locations on the Delaware River. Grab samples are taken at sites DR8190 (Commodore Barry Bridge), DR10016 (Ben Franklin Bridge), and DR11011 (Baxter Water Treatment Plant Intake). From 2012-2014, PWD collected phytoplankton samples from monitoring location SC470 (Navy Yard) on the Schuylkill River. Samples were delivered to the Patrick Center of the

Academy of Natural Sciences of Philadelphia, phycology section, for taxonomic identification of diatoms and soft algae, as well as the determination of intracellular nutrient (C, N, P) concentrations. In spring 2016, PWD began a pilot effort to collect continuous chlorophyll-a data at three USGS stations along the Delaware River: 01467200 (Ben Franklin Bridge), 014670261 (Delaware River near Pennypack Woods), and 01463500 (Trenton).

Physical Monitoring

Physical Habitat Assessments

Habitat assessments are conducted along with benthic macroinvertebrate monitoring and thus the habitat assessment strategy is described under the heading **Biological Monitoring – Macroinvertebrate Assessments,** above**.** PWD assesses stream physical habitat condition using PADEP Instream Comprehensive Evaluation (ICE) protocols. During 2017, PWD conducted physical habitat assessments at twenty-four locations within Philadelphia area watersheds. Sampling was conducted at eight USGS gages in the PWD/USGS Cooperative Monitoring program, twelve mainstem sites in the targeted Pennypack Creek Watershed, and four randomly selected sites. These data are presented in **Appendix J – PWD Wadeable Streams Benthic Macroinvertebrate and Physical Habitat Assessments**. In spring 2018, PWD sampled nine USGS gages, twelve sites in the Poquessing Creek Watershed, and four randomly chosen sites.

Habitat Suitability Index (HSI)

In addition to habitat assessments, Habitat Suitability Index (HSI) models, developed by the U.S. Fish and Wildlife Service (USFWS), have been incorporated into the monitoring program. Based on empirical data and supported by years of research and comprehensive review of scientific literature, these models present numerical relationships between various habitat parameters and biological resources, particularly gamefish species and species of special environmental concern. To date, HSI have applied to Darby-Cobbs, Tookany/Tacony-Frankford, Wissahickon, and Pennypack Creek Watersheds. The Poquessing Creek Watershed CCR approach attempted to simplify the application of fish habitat suitability analysis to generalized guilds.

Fluvial Geomorphologic (FGM) / Infrastructure Analysis

Fluvial Geomorphologic (FGM) studies establish the physical attributes of the stream, identify areas of concern, and provide recommendations for rehabilitation of the stream corridors and floodplains. To date, FGM analysis has been conducted on the Darby-Cobbs, Tookany/Tacony-Frankford, Wissahickon, Pennypack, and Poquessing Creeks. Analysis was conducted in order to characterize channel morphology, disturbance, stability, and habitat parameters as well as to provide a template for hydrologic and hydraulic modeling and serve as a baseline for assessing channel bank and bed changes. Data provided from the FGM analyses will also serve to develop reach rankings within each watershed to prioritize restoration strategies.

During FY18, PWD completed infrastructure protection and stream restoration projects at the Wissahickon Creek 2nd Dam, Neill Drive tributary to the Schuylkill River, Green Tree Run, and conducted gully stabilization at St Martins Bridge. Construction of the Gorgas Run Stream Restoration project was completed. PWD staff continued to monitor the effectiveness of several projects, with a specific emphasis on calculating the reduction of sediment to Wissahickon Creek.

Summary of Monitoring Locations

Biological, physical and chemical monitoring locations are based on 3 criteria: 1) appropriate habitat heterogeneity; 2) access availability; and 3) proximity to USGS stream gaging stations and PADEP 305b monitoring sites. In general, the number of monitoring sites is proportional to the size of the drainage and the watershed's link magnitude (*i.e.*, number of 1st order streams). Maps of assessment sites by watershed and program (biological, chemical, or physical), which are also available as GIS data, are presented in **Appendix F – Monitoring Locations**.

Quality Assurance/Quality Control (QA/QC) and Data Evaluation

PWD has planned and carried out an extensive sampling and monitoring program to characterize conditions in Philadelphia's watersheds. Sampling and monitoring follow the Standard Operating Protocols (SOPs) and Quality Manual as maintained by PWD's Bureau of Laboratory Services (BLS). These documents cover the elements of quality assurance, including field and laboratory procedures, chain of custody, holding times, collection of blanks and duplicates, and health and safety.

They are intended to help the program achieve a level of quality assurance and control that is acceptable to regulatory agencies. More information regarding Standard Operating Procedures (SOPs) for chemical and biological assessments is available from BLS.

c. Inventory of Point and Non-Point sources

At the end of FY18, there are 120 NPDES permitted dischargers in Philadelphia County, as shown in **Appendix K – NPDES Industrial Stormwater Permitted Sites – Philadelphia County**. This listing was downloaded from the PADEP Environment Facility Compliance Tracking System (eFACTS). The eFACTS website can be accessed through the following link:
http://www.ahs.dep.pa.gov/eFACTSWeb/default.aspx.

PWD is also actively involved in developing estimates of non-point source pollutants. The results of this analysis are described in the hydrologic models in **Section G - Assessment of Controls** on page 42.

d. Preliminary problem assessment

CCRs were completed for the Wissahickon (2007), Pennypack (2009) and the Poquessing (2010) Creek Watersheds. These reports include analysis of data collected over the monitoring period and present a characterization of problems within the watershed. The reports for each watershed are available to the public through the internet at the following address:
http://www.phillywatersheds.org/what_were_doing/documents_and_data/watershed_plans_reports.

Step 2. Watershed Plan Development: Permit issuance through end of Year 5

For information on the status of the Act 167 plans, please refer to the CSO Annual Report **Table III.C.1-2 - Planning by Watershed** on page 40 for more information.

Step 3. Watershed Plan Implementation and Performance Monitoring: Permit issuance through expiration

a. Dry Weather Water Quality and Aesthetics

Operate the Defective Lateral Program

Over the last fiscal year, PWD has continued to successfully operate its Defective Lateral Program. A detailed discussion of this program is provided within this report in **Section F.3 - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal** on page 21.

Debris removal from waterways impacted by storm water discharges

PWD continues to employ the Waterways Restoration Team (WRT) to remove debris and conduct small scale stream restoration projects within the City's waterways. Please refer the CSO Annual Report **Section II.F – NMC 6 - Control of Solid and Floatable Materials in CSOs** on page 15 for information about debris removal from waterways impacted by storm water discharges.

Lincoln Drive sewer relining

PWD completed the Lincoln Drive sewer relining in 2004. Additional information on this project was reported in previous reports; please refer to Section F.2.3.a.iii on page 261 of the FY 2010 CSO-Stormwater Annual Report.

Stormwater Outfall Dry Weather Inspections

The City maintains a stormwater outfall inspection program in compliance with the MS4 permit. All 434 of the City's permitted stormwater outfalls are scheduled to be inspected by Industrial Waste and Backflow Compliance (IWBC) at least once each permit cycle. Those with dry weather flow are sampled for fecal coliform and fluoride analysis. The results of these samples are reported on a quarterly basis and summarized in this annual report. Those outfalls identified as Priority outfalls under the MS4 permit are inspected quarterly. During FY18, PWD conducted 158 outfall inspections and 94 samples were taken due to observed dry weather flow. Of those inspections, 41 occurred at priority outfalls.

The full details of program accomplishments for FY18 can be found in **Appendix L – Defective Lateral Connection Group FY18 Report**.

Defective Lateral Program - Priority Outfalls

7th & Cheltenham Avenue Outfall (T-088-01)

As of June 30, 2018, DCG program activities have performed 2,831 complete tests in this sewershed, identifying 134 cross-connections, all of which have been abated.

The locations of dry weather diversion devices, and the number of inspections, blockages, and discharges found by the Flow Control unit during FY18 are listed below.

Table F.2-5: 7th & Cheltenham Ave – Diversion Devices – FY18 Summary

Location	ID #	Inspections	Blockages	Discharges
Plymouth St. west of Pittsville St.	CFD-01	53	2	0
Pittsville St. south of Plymouth St.	CFD-02	55	2	0
Elston St. east of Bouvier St.	CFD-03	48	1	0
Ashley St. west of Bouvier St.	CFD-04	32	1	0
Cheltenham Ave. east of 19th St.	CFD-05	36	1	0
Verbena St. south of Cheltenham Ave.	CFD-06	36	0	0
Cheltenham Ave. east of 7th St.	CFD-07	92	3	2
7th St. south of Cheltenham Ave.	CFD-08	93	4	0

Inspections and fecal coliform sampling at this outfall continues quarterly. Results for the outfall samples during FY18 are listed below.

Table F.2-6: 7th & Cheltenham Ave – Fecal Coliform Results – FY18 Summary

Date	Fecal Count (MPN per 100 ml)
07/12/2017	> 2419.6
10/05/2017	> 2419.6
03/06/2018	5475
05/02/2018	97

Monastery Avenue Outfall (W-060-01

*)*As of June 30, 2018, DCG program activities have performed 611 complete tests in this sewershed, identifying 16 cross-connections, all of which have been abated.

The locations of dry weather diversion devices and the number of inspections, blockages, and discharges found by the Flow Control unit during FY18 are listed below.

Table F.2-7: Monastery Ave – Diversion Devices - FY18 Summary

Location	ID#	Inspections	Blockages	Discharges
Jannette St. west of Monastery Ave.	MFD-01	28	1	0
Green La. North of Lawnton St.	MFD-02	27	0	0

Inspections and fecal coliform sampling at this outfall continues quarterly. Results for the outfall samples during FY18 are listed below.

Table F.2-8: Monastery Ave – Fecal Coliform Results – FY18 Summary

Date	Fecal Count (MPN per 100 ml)
07/17/2017	1553.1
10/03/2017	78.9
03/01/2018	318
05/02/2018	10

Monoshone Creek Outfalls (W-068-05)

Additional areas of focus: W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04

As of June 30, 2018, DCG program activities have performed 2,748 complete tests in these sewershed areas, identifying 94 cross-connections, all of which have been abated. The majority of the efforts have been in the W-068-05 sewershed area which is by far the largest in terms of drainage area and properties served.

Inspections and fecal coliform sampling at the W-068-05 outfall continues quarterly. Results for the outfall samples during FY18 are listed below.

Table F.2-9: Monoshone Creek (W-068-05 Outfall) – Fecal Coliform Results – FY18 Summary

Date	Fecal Count (MPN per 100 ml)
07/17/2017	>2419.6
10/03/2017	>2419.6
2/28/2018	9804
05/01/2018	17329

Sandyford Run Outfall (P-090-02)

As of June 30, 2018, DCG program activities have performed 5,832 complete tests in this sewershed, identifying 87 cross-connections, all of which have been abated.

A diversion valve was installed on 4/2/1998 and eliminated all dry weather flow from this outfall. The location of the dry weather diversion device and the number of inspections, blockages, and discharges found by the Flow Control unit during FY18 are listed below. Samples were taken at diversion device locations.

Table F.2-10: Sandyford Run – Diversion Device - FY18 Summary

Location	ID#	Inspections	Blockages	Discharges
Brous and Lexington Aves.	PFD-01	98	1	0

Table F.2-11: Sandyford Run – Diversion Device - Fecal Coliform Results – FY18 Summary

Date	Fecal Count (MPN per 100 ml)
07/21/2017	108.1
10/05/2017	NF*
3/1/2018	110
05/01/2018	41

Note: * NF indicates that no flow was observed

Defective Lateral Program - Other Important Outfalls

Outfalls are prioritized for investigative work by the Defective Connections Group (DCG) using the Stormwater Outfall Priority Score list.

Franklin and Hasbrook Outfall (T-089-04)

As of June 30, 2018, DCG program activities have performed 1,017 complete tests in this sewershed, identifying 46 cross-connections, all of which have been abated.

The location of the dry weather diversion device and the number of inspections, blockages, and discharges found by the Flow Control unit during FY18 are listed below.

Table F.2-12: Franklin and Hasbrook - Diversion Device - FY18 Summary

Location	ID#	Inspections	Blockages	Discharges
Franklin and Hasbrook	CFD-01	111	7	7

Please refer to **Section F.3 - Detection, Investigation, and Abatement of Illicit Connections and Improper Disposal** on page 21 for additional information on activities conducted for the Defective Lateral Program.

Manayunk Canal Outfalls (S-059-04)

Additional areas of focus: S-051-06, S-058-01, S-059-01 through S-059-11

As of June 30, 2018, DLC program activities have performed 2,479 complete tests in these sewershed areas, identifying 62 cross-connections, all of which have been abated. The majority of the efforts have been in the S-059-04 sewershed area.

Inspections and fecal coliform sampling at the following outfalls continues quarterly. Results for the outfall samples during FY18 are listed below.

Table F.2-13: Manayunk Canal - Fecal Coliform Results – FY18 Summary

Outfall	Fecal Count (MPN per 100 mL)			
	07/11/2017	*10/02/2017*	*1/16/2018*	*04/19/2018*
S-058-01	> 2419.6	15531.1	648.8	428
S-059-01	> 2419.6	> 2419.6 (10/04/2017)	15531	155310
S-059-02	> 2419.6	> 2419.6	> 2419.6	68670
S-059-03	1986.3	344.8	32.7	1956
S-059-04	1732.9	> 2419.6	5794	> 241960
S-059-05	1413.6	547.5	1732.9	9208
S-059-09	NF*	NF*	NF*	NF*

Note: * NF indicates that no flow was observed

Priority Outfall Closure Testing

Investigation will continue within each particular outfall area (sewershed) until the Priority outfall status may be closed. During FY18, none of the Priority outfalls were authorized to be removed from the list by DEP.

Healthy Living Resources

Develop integrated storm water management plans

PWD develops integrated stormwater management plans for all of the City's watersheds. Please refer to the CSO Annual Report in **Section III.C.3.7 - Basin-Specific Stormwater Management Plans (ACT 167)** on page 49 for a detailed explanation of the City's watersheds stormwater management plans.

Assess the benefits of implementing a Natural Stream Channel Design (NSCD) and effectiveness of the NSCD restoration approach

PWD has conducted several projects that have been designed with Natural Stream Channel Design concepts in mind. As each of PWD's NSCD projects are constructed, PWD realizes the importance of the extensive monitoring and O&M that accompanies such projects. Each project provides the opportunity to learn about what techniques do and do not work in their respective hydrologic and hydraulic regimes. In order to assess the effectiveness of these NSCD projects, PWD conducts post implementation monitoring at each site that includes the measurement of relevant biological, habitat, and physical parameters to be used in comparison to pre-construction conditions.

Wet Weather Water Quality and Quantity

Implement several BMP projects

PWD and its partners have implemented many BMP projects throughout the City including GSI, stream restoration, and wetland creation projects. For a complete listing of both completed and current GSI projects, please refer to the **Appendix A - Green City, Clean Waters FY18 Annual report.** For a description of activities conducted for PWD's stream restoration, and wetland creation projects, please refer to the CSO Annual Report **Sections III.C.2.3 Stream Habitat Restoration** on page 44 and **III.C.2.4 Wetland Enhancement and Construction** starting on page 45.

Monitor three demonstration BMPs

PWD is currently monitoring multiple stormwater BMP project types; for example, stormwater tree trenches, stormwater planters, and porous pavement to continue to develop and improve monitoring protocols. Monitoring activities for PWD's green stormwater infrastructure projects during FY18 are documented within **Appendix A: Green City, Clean Waters FY18 Annual Report Section-Appendix 4: GSI Monitoring Status Report.**

PWD is committed to ensuring stormwater BMPs owned and operated by the City are maintained. This commitment is often evaluated through monitoring of these sites. PWD has detailed activities conducted during FY18 for PWD's stream restoration, and wetland creation; please refer to the CSO Annual Report **Sections III.C.2.3 Stream Habitat Restoration** on page 44 and **III.C.2.4 Wetland Enhancement and Construction** starting on page 45.

F.3 Detection, Investigation, and Abatement of Illicit Connection and Improper Disposal

a. Prevention of Illicit Discharges

Sewer and Lateral Inspections

The City requires plumbing permits for connections to the municipal sewer system. The permit affords the property owner an inspection of the plumbing work performed. Corrections of defective connections are confirmed to ensure that the ultimate discharge to the receiving waters does not contain sanitary waste. Philadelphia Water reviewed 1852 new sewer and storm connections during FY18. This numbers includes all connections (storm, sanitary and /or combined sewers). A single project or permit may also have one connection or multiple connections.

b. Investigation of Illicit Discharge Sources

Rank the MS4 outfalls according to their priority for corrective actions

PWD maintains a stormwater outfall monitoring system in compliance with the MS4 permit issued by the PADEP. Samples are collected for outfalls that have dry weather flow and analyzed for fecal coliform and fluoride. Priority outfalls have been established through the 1998 Stormwater Consent Order and Agreement and internally, additional areas of focus have been added to maintain progress in the screening, testing and abating program and for efficient crew deployment. Priority Outfalls are sampled on a quarterly basis. Refer to page 17 of this report for FY18 priority outfall summaries.

Investigate dry weather flow to identify sewer lateral defects

During FY18, the DCG performed 1,968 complete dye tests with 136 defective connections found and 59 abatements completed. Details of FY18 activities are listed below.

Table F.3-1: Defective Connections Program - FY18 Summary

Quarter	CY2017-Q3	CY2017-Q4	CY2018-Q1	CY2018-Q2	Total
Date Coverage	Jul17-Sep17	Oct17-Dec17	Jan18-Mar18	Apr18-Jun18	**FY2018**
Completed Tests	601	496	497	374	1968
No Cross Connections	589	465	426	352	1832
Cross Connection Identified	12	31	71	22	136
Abatements *	9	16	10	24	59

Note: *Some cross connections abated may have been identified in prior fiscal years

Reports of potential dry weather discharge from the stormwater system are also investigated, primarily through the Industrial Waste and/or Sewer Maintenance units. During FY18, 20 incidents were investigated. For details, refer to **Appendix N – FY18 Sanitary Infiltration Events.**

The DCG Field Investigation SOP was updated in March 2017. A copy is available upon request.

d. Abatements

Written notice about sewer lateral defects

The Plumbing Repair Programs unit handles customer communications (through letters, telephone or site visits) and is responsible for the abatement of the defects identified.

Abatements of Cross Connections

63 abatements were completed during FY18. Details of abatement types and costs are listed below.

Table F.3-2 Defective Connection Abatement – 5 Year Summary

Fiscal Year	# Cross Connections Abated		Total Cost of Abatements
	Residential	Commercial	
2014	47	11	$ 442,113.77
2015	39	4	$ 357,289.12
2016	32	7	$ 247,514.90
2017	31	5	$ 317,851.00
2018	56	7	$ 562,747.33
Total	205	34	$ 1,927,516.12

Residential Properties Cross Connections Abatement

During FY18, 58 residential abatements were completed at a cost of $ 544,947.33.

Commercial and Industrial Properties Cross Connections Abatement

During FY18, 7 commercial abatements were completed at a cost of $ 17,800.00.

Defective Connections Abatement Schedule

All defective connections are required to be abated within 120 days of discovery, in compliance with the MS4 permit.

Defective Connections Abatement Confirmation Tests

All abatements completed during FY18 were tested to confirm that the abatement was completed properly.

e. Defective Connection Program Reporting

Illicit connection program quarterly report

Defective Lateral Quarterly Reports are submitted four times a year to PADEP as part of the reporting requirements of the City of Philadelphia NPDES Storm Water Management Permit No. PA 0054712. The report covers three-month periods starting in January, April, July, and October which are submitted no later than 45 days from the end of the reporting period. The Quarterly reports were submitted as required during FY18, and **Appendix P – Defective Lateral Quarterly Reports FY18** contains all of these reports.

Illicit connection program quarterly report contents

The report content within the illicit connection program quarterly reports has not changed in FY18.

F.4 Monitor and Control Pollutants from Industrial Sources

a. Applications/Permits

The City obtains NPDES permits/discharge information from industries if they contribute significant amounts of stormwater into the City's sewer system. Industries that contribute stormwater directly into a waterway or discharge non-industrial waste into the system usually coordinate directly with the PADEP. A list of NPDES permits that involve stormwater associated with industrial activities in the City were obtained from the Department's website and are listed in **Appendix K – NPDES Industrial Stormwater Permitted Sites**.

b. Inspections

Industrial inspections

The Philadelphia Local Emergency Planning Committee (PLEPC) is the entity tasked with meeting the responsibilities of SARA Title III. Under PLEPC, the Philadelphia Fire Department (PFD) Hazmat Administrative Unit (HMAU) representative is the individual that carries out the inspections. HMAU personnel inspect SARA facilities to ensure that information submitted in their Tier II report is accurate. The inspection includes a visual on-site inspection, verifying the facility has a Preparedness, Prevention, and Contingency (PPC) plan and reviewing any other information contained within the Tier II report. A total of 431 facilities submitted Tier II status reports. As of August 2018, 56 inspections have been performed in calendar year 2018. This effort varies each year depending on staffing and the number of SARA Tier II reports that are submitted.

As part of the 2017 Environmental Protection Agency's Administrative Order for Compliance on Consent, PWD and PFD worked together to establish a Memorandum of Understanding(MOU) that commits the departments to conduct stormwater inspections on Tier II facilities. PWD and PFD inspectors developed a stormwater inspection form to be used during these inspections. Since the MOU was signed in February 2018, stormwater inspections have been conducted at seven Tier II facilities.

Industrial waste inspection forms

The Industrial Waste Inspection Form was updated in 2006 to include a stormwater inspection section. A copy of the form can be found in previous reports; please refer to Appendix O of the CSO-Stormwater FY09 Annual Report**.**

c. Monitoring/Enforcement

Industrial DMR submission

When necessary, the City shall request DMRs or additional sampling from the Department for surrounding industries to ensure compliance with NPDES effluent limitations.

NPDES permits enforcement

Should PWD personnel observe a violation of NPDES permit terms and conditions, PWD will report the violation immediately and notify the interested and downstream parties, including PADEP, on a case by case basis.

F.5 Monitor and Control Stormwater from Construction Activities

Stormwater runoff is a concern both during construction and post-construction. Integrated in the City's development review process, PWD is provided the authority to review and regulate the runoff from earth disturbance activities to improve water quality. Additionally, post-construction stormwater management plan review extends beyond peak rate control and encompasses water quality and water quantity technical requirements for more frequent storm events. Efforts continue to be focused on improving plan review for both Erosion & Sedimentation (E&S) as well as post-construction stormwater management. The following discussion documents the progress made so far in terms of stormwater runoff from construction activities including the collaboration between the Philadelphia development community, multiple City Departments, and State agencies.

During FY18, PWD performed numerous tasks in direct compliance with the NPDES Permit as well as tasks supporting continuance and improvement of a growing stormwater management program and watershed program. Some of the FY18 activities include the following:

- Continued coordination efforts with Philadelphia Licenses and Inspections (L&I) regarding permit review and issuance for private development projects applicable to the Stormwater Regulations. At a minimum, the L&I issuance of a Zoning, Demolition, Foundation, and Building permit was coordinated appropriately between the two agencies. In addition, L&I supported PWD in enforcement measures through the issuance of Stop Work Orders and withholding Certificate of Occupancy permits for sites that are non-compliant.
- Continued coordination with the PA DEP Southeast Regional Office Waterways and Wetlands program through regular project communication and quarterly meetings with PA DEP and southeast region conservation district staff. The purpose of the quarterly meetings is to discuss regional and district updates, permitting services and projects, and other various topics. PWD also participated in applicant project meetings with DEP staff to discuss upcoming projects and active projects.
- Scheduled and held coordination meetings with local universities and other large landowners to discuss upcoming or current development projects as well as identify ways to strengthen communication and streamline the review process.
- Continued to implement E&S compliance as an element of all active construction inspections by ensuring appropriate controls are in place throughout construction activity. Potential E&S issues or violations are documented as part of an inspection report provided to the on-site representative. The reports identify the required corrective actions, and active construction inspectors will return to the site to verify compliance. E&S violations may trigger active construction enforcement actions such as a Stop Work Order, requiring continued coordination through L&I.
- Continued to update plan review website content, in an effort to provide clear and accessible resources to the applicant to support quality submittals and efficient reviews.

- Continued to review projects applying for Philadelphia's Green Roof Density Bonus, which was incorporated into the Zoning Code in 2015. This bonus offers exceptions to certain residential density rules for development projects that include a green roof. The green roof must meet PWD's requirements and be approved by PWD before the bonus can be awarded. In FY18, PWD approved 12 projects as eligible to apply for this bonus.
- Continued to attend bi-monthly Business Industry Association (BIA) meetings for the Government Affairs/Fix It Philly subcommittee. In these meetings, representatives from the development community including developers, architects, and engineers come together with City agency representatives from Water, L&I, Planning, and Streets to discuss policy and legislation impacting development in Philadelphia to ensure a transparent and efficient development process.
- Continued to hold Development Services Committee (DSC) meetings with representatives from the development community including developers, designers, large land owners, and attorneys to discuss ideas for improving the PWD stormwater regulatory review and inspections program to better streamline development in the City. In FY18, the DSC continued to discuss ideas to increase the amount of stormwater being managed on each site, including new zoning bonuses and more predictable grant funding. In addition, several DSC members participated in focus groups regarding PWD's development of online technical design worksheets. The committee continues to be a valuable resource for the Department to gather input on existing procedures as well as new policies and programs.
- PWD continued to conduct reviews of stormwater management plans, hold weekly walk-in hours for applicants and maintain the website to allow online submittal of plans.

A summary of all plan review activities City-wide in FY18 is presented in **Table F.5-1** on page 27.

a. Construction Site Runoff Control

PWD reviews and approves E&S Plans, along with Post-Construction Stormwater Management Plans, for all development sites disturbing more than 15,000 square feet of earth citywide. For E&S plans, PWD follows policies and practices as provided within the PA DEP E&S Control Manual. PWD conducts coordinated reviews with the PA DEP for projects disturbing more than one acre of earth.

Site inspections of E&S controls are conducted on a reoccurring basis and in response to any received complaints during active construction. The purpose of reoccurring inspections is to monitor E&S controls on projects where construction and earth moving activities are active, and to require site operators to maintain E&S controls as needed. PWD inspects controls such as, but not limited to, rock construction entrances, silt fences, inlet protection, and concrete washouts. During an inspection, the inspector communicates with the construction manager or site representative and requests to see a copy of the on-site E&S Plan. Photographs are taken documenting site conditions. An inspection report detailing any out-of-compliance items is generated and distributed to the site manager, and then maintained as part of PWD's electronic project file. Failure to adhere to the requirements in the inspection reports can result in a Notice of Violation or a Stop Work Order. For more information regarding enforcement actions, see **Section F.5.e** on page 32.

The sites visited cover all of Philadelphia including both separate storm sewer areas and combined sewer areas as depicted in **Figure F.5-1** on page 27.

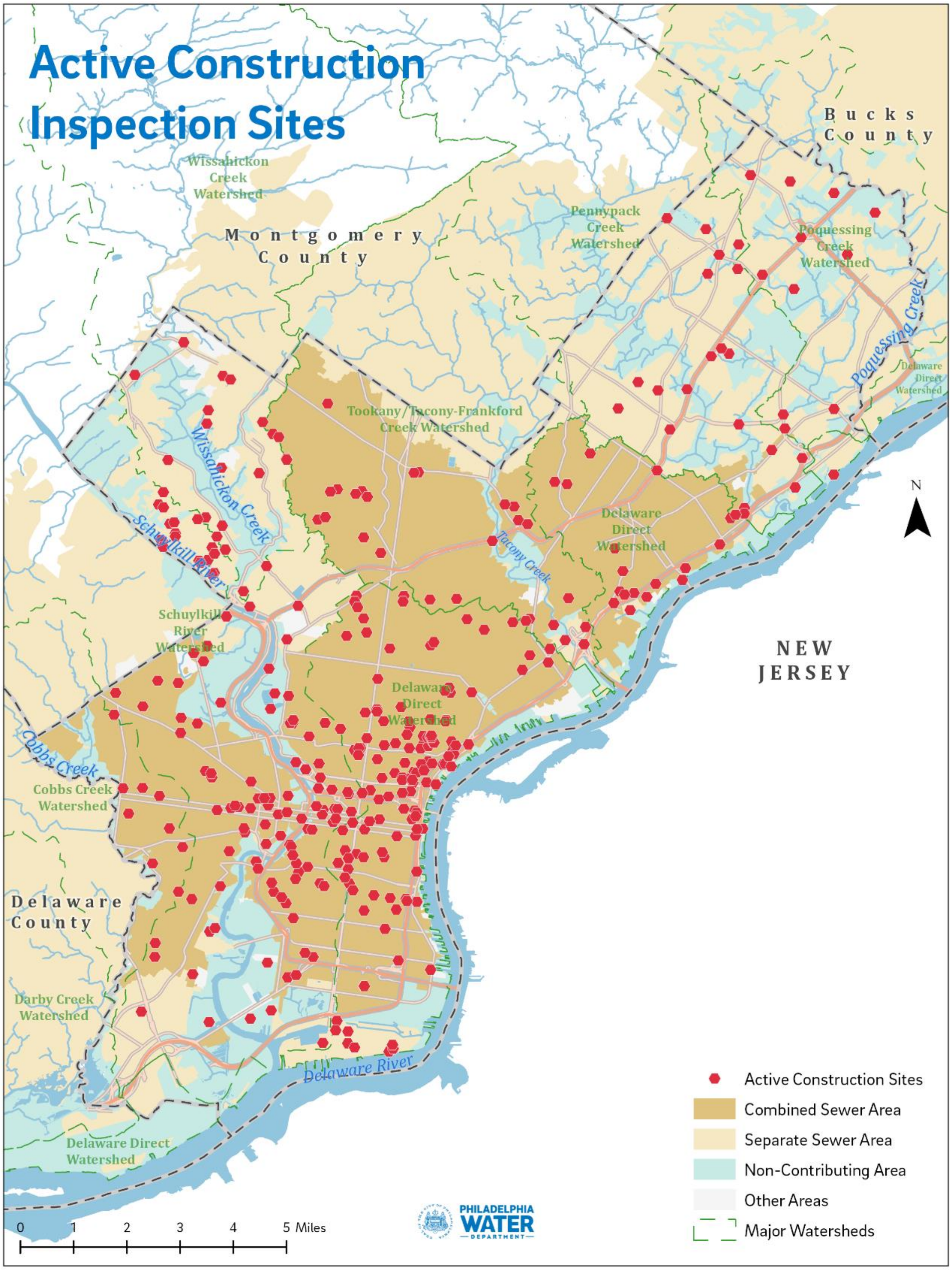
Table F.5-1: FY18 Summary of Plan Review Activities

	Jul. '17	Aug. '17	Sep. '17	Quarter Total	Oct. '17	Nov. '17	Dec. '17	Quarter Total	Jan. '18	Feb. '18	Mar. '18	Quarter Total	Apr. '18	May. '18	Jun. '18	Quarter Total	FY18 Total
Conceptual Review Stage																	
Approvals	13	16	10	39	8	8	15	31	15	25	16	56	12	24	18	54	180
Rejections	51	30	35	116	43	38	33	114	51	61	57	169	63	62	40	165	564
Reviews	64	46	45	155	51	46	48	145	66	86	73	225	75	86	58	219	744
New Project Submittals	28	20	27	75	27	26	29	82	40	36	39	115	38	35	28	101	373
Average Review Time (days)	4.6	4.1	3.3	4.1	4.8	3.4	4.1	4.1	4.8	4.0	4.1	4.3	4.3	2.7	2.9	3.3	3.9
Post Construction Stormwater Management Plan Review Stage																	
Administrative Screenings	21	10	12	43	13	11	9	33	13	17	15	45	26	18	12	56	177
Technical Approvals Issued	11	9	11	31	3	10	11	24	3	8	4	15	14	10	5	29	99
Rejections	32	34	23	89	27	38	16	81	25	21	27	73	38	29	34	101	344
Full Technical Reviews	64	72	54	190	51	65	41	157	42	48	51	141	70	53	55	178	666
New Project Submittals Received	24	25	22	71	21	20	16	57	22	20	36	78	35	28	16	79	285
Average Number of Reviews per Approval	4.6	4.7	3.5	4.2	4.7	4.3	4.3	4.3	4.3	5.0	4.0	4.6	4.7	4.0	5.4	4.6	4.4
Average Approval Time (days)	170	143	102	138	117	175	188	173	155	175	247	190	230	156	511	253	188
Acres of Earth Disturbance Approved	18.7	31.4	18.6	68.7	6.6	22.4	31.1	60.1	6.1	22.1	3.7	31.9	25.3	14.2	11.9	51.4	212.2
Acres of Green Roofs Approved	0.6	0.8	0.2	1.6	0.2	0.8	1.5	2.5	0.0	0.0	0.3	0.3	0.6	0.9	0.2	1.7	6.0
Acres of Porous Pavement Approved	0.2	0.4	3.1	3.8	0.1	13.0	0.9	14.0	0.0	0.9	0.1	1.0	2.1	1.1	0.1	3.2	21.9
DEP Reviews																	
New Coordinated Reviews	2	6	9	17	1	14	8	23	6	1	5	12	11	9	14	34	86
Erosion and Sedimentation Plan Review																	
Defer to DEP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approved	6	8	11	25	4	11	6	21	2	7	6	15	5	8	2	15	76
Rejected	17	14	9	40	9	13	6	28	8	9	16	33	17	11	13	41	142
Not Applicable	9	18	13	40	14	13	10	37	15	11	26	52	18	16	9	43	172
Total Inspections																	
New Sites Inspected	16	18	12	46	32	17	14	63	10	11	29	50	49	69	62	180	339
Total Inspections	386	496	454	1336	590	503	466	1559	459	365	429	1253	527	492	506	1525	5673
Active Construction Inspections at Project Sites with MS4 Sewers	72	108	96	276	107	118	83	308	78	61	89	228	113	99	104	316	1128

	Jul. '17	Aug. '17	Sep. '17	Quarter Total	Oct. '17	Nov. '17	Dec. '17	Quarter Total	Jan. '18	Feb. '18	Mar. '18	Quarter Total	Apr. '18	May. '18	Jun. '18	Quarter Total	FY18 Total
Post Construction Inspections at Project Sites with MS4 Sewers	4	1	0	5	13	1	5	19	2	3	9	14	11	20	12	43	81
Total Inspections at Project Sites with MS4 Sewers	76	109	96	281	120	119	88	327	80	64	98	242	124	119	116	359	1209
Active Construction Inspections at Project Sites with Combined Sewers	288	364	334	986	432	360	351	1143	359	283	307	949	359	324	341	1024	4102
Post Construction Inspections at Project Sites with Combined Sewers	2	0	0	2	1	1	0	2	0	1	10	11	29	17	20	66	81
Total Inspections at Project Sites with Combined Sewers	290	364	334	988	433	361	351	1145	359	284	317	960	388	341	361	1090	4183

Please note: In FY09, PWD changed the Technical Screening to more of an administrative check to better mirror the DEP's administrative check. PWD Screenings are no longer included in the Technical Review count.Total Inspections includes projects in "Non-Contributing" sewered areas.

Figure F.5-1: FY18 Active Construction Sites



b. Post-Construction Stormwater Management in New Development and Redevelopment

Adopted in January 2006, the Philadelphia Stormwater Regulations enabled PWD to review plans for both new and redevelopment sites throughout the City to ensure water quality and quantity were part of the proposed management plan. Since 2006, PWD has collected and synthesized feedback from the development community regarding improvements to the stormwater plan review program. With the signing of a Consent Order and Agreement with the PA DEP in June 2011, PWD saw an opportunity to increase stormwater management from land development projects while simultaneously implementing business-friendly improvements to the program. Effective July 1, 2015, the Stormwater Regulations were updated to improve and strengthen PWD's stormwater programs. The Philadelphia Stormwater Management Regulations are available online at http://www.phila.gov/water/PDF/PWDregCH6.pdf.

c. Applications/Permits

Across the entire city during FY18, 373 unique projects were submitted to PWD for conceptual review through the program's website. PWD approved full technical plans for 99 projects during FY18 citywide. It should be noted that this number does not include plans re-submitted for review, some of them multiple times. The distribution of development projects that submitted post-construction stormwater management plans for review is presented in **Table F.5-2 & 3.**

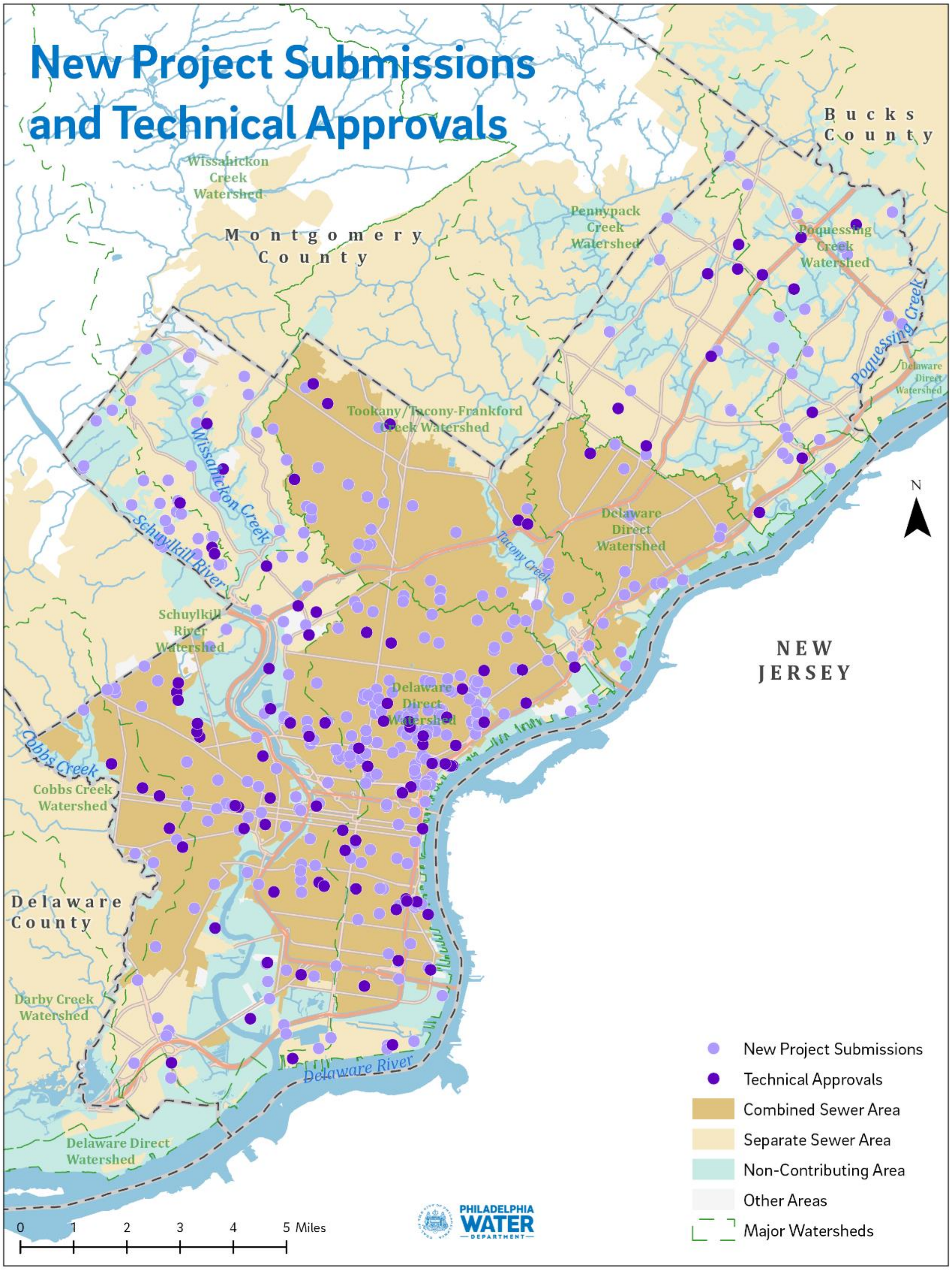
Table F.5-2: Approved Stormwater Plan Location Summary by Contributing Area

Drainage Type	Number of Locations
Combined Sewer Area	66
Non-Contributing Area	9
Separate Sewer Area	24
Total	**99**

Table F.5-3: Approved Stormwater Plan Location Summary by Watershed

Drainage Watershed	Number of Locations
Delaware River	37
Poquessing Creek	6
Pennypack Creek	7
Schuylkill River	33
Tacony/Frankford Creek	7
Wissahickon Creek	4
Darby-Cobbs Creek	5
Total	**99**

Figure F.5-2: Locations of New Project Submissions and Technical Approvals



d. Inspections

PWD requires a pre-construction meeting prior to commencement of earth moving activities for projects applicable to post-construction stormwater management requirements. In FY18, PWD conducted 121 pre-construction meetings citywide for development projects. During the pre-construction meeting, both the approved E&S Control Plan and the approved Post-Construction Stormwater Management Plan (PCSMP) are discussed with the construction manager and property owner representative. Post-Construction Stormwater Management inspections are discussed in **Section F.8** on page 36.

The inspection program continued in FY18 by conducting inspections of stormwater structural controls on land development sites. PWD stormwater inspectors conducted site visits for 354 active sites citywide during FY18. Technical plan review staff was also on-site to verify construction of the SMPs was completed in accordance with the approved plan. In the case that concerns are identified regarding SMP installation during construction, the technical plan reviewer will discuss the necessary corrective actions for the project with the PWD inspector and the construction manager.

PWD stormwater inspectors monitor the installation of SMPs and erosion and sedimentation controls during active construction for private development sites. During FY18, PWD was able to maintain its presence in the field by conducting 1,128 active construction inspections on 75 sites in the separate sewered areas of the city. Many sites were visited multiple times to ensure compliance with appropriate requirements (**Table F.5-4**).

Table F.5-4: Active Construction Inspection Site Location Summary

Drainage Type	Number of Locations
Combined Sewer Area	254
Non-Contributing Area	25
Separate Sewer Area	75
Total	**354**

e. Monitoring/Enforcement

PWD issues a Notice of Violation to sites when significant or persistent issues with E&S controls or the installation of required SMPs are not addressed in a timely manner. In FY18, PWD issued a total of 22 Notice of Violations (NOVs) to projects under construction citywide. The major compliance issues for active construction projects include improper use of silt fences, inadequate or lack of rock construction entrances, contractor not following the onsite E&S Plan, a complete absence of E&S controls, and incorrect SMP installation.

Notice of Violations include a deadline for compliance and re-inspection. If a project remains out of compliance, PWD will coordinate with the Department of Licenses & Inspections to issue a Stop Work Order. PWD also coordinates with the Department of Licenses & Inspections to hold the building Certificate of Occupancy for any projects where major issues are identified during the construction process.

In some cases, projects may fall out of compliance after enforcement actions were previously taken during the construction period. As part of the 2017 Environmental Protection Agency's Administrative Order for Compliance on Consent, PWD was required to develop an SOP to detail enforcement procedures for responding to E&S control issues when established enforcement methods do not result in compliance. In FY18, PWD developed and submitted to EPA a Repeat Offenders Standard Operation Procedure (SOP).

f. NPDES Permit Requests

PWD continues to serve as the Conservation District for the City of Philadelphia for NPDES Construction Permitting Requirements and Chapter 102 Regulations relating to Erosion and Sedimentation Pollution Control. PWD continues to receive notifications and coordinate reviews for permitting. For more information and full details on this process described in previous reports; please refer to Section F.5.f NPDES Permit Requests on page 204 of the CSO-Stormwater FY12 Annual Report.

g. Stormwater BMP Handbook and Construction Site BMP Sediment & Erosion Control Checklist

The Stormwater Management Guidance Manual Version 3.0 represents a comprehensive revision released in conjunction with the updated Stormwater Regulations on July 1, 2015. Primarily a web-based resource, this version of the manual is organized to reflect the life cycle of a development project from initial submission through operation and maintenance. In addition to providing context on the regulatory framework for stormwater management in the city, the manual builds upon nearly a decade of program growth and technological advancements to streamline the technical design requirements and clearly document the plan review process for applicants. The Department leveraged feedback from design engineers to clarify existing content, provide new resources and develop a fully searchable and accessible online manual. The manual is located on the web at https://www.pwdplanreview.org/manual/introduction.

F.6 Watershed, Combined Sewer Overflow (CSO), and Source Water Protection Programs

PWD, through the Planning and Environmental Services Division (PESD), strives to reduce the amount of point and non-point discharges entering regional waterways and improve the environmental health of the region so that all waters are fishable and swimmable. The main programs within PESD, in addition to the Stormwater Management Program, that work together to improve regional ecological health, water quality, and sustainability are: EWS, CSO Management Program, Watershed Planning, Source Water Protection Program, and Wetlands Mitigation Registry. The Watershed Planning Program is presently explained in detail throughout **Section III.C of the CSO Annual Report** on page 38.

Source Water Protection Program

PWD’s Source Water Protection Program embodies PWD’s multi-barrier approach to ensuring the safety and quality of Philadelphia’s drinking water, whose sources consist of the Schuylkill and Delaware Rivers. The Source Water Protection Program staff work closely with PWD water treatment plant operators to anticipate and respond to emergencies and challenges to conventional treatment technology. PWD continues to implement the Source Water Protection Program and has discussed it in full detail in the past. For more information on this program, please refer to the following sections:

- Schuylkill Action Network
  Please refer the CSO Annual Report **Section II.G.2 – Schuylkill Action Network** on page 23 for information about this topic.
- Delaware Valley Early Warning System
  Please refer the CSO Annual Report **Section II.G.2 – Delaware Valley Early Warning System** on page 25 for information about this topic.
- RiverCast
  Please refer the CSO Annual Report **Section II.G.2 – RiverCast** on page 23 information about RiverCast.

Combined Sewer Overflow Management Program

The Combined Sewer Overflow management program works to implement technically viable, cost effective improvements and operational changes that mitigate the impacts of combined sewer overflows. Please refer to **Section I Management and Control of CSOs** on page 1 in the CSO Annual Report for additional information.

Watershed Mitigation Registry

Please refer to the CSO Annual Report **Section III.C.2.4 – Wetland Enhancement and Construction** on page 45 for information about the Watershed Mitigation Registry.

F.7 Miscellaneous Programs and Activities

a. Pollutant Migration/Infiltration to the MS4 System

PWD responds to all citizen complaints of liquid, solid, or gaseous pollutants within Philadelphia. A list of all pollutant migration events in the MS4 section of the City that occurred in FY18 is presented in **Appendix O – FY18 Pollutant Migration/Infiltration**.

b. Public Education and Awareness

Public Education Literature

The City takes an active role in providing information and education to the public and our community. Several events and programs are conducted each year in which the City provides numerous amounts of literature to the public. Please refer to the CSO Annual Report **Section II.G – Pollution Prevention** on page 22 for information about this topic.

c. Pesticides, Herbicides, and Fertilizer Controls

Integrated Pest Management protocol

The majority of the City does not use pesticides or conduct any practices that require the use of the Integrated Pest Management (IPM) protocol. The City is currently focusing on invasive plant management through the use of herbicide to remove invasive plants.

The Philadelphia Health Department uses larvicides, Bacillus Sphaericus (brand name Vectolex), Methoprene (Altosid), and Spinosad (Natular), to prevent mosquito breeding. These larvicides are approved for use in the stormwater catch basins and are applied as such. The IPM protocol is followed when using the larvicides by inspecting the catch basins before treatments, using the least toxic or non-toxic product, and submitting a request for repairs when necessary. PWD and the Department of Public Health work closely together. This collaboration has resulted in the Health Department receiving maps with locations of the City's storm water inlets and surface basins. This allows PWD improved access to refer concerns of pests in the water collections systems for treatment by Health Department staff.

All associated Philadelphia Health Department staff are certified pest control applicators in accordance with PA Department of Agriculture. To maintain this certification, on-going training is required. The Philadelphia Health Department holds several on-site trainings per year for staff.

Education materials to private pesticide users

The Philadelphia Health Department provides educational materials to organizations, companies and/or individuals upon request. Often private exterminators, especially companies that handle pest control work for City facilities, request this information since most buildings in the City contract out for pest control work through the individual Departments. Health Department Sanitarians (Inspectors) have this information available to provide to the public.

d. Snow Management Plan

The City faces winter storms that bring potentially dangerous accumulations of ice, sleet, freezing rain, and snow. To mitigate the impact of these storms, the Streets Department has prepared a Snow and Ice Operations Plan which provides a detailed outline of the City's response to adverse winter weather conditions. The plan includes the salt storage locations at the six Highway Districts. Page 41 of the Plan describes the Streets Department salting policy. The updated Snow and Ice Removal Operations Plan for winter 2017-2018 is provided in **Appendix M - City of Philadelphia Snow and Ice Operations Plan Winter 2017-2018.**

e. Municipal/Hazardous Waste, Storage, Treatment, and Processing Facilities

The City's one waste transfer station, Northwest Transfer Station, is located at Domino Lane and Umbria Street. Observations from both an inspection conducted by EPA during the audit in 2015, and a City-lead inspection in May 2017, determined this facility meets the PADEP criteria of an industrial site. During FY18, Streets Department submitted a PAG-03 General NPDES Industrial Stormwater permit application for the Northwest Transfer Station and are awaiting a response from PADEP.

F.8 Best Management Practices (BMPs)

a. Submit storm sewer discharge ordinance

The authority for PWD to adopt stormwater regulations is found within Title 14 Zoning and Planning Code under §14-704(3) Stormwater Management. PWD maintains Stormwater Regulations as Chapter 6 of PWD's regulations. These regulations were originally adopted in 2006 and have been most recently updated in July of 2015. These regulations require stormwater management on development projects that exceed an earth disturbance threshold of 15,000 square feet. For more information regarding PWD's regulation updates within the last year, see **Section F.5.b. – Post-Construction Stormwater Management in New Development and Redevelopment** on page 30.

PWD has added documentation to a website (http://www.pwdplanreview.org) to provide the development community a means of accessing the most recent stormwater management information.

b. Commercial and Residential Source Controls

b.i. Mingo Creek Surge Basin

The Basin was last dewatered in August of 2012 to inspect the sediment levels. The basin sediment appeared to have not changed since its last inspection in 2009; therefore, no further accumulation had occurred. A bathymetric study of the basin is being planned and the results of this survey will be evaluated to determine if additional action is required for sedimentation control. For more information on this project, please refer to Section F.8.b.i on page 214 of the CSO-Stormwater FY12 Annual Report.

b.ii. Existing privately owned structural controls

To ensure ongoing SMP maintenance of private facilities, the PWD continues to utilize three means: executing Operation & Maintenance Agreements, conducting post-construction maintenance inspections, and utilizing enforcement tools.

An Operation & Maintenance Agreement is executed by PWD and the property owner, notarized, and recorded to the property land deed prior to the issuance of a Post-Construction Stormwater Management Plan Approval by the PWD. These agreements outline the SMP(s) on the private site and stipulate maintenance requirements. The agreements also include language granting the PWD the right to inspect on-site SMPs and even perform maintenance on behalf of the property owner if necessary. The PWD also maintains a comprehensive operations and maintenance manual for SMPs geared toward private development users: http://www.phila.gov/water/PDF/Retrofit-O.M.Manual.pdf.

Post-construction maintenance inspections of private facilities were conducted through the reporting period. The PWD utilizes both specialized inspection techniques as well as visual inspections to assess the performance of private SMPs. The inspections conducted to date have identified the most effective methods and technologies, including closed-circuit television, ground penetrating radar, surveys of critical system elevation points, confined space, pole-mounted camera photography, and visual and wet weather inspections. In FY18, the PWD performed 162 post-construction inspections citywide. The PWD will continue to evaluate and refine post-construction inspection protocols.

Utilizing **enforcement tools**, PWD will issue notification to the property owner if an SMP is found to be insufficiently maintained. This notification will include a description of any issues identified and a timeline for achieving compliance. The City is authorized to compel maintenance of SMPs on private property under the Philadelphia Code and PWD Regulations. Development sites that are subject to PWD's stormwater regulations are required to maintain the SMP(s) to function as designed. If this initial notification is unsuccessful at bringing action from the property owner, PWD can compel compliance through a number of enforcement tools, including issuance of notice of violations, fines, court action, and/or a nuisance abatement and lien by the City. For non-compliant projects, PWD will also suspend any applicable stormwater billing credits if the required maintenance is not performed.

In FY18, 18 projects were brought back into compliance citywide using the above-referenced protocols. PWD will continue to work with property owners to ensure that SMPs are inspected and maintained in accordance with Regulations and recorded O&M agreements.

c. Development plans review

PWD and the City Planning Commission provide review of drainage plans for new and redevelopment. The drainage plans address both flood control and potential stormwater pollutants under the authority of the Philadelphia Code. Please refer to **Section F.5 – Monitor and Control Stormwater from Construction Activities** on page 25 for additional information.

d. Street Cleaning Program

During FY18, the Streets Department continued its street cleaning programs that target street debris and litter. With its fleet of mechanical sweepers, the Streets Department provides daily street cleaning in Center City and on major arteries and commercial corridors throughout the city. Since FY14 the Streets Department has initiated monthly street sweeping operations on routes along the Tookany / Tacony Frankford, Wissahickon, Cobbs Creek and Pennypack watersheds within the city.

In addition, the Center City District (CCD) and University City District (UCD) conduct sidewalk cleaning. Heavily-trafficked commercial streets and areas receive daily sweeping with pans and brooms and mechanical cleaning. Other areas with a high density are cleaned at least twice weekly with machines (some areas are cleaned daily). Sidewalks also get a monthly power washing, except in winter, to remove accumulated stains, gum and grime. In FY18, 31,000 miles of streets were mechanically cleaned. Through a variety of fee-for-service arrangements, CCD crews clean several adjacent commercial and residential areas and provide a 24-hour deployment to clean the three and a half mile long underground subway concourse and Center City's two regional rail stations.

Public awareness of litter

The City promotes, develops, and implements litter reduction programs in an effort to increase public awareness of litter as a source of stormwater pollution. There are about 500 solar-powered, compaction litter receptacles in Center City, and another 460 in other commercial districts throughout the city. Over 600 standard wire baskets are also in place through the Philadelphia More Beautiful Committee (PMBC) Adopt-A-Basket program, that provides block captains with wire waste baskets to distribute and manage across city neighborhoods. PMBC also organizes neighborhood cleaning events citywide. Such cleaning efforts are bolstered every April by the Philly Spring Cleaning day, a citywide anti-litter event partnering various city agencies and neighborhood community groups, now in its eleventh year. This year's event included a total of 779 clean-up projects throughout the city. As a result of the overall clean-up efforts, a total of 321 tons of trash, 82 tons of tires, 6.4 tons of yard waste and 3.7 tons of recycling material was removed from city streets, sidewalks and open areas. In addition, participants from Streets' Future Track program were featured as part of four clean-up projects in targeted areas of Southwest Philadelphia where they designed, planned and completed each project effort. These efforts are bolstered by Philadelphia's SWEEP program. SWEEP officers, employees of the Streets Department, work with residential communities to address locations with problematic amounts of litter and short dumping. In cases of non-compliance, SWEEP officers will issue warnings and citations to the appropriate individuals.

During FY17, the City of Philadelphia Mayor Kenney signed an Executive Order to create the Zero Waste and Litter Cabinet (Cabinet) to move the City towards a zero waste and litter-free future. To accomplish the goals of reducing waste and litter the Cabinet was created as an interdepartmental effort to combat litter, enhance cleanliness of streets and public spaces, and increase the waste diversion rate toward a long-term goal of Zero Waste entering landfills or conventional incinerators. A Zero Waste and Litter Cabinet Action Plan was released in summer 2017 and is available here: http://cleanphl.org/.

e. Animal Waste and Code Enforcement

Educational material regarding control of animal waste

The City of Philadelphia actively enforces code which covers the regulation of animal waste. The Philadelphia Code and Charter Chapter 10.100 – Animals and Chapter 10.700 – Refuse and Littering address the proper clean-up of pet waste and applicable fines and penalties. In addition, signs advertising said penalties are displayed city-wide in an effort to prevent residents from violating this statute. The City of Philadelphia also provides the text of this code online at http://municipalcodes.lexisnexis.com/codes/philadelphia/.

PWD provides additional information on pet waste to the public including how it affects stormwater and why to pick it up through its website located at the following site: http://www.phillywatersheds.org/whats_in_it_for_you/residents/pet-waste/.

Dog Waste Control Program

PWD launched an innovative approach to address dog waste in targeted neighborhoods in July of 2010. Through a pilot project in the Delaware Watershed, the Partnership for the Delaware Estuary found that many dog-owners are unaware of the connection of dog waste to water pollution. Building on almost of decade of experience, PWD redeveloped the dog waste program in FY18 to more broadly appeal to dog owners across the City. The new program will expand outreach into community dog parks, City-owned parks and various events hosted by organizations across the city.

f. Flood Management and Flood Control Devices

Structures built within the floodplain

All development within the Special Flood Hazard Area (SFHA), which is identified on FEMA's Flood Information Rate Maps (FIRM's), are reviewed and approved per the City's codes and regulations found in both Zoning and Building codes. L&I will identify all City parcels within the SFHA, and upon an application submission will determine whether the floodplain codes apply. If the development site itself is determined to be within the SFHA, structures built will be designed to an elevation of Base Flood Elevation (BFE) plus a safety factor of at least 18 inches. The Department of L&I will maintain records of compliance for all development located with the SFHA. Licenses and Inspections issued 94 permits for new construction, addition, and alterations in FY18.

Evaluate new and existing structural drainage controls

Our evaluation of structural drainage controls was discussed in further detail in **Section F.8.b.ii - Existing privately owned structural controls** on page 36 of this report.

Work is being done on sections of the city that have chronic flooding to eliminate or reduce these occurrences; please refer to CSO Annual Report **Section II.B.3.3 – Storm Flood Relief** on page 3 for more information about the SFR projects and details on evaluating structural drainage controls.

Streambank Restoration and Wetland Enhancement

Please refer to the CSO Annual Report **Section III.C.2.3 – Stream Habitat Restoration** on page 44 for information pertaining to streambank restoration.

Please refer to the CSO Annual Report **Section III.C.2.4 – Wetland Enhancement and Construction** on page 45 for information pertaining to wetland enhancement.

g. Sanitary Infiltration Controls

Limit sanitary infiltration

As part of the Cross Connection Repair Program, PWD has conducted 1,479 abatements to correct cross connection in sewer laterals since 1994; 63 abatements were completed in FY18 alone. PWD also has in place twelve dry weather diversion devices which divert sanitary flow back into the sanitary sewer but still allow stormwater to pass through during wet weather events. PWD estimates that these abatements and dry weather diversion devices have prevented over 207.8 million gallons of contaminated flow from entering our waterways since the inception of the program and about 8.9 million gallons during FY18. Please refer to **Section F.3 – Detection, Investigation, and Abatement of Illicit Connection and Improper Disposal** on page 22 for more information on the Cross Connection Repair Program.

In addition, as part of PWD's Sewer Maintenance Program, sewer lining is routinely conducted on both sanitary and storm sewers. Lining sewers helps to reinforce, seal and rehabilitate the existing sewers, specifically preventing infiltration to allow the pipe capacity to be reserved for sanitary and storm flow. Apart from those being done under consent orders, there are several sewer lining projects in the City that originate from sewer maintenance issues like street cave-ins, depressions, backups, as well as sewer assessment meetings.

As a part of PWD's commitment to improvement of water quality and aesthetics in dry weather, large sewer lining projects began on the entire length of intercepting sewers along the Tookany/Tacony-

Frankford and Cobbs Creeks. Please refer to **Appendix A Green City, Clean Waters FY18 Annual Report Section 3.3 Interceptor Relining** on page 7 for more information on the interceptor relining project.

Construction of a storage tank upstream of relief sewer manhole R-20, located at Main Street and Shurs Lane, to capture and store excess flows was completed during November of 2013. The consent order requirement for sewer linings to be done around regulator R-20 in an effort to reduce inflow and infiltration has been completed. Please refer to CSO Annual Report **Section III.B.1– Eliminate COS/Main and Shurs Off-Line Storage (SW) - Construction and Implementation of the Main and Shurs Off-line Storage Project** on page 36 for more information on the Main and Shurs Off-line Storage Project and efforts to reduce inflow and infiltration at R-20.

PWD constructed a parallel relief sewer in December of 2011 to eliminate overflows at manhole PC-30 as per a consent order issued by the DEP. The overflows at PC-30 were caused by a combination of various factors which influence the hydraulic carrying capacity of the Poquessing Creek Interceptor during wet weather events. In FY18, PWD continued to monitor the effectiveness of this relief sewer. There were also several sewer lining projects done under the consent order for PC-30 area in conjunction with the relief sewer being constructed. Please refer to CSO Annual Report **Section III.B.2. – PC-30 Relief Sewer** on page 37 for more information on the PC-30 Relief Sewer.

Investigate, remediate, and report sanitary infiltration

PWD responds to all citizen complaints of liquid, solid, or gaseous pollutants within Philadelphia. A database called the Sewage Pollution Incident & Location Log (SPILL), which stores information about unintentional sanitary discharges including the date reported, problem location, spill type, description, and abatement date, is maintained. Detailed information on the events found on the SPILL database of reported sewage pollution incidents in FY18 are found within in **Appendix N – FY18 Sanitary Infiltration Events**.

During FY18, two complaints of malfunctioning on-lot sewage disposal systems were investigated. Of those complaints, one has been mitigated and one is awaiting PWD review for public sewer to be installed. Also during FY18, nine applications were received and issued for the installation of on-lot sewage disposal systems. Of those applications, nine permits were approved. In addition, 564 portable toilet permits were issued. PWD continues to support the inspection and remediation of these systems.

h. Spill Prevention and Response

The City's response plan to respond to and contain harmful spills that may discharge to the municipal separate storm sewer system is managed by the Office of Emergency Management. The City of Philadelphia Emergency Operations Plan – Annex F Hazardous Materials and PWD – Waterways Contamination Response Protocol, can be found in the Additional Documents folder on the **Supplemental CD**.

In order to protect PWD's structures and treatment processes, PWD staff respond to oil and chemical spills and other incidents that have the potential to threaten the water supply or impact the sewer system, twenty-four hours per day, seven days per week. PWD responds to all incidents that can impact the sewer system or endanger PWD employees. This includes both the sanitary sewer system and the storm sewer system. PWD supervises cleanup activities and assesses environmental impact. PWD inspectors also investigate various other types of complaints. A list of all pollutant migration events in the MS4 section of the City that occurred in FY18 is presented in **Appendix O – Pollutant Migration/Infiltration.**

i. Public Reporting of Illicit Discharges, Improper Disposal

The City encourages public citizens to report the occurrence of illicit discharges that may impact the sewer system and water bodies. To facilitate the timely reporting of such events, PWD operates a Municipal Dispatcher 24 Hours/Day, 7 Days/Week to handle reports from the public. In addition, a customer service hotline (215 686-6300) is also operated that provides the ability to connect to the Dispatcher. This information is distributed in mailings, as well as online at http://www.phila.gov/water/contact_us.html.

Upon the reporting of such an incident, a PWD inspector is immediately dispatched to the site to investigate and determine the source of the discharge, as well as the extent of impact on the receiving water body. Each incident is logged into an electronic database that enables tracking of the details of each occurrence.

PWD received 166,998 phone calls which lead to 21,283 service requests being conducted during FY18. Currently PWD does not track phone calls specifically related to illicit discharges and improper disposals in the MS4 area, but instead tracks much broader topics including sewage backup, flooding, street cave-ins and water service disruptions.

Philly 311

Philly311 was created to help eliminate the need to sort through the numerous phone numbers and hotlines available to contact the City government. A customer service specialist will connect the user to the information and services they may need either by calling 3-1-1, asking a question on the website or through Twitter @philly311. A Philly 311 mobile app is available for iPhone, Android, or Blackberry devices to report issues such as graffiti, potholes, litter and more. For more information on uses of Philly311, please visit: http://www.phila.gov/311/. During FY18, Philly 311 transferred 2,055 non-emergency inlet and hydrant requests to Customer Service Call Center.

j. Used Oil and Toxic Material Disposal

The City continues to facilitate the proper disposal of used oil and other toxic materials. This program includes collections events, distribution of educational materials, the operation of a website, and a hotline accessible to the public. For more information on the hazardous waste program please visit: http://www.philadelphiastreets.com/hazardous-waste.

k. Storm Water Inlet Labeling/Stenciling

In September 2015, Philadelphia Water released a refreshed storm drain marking program. This new iteration features watershed specific storm drain markers. Each of the seven new markers prominently features a unique color scheme and an animal native to that respective watershed. Educational materials provided with each kit better inform the public about how their actions on the street can reduce stormwater runoff pollution. In 2017, PWD launched a beta version of a new web-based storm drain marking app. This new app will allow participants to more accurately mark inlets on their blocks and public spaces. Inlets are color coded by watershed allowing participants to view the often hidden natural watershed boundaries of our city. The direct capture of information via the app will also allow the Department to more accurately track the placement of markers throughout the city. The app can be accessed here: https://markingapp.philadelphiawater.org/.

During FY18 Philadelphia Water distributed 111 storm drain marking kits, totaling 1,665 individual stormwater inlet labels. PWD continues to encourage community organizations and citizens to get involved in storm drain marking projects. More information on this program has been provided in previous years; please refer to Section F.8.k on page 312 of the CSO-Stormwater FY10 Annual Report.

Section G Assessment of Controls

Annually estimate pollutant loadings & reductions from stormwater management plan

PWD selected a set of effective post-construction stormwater management controls to address problems identified in the waterways and documented these controls in the Stormwater Management Guidance Manual. Philadelphia's stormwater management regulation legally require all development and redevelopment projects subject to these regulations to implement the identified controls. The requirements of the stormwater regulations were developed through the Act 167 planning process in coordination with neighboring counties. The requirements are explained in detail in Section 1.2.1 of the Stormwater Management Guidance Manual and summarized below.

Water Quality

The Water Quality requirement focuses on the removal of both runoff volume and pollutants and is similar to requirements in surrounding states and other major cities across the country. Because flow rates and velocities were identified as significant causes of aquatic ecosystem impairment, infiltration is emphasized as the preferred water quality management practice unless evidence is provided that it is infeasible on a particular site. Additional water quality benefits are provided, in part, by slowing water down and allowing suspended solids and associated pollutants to settle.

The Water Quality requirement stipulates infiltration of the first 1.5 inches of runoff from all directly connected impervious area (DCIA) within the limits of earth disturbance. The initial 2006 regulations required 1.0 inch of runoff to be managed, based on water budget analyses and precedents for control of the 90^{th} percentile event set by Maryland and other nearby states with similar climates. This requirement has been increased in 2015 to 1.5 inches based on evidence provided by simulations showing that this level of control will further reduce the volume and flow rate of runoff to waterways.

Channel Protection

Erosion of stream beds and banks caused by high volumes and velocities of urban runoff was identified as a significant contributing factor to aquatic ecosystem impairment in Philadelphia's stream systems. For this reason, a channel protection requirement was incorporated in the stormwater regulations. This requirement is based on the concept of effective channel forming discharge and is similar to precedents set by Maryland and other nearby states with similar climates and geology.

The Channel Protection requirement stipulates the detention and release of runoff from the one-year, 24-hour Natural Resources Conservation Service Type II design storm event for all DCIA within the limits of earth disturbance at a maximum rate of 0.24 cfs per acre of directly connected impervious drainage area in no more than 72 hours.

Flood Control

Act 167 Plans identified peak rates of runoff as a contributing factor to out-of-bank flooding events in Philadelphia and surrounding counties. To address peak rate control, geographically specific requirements were incorporated in Philadelphia's stormwater regulations and manual.

The Flood Control requirement stipulates that a development project meet or reduce peak rates of runoff, as determined by its Flood Management District, from predevelopment to post-development conditions during certain storm events.

There are approximately 20.7 square miles of impervious area in the portion of the City that falls under the MS4 permit. As of September 2018, approximately 1.01 square miles (644 acres) of directly connected impervious area are tributary to completed or approved green stormwater infrastructure. This is approximately 4.9% of the impervious area.

Section H Fiscal Resources

Maintain adequate program funding

During FY18, the City provided fiscal resources needed to support operation and maintenance of the Stormwater Management Program. The budget for the upcoming FY19 budget is available upon request.

Annually submit fiscal analysis

The conditions of the NPDES permit can be achieved through appropriate budget planning supporting the projects and assessments critical to a successful program. Any funding changes will be included as part of subsequent annual reports.

APPENDIX A

Green City, Clean Waters

FY 2018 Annual Report

Seventh Annual Report for the City of Philadelphia's Consent Order and Agreement on *Green City, Clean Waters*

Reporting period July 1, 2017 – June 30, 2018

Submitted to

The Commonwealth of Pennsylvania

Department of Environmental Protection

And

The United States Environmental Protection Agency

By the City of Philadelphia Water Department

September 30, 2018

Table of Contents

List of Tables

1.0 Introduction

2.0 Implementation Tracking and Reporting

3.0 Water Pollution Control Plant and Collection System Project Progress

4.0 Green Stormwater Infrastructure through Public Implementation

5.0 Green Stormwater Infrastructure through Private Development

7.0 Public Outreach and Participation

List of Figures

4.0 Green Stormwater Infrastructure through Public Implementation

5.0 Green Stormwater Infrastructure through Private Development

7.0 Public Outreach and Participation

Appendices

Glossary of Acronyms

AOCC	Administrative Order for Compliance on Consent
BMP	Best Management Practice
BOD	Biological Oxygen Demand
City	City of Philadelphia
CMP	Comprehensive Monitoring Plan
COA	Consent Order and Agreement
CSO	Combined Sewer Overflow
GA	Greened Acre
GARP	Greened Acre Retrofit Program
GIS	Geographic Information Systems
GSI	Green Stormwater Infrastructure
LTCPU	Long Term Control Plan Update
NPDES	Discharge Elimination System
PADEP	Pennsylvania Department of Environmental Protection
PCSMP	Post Construction Stormwater Management Project
PennDOT	Pennsylvania Department of Transportation
PIDC	Philadelphia Industrial Development Corporation
PPR	Philadelphia Parks and Recreation
PSWMR	Philadelphia Stormwater Management Regulations
PWD	Philadelphia Water Department
SDP	School District of Philadelphia
SMIP	Stormwater Management Incentive Program
SMP	Stormwater Management Practice
SRT	Simulated Runoff Testing
US EPA	United States Environmental Protection Agency
WPCP	Water Pollution Control Plant
WQBEL	Water Quality-Based Effluent Limit

1.0 Introduction

The Consent Order and Agreement (COA) between the City of Philadelphia (City) and the Pennsylvania Department of Environmental Protection (PADEP), and the Administrative Order for Compliance on Consent (AOCC) between the City and the United States Environmental Protection Agency (US EPA), formalized the regulatory approval of the *Green City, Clean Waters* program and amended the 2009 CSO Long Term Control Plan Update (LTCPU).

This is the seventh Annual Report submitted under the requirements of the COA. Fiscal Year 2018 (FY18) covers the City's *Green City, Clean Waters* implementation progress activities that occurred between July 1, 2017 and June 30, 2018.

1.1 Water Quality Based Effluent Limit Performance Standards

The Water Quality-Based Effluent Limits (WQBEL) performance standards are broken into incremental targets that must be achieved by the City of Philadelphia every five years of the 25-year program. The Philadelphia Water Department (PWD) submitted the Year 5 Evaluation and Adaptation Plan (EAP) October 30, 2016 to PADEP. The EAP focused on the cumulation of the first target in Year 5 (2016) and can be found at http://phillywatersheds.org/doc/Year5_EAPBody_website.pdf. The next interim 5-year WQBEL target is in Year 10 in 2021. **Table 1-1: Water Quality-Based Effluent Limits** displays the cumulative progress towards meeting the Year 5 WQBEL target and includes the upcoming Year 10 WQBEL target.

Table 1-1: Water Quality-Based Effluent Limits

<table>
<tr><th>Metric</th><th>Units</th><th>Base Line Value</th><th>Year 5 WQBEL Target</th><th>Cumulative Amount as of Year 5 (2016)</th><th>Year 10 WQBEL Target</th></tr>
<tr><td>NE WPCP Improvements</td><td>Percent Complete</td><td>0</td><td colspan="2">See Section 3.1.1</td><td rowspan="3">In forthcoming NPDES permits</td></tr>
<tr><td>SE WPCP Improvements</td><td>Percent Complete</td><td>0</td><td colspan="2">See Section 3.1.2</td></tr>
<tr><td>SW WPCP Improvements</td><td>Percent Complete</td><td>0</td><td colspan="2">See Section 3.1.3</td></tr>
<tr><td>Miles of Interceptor Lined</td><td>Miles</td><td>0</td><td>2</td><td>7.5</td><td>6</td></tr>
<tr><td>Overflow Reduction Volume</td><td>Million Gallons Per Year</td><td>0</td><td>600</td><td>1,710</td><td>2,044</td></tr>
<tr><td>Total GAs</td><td>GAs</td><td>0</td><td>744</td><td>837.7</td><td>2,148</td></tr>
<tr><td>Equivalent Mass Capture (TSS)</td><td>Percent</td><td>62%</td><td>Report value</td><td>70.5%</td><td>Report value</td></tr>
<tr><td>Equivalent Mass Capture (BOD)</td><td>Percent</td><td>62%</td><td>Report value</td><td>88.9%</td><td>Report value</td></tr>
<tr><td>Equivalent Mass Capture (Fecal Coliform)</td><td>Percent</td><td>62%</td><td>Report value</td><td>72.0%</td><td>Report value</td></tr>
</table>

1.2 *Green City, Clean Waters* Greened Acres

Greened Acre (GA) progress is achieved through three implementation approaches: Public Investment, (Re)Development Regulations, and Incentivized Retrofits. **Table 1-2: Cumulative Greened Acres** displays the cumulative program progress towards meeting the total GAs at the end of Year 7.

Table 1-2: Cumulative Greened Acres

Implementation Approach	Cumulative Number of Projects (FY11-FY18)	Cumulative GAs (FY11-FY18)
Public Retrofits	178	257
Private Development	343	511
Incentivized Retrofits	76	391
Total	**597**	**1159**

2.0 Implementation Tracking and Reporting

2.1 *Green City, Clean Waters* Program Tracking System

Currently the existing databases and systems track program implementation and support data requests for internal and external reporting. The development of the *Green City, Clean Waters* program tracking system will integrate this data from the existing Water Department systems to streamline the process.

During FY18, several milestones were achieved in the development of the *Green City, Clean Waters* program tracking system. This year, User Acceptance Testing and Unit Testing were performed on the system to ensure proper programmatic alignment for metric calculations. Additionally, Component Design Documents were finalized to memorialize the dashboards, data visualizations and calculations of metrics.

Table 2-1: FY18 Status Updates for Existing Databases and Systems

Existing Databases and Systems	Status
PlanIT	PWD's tracking system that stores information from site evaluations conducted on locations throughout Philadelphia. All sites must undergo an initial evaluation to determine the feasibility of green infrastructure before they can be transferred to CIPIT to begin design phase.
GreenIT	PWD's metrics tracking system for all public green stormwater infrastructure (GSI) projects. GreenIT tracks estimated, designed, built, and maintained compliance metrics. In FY18, PWD launched version 3 of GreenIT. Version 3 includes new fields in support of the H&H compliance model and conversion of the Data Entry Application to an online tool, rather than a locally installed application. The Data Entry Application is used to create metrics reports by consultants and staff that are directly uploaded to the GreenIT database.
CIPIT	PWD's Capital Program Information Tracking System was replaced in August 2017. The new system, CIPIT, is an off-the-shelf software configured to meet PWD's business requirements and includes integration with PlanIT and GreenIT. In FY18, PWD initiated work to enhance user experience and meet additional functional needs through delivery of a backlog of issues captured during initial implementation.
Stormwater Plan Review Database	PWD's tracking system that stores metrics, including detailed stormwater management practice (SMP) data, related to private development project compliance with the Philadelphia Stormwater Regulations as well as voluntary stormwater management retrofit projects. The database is designed to track workflows related to reviews and inspections, including the status of conceptual and technical reviews, record drawing reviews, and active and post-construction inspections.
Geographic Information System (GIS) Asset Tracking	GIS is used to track the location of all PWD assets. This includes public retrofit, private development and incentivized retrofit SMPs.
Maintenance Management Systems	GSI maintenance activities have been fully incorporated into PWD's Cityworks work order management system, which is linked to the City's GIS and provides tools to track and manage work performed on PWD's assets such as fire hydrants, inlets, water mains, sewers, and GSI.

2.2 Reporting Metrics

Green Stormwater Infrastructure through Public Implementation

The information in GreenIT is used to produce compliance reporting outputs for the completed and planned public project tables in **Appendices 1** and **2** of this report. The Public Completed Projects reporting format and metric definitions are described in Table 1 and Table 2, respectively, in **Appendix 1**. The Public Planned Projects reporting format is described in Table 1 in **Appendix 2**.

Green Stormwater Infrastructure through Private Development

Information from the Stormwater Plan Review Database is used to produce reporting outputs for completed private redevelopment and incentives project tables in **Appendix 3**. The reporting format described in Table 1 in **Appendix 3**.

Stormwater Management Types

SMP types used for public implementation are described in Table 3 of **Appendix 1** and private implementation are defined in Table 2 of **Appendix 3**.

3.0 Water Pollution Control Plant and Collection System Project Progress

3.1 Water Pollution Control Plant and Collection System Project Progress

Upgrades to increase the peak flow capacity at each of the City's Water Pollution Control Plants (WPCPs) were described in the Wet Weather Facility Plan, submitted on June 1, 2016. During FY18, PWD has continued working towards completing the projects committed to in the Wet Weather Facility Plan. Within the following sections, progress in FY18 on these projects is discussed. The *Green City, Clean Waters* Wet Weather Facility Plan can be referenced here: http://phillywatersheds.org/doc/Wet_Weather_Facility_Plan_website.pdf.

3.1.1 Northeast Water Pollution Control Plant

Within **Table 3-1**, the eight Northeast WPCP improvements committed to in the Wet Weather Facility Plan are listed with their required operation years, as approved by the PADEP. To date, two improvements were completed and the remaining six improvements are on track for completion by the required completion date.

Table 3-1: Status of Northeast WPCP Improvements

Northeast WPCP Improvements	Required Operation	Project Status (FY18)
Facility Improvements		
Remove Double Deck Effluent Channel in Final Sedimentation Tanks Set 2	6/1/2016	Complete
New (4 x 48”) conduits from Preliminary Treatment Building to Primary Sedimentation Tanks Set 1	6/1/2016	Complete
High Flow Treatment System	6/1/2021	In Construction
Gravity Sludge Thickeners	6/1/2021	In Construction
Preliminary Treatment Building #2	6/1/2031	In Design
New Influent Baffles in Primary Sedimentation Tanks Set 2	6/1/2031	In Design
Operational Improvements		
Operate with minimal sludge blanket when Gravity Sludge Thickeners in service	6/1/2021	On Track

3.1.2 Southeast Water Pollution Control Plant

All Southeast WPCP improvement commitments in the Wet Weather Facility Plan were completed in FY16, meeting the required operation date of June 1, 2016. For more detailed information, please see the *Green City, Clean Waters* Wet Weather Facility Plan or the Year 5 EAP.

3.1.3 Southwest Water Pollution Control Plant

Within **Table 3-2**, the Southwest WPCP improvement committed to in the Wet Weather Facility Plan is listed with its associated required operation year. There is one project that is on track for completion by the required date.

Table 3-2: Status of Southwest WPCP Improvements

Southwest WPCP Improvements	Required Operation	Project Status (FY18)
Facility Improvements		
Additional Effluent Pump	6/1/2026	In Construction

3.2 Philadelphia Collection System Improvements

Within **Table 3-3**, the three Collection System improvements committed to in the Wet Weather Facility Plan are listed with their required operation dates. Two of the improvements were completed, meeting the required deadlines. The other improvement identified is a study to evaluate CSO regulator capacities and identify improvements, if necessary. This study is ongoing and is anticipated to continue throughout the implementation of the LTCPU, as PWD is committed to maintaining and improving the efficiency of the collection system.

Table 3-3: Status of Collection System Improvements

Collection System Improvements	Required Operation	Project Status
Improvements		
NE Second 66” Frankford Grit Chamber Bypass In Service	6/1/2016	Complete
NE Frankford High Level Second Barrel Rehabilitation	6/1/2016	Complete
All Districts: Balancing CSO Regulator Wet Weather Capacities	Study - Ongoing	On Track

3.3 Interceptor Relining

FY18 Progress on Miles of Interceptor Lined

The WQBEL Performance Standards requires 6 miles of interceptor lining completed by the end of year 10 (2021). During FY18 the number of completed miles remained the same as FY17, but the City is well ahead of the Year 10 target with 7.5 miles completed. Additionally, there are 4.3 miles in construction or in contract management, and 3.3 miles in design (**Table 3-4**).

Table 3-4: Interceptor Relining FY18 Status

Project Name	Street Extents	Length (Miles)
Construction Complete		**7.5**
60th and Cobbs Creek Parkway to 75th and Wheeler Sewer Lining	60th and Cobbs Creek Parkway to 75th and Wheeler	2.2
Cobbs Creek Park to 63rd and Market Sewer Lining	Cobbs Creek Park to 63rd and Market	0.5
Cobbs Creek Interceptor Phase 1 CIPP Lining	63rd and Market to 62nd and Baltimore	1.6
Tacony Creek Intercepting Sewer Lining Phase 1	Chew & Rising Sun to I & Ramona	1.9
Tacony Creek Intercepting Sewer Lining Phase 2	2nd St & 64th Ave to Chew & Rising Sun; DRW Mascher to Tacony Interceptor; Cheltenham Ave to Crescentville & Godfrey	1.3
In Contract Management		**4.3**
Cobbs Creek Intercepting Sewer Lining Phase 2	61st and Baltimore to 60th and Warrington	1
Cobbs Creek Interceptor Lining Phase 3	City Avenue to D R/W in former 67th Street	1.7
Cobbs Creek Intercepting Sewer Lining Phase 4 (Indian Creek Branch)	City Avenue to D R/W in former 67th Street	1.6
In Design		**3.3**
Tacony Creek Intercepting Sewer Lining Phase 3	I & Ramona to O & Erie	1
Upper Frankford LL Collector/Tacony Intercepting Sewer Lining Phase 4	Castor & Wyoming to Frankford/Hunting Park	1.1
Upper Frankford Creek LL Collector/Tacony Intercepting Sewer Lining Phase 5	Frankford/Hunting Park to Luzerne & Richmond	1.2
Total Anticipated Miles of Interceptor Lined		**15.1**

4.0 Green Stormwater Infrastructure through Public Implementation

The programmatic strategies for achieving public GAs are benchmarked in four phases: planning, design, construction, and post-construction maintenance. The following four subsections describe the progress made during FY18 for each of these phases. **Table 4-1** summarizes Public GSI projects and GAs for FY18. **Figure 4.2** displays the Planned and Completed Public GSI projects.

Table 4-1: FY18 Summary of Public Green Stormwater Infrastructure

	End of FY18			Cumulative
Project Phase	In Design	In Contract Development	In Construction	Completed
Number of Projects	189	49	54	**178**
Current Number of GAs	TBD*	135	170	**257**

*Current number of GAs is subject to change as projects go through the design process

4.1 Planning Approaches for Green Stormwater Infrastructure Implementation

PWD has continued to evaluate entire neighborhoods and specific sites to identify appropriate locations to site GSI footprints. During FY18, PWD continued to streamline a district-based approach to develop a diverse set of project types that range from smaller green street SMPs to larger systems on parks. The current planning process was solidified in version 2.0 of the GSI Planning and Design Manual and has been used to successfully build a large queue of potential GSI locations. Planners with detailed knowledge of their districts strategically prioritize and package these locations for the design phase.

Planning Outreach and Coordination

PWD works closely with a variety of partners to implement the *Green City, Clean Waters* program throughout all stages of a project. During the planning phase, PWD continued to coordinate the siting of GSI footprints with city agency partners, community groups, and other stakeholders via regular communication and meetings. This past year, the planning team became more involved in maximizing stormwater management on all types of GSI projects, beyond just PWD-led capital planning efforts. Planners provided recommendations for maximizing the amount of stormwater managed on private development sites that had potential to manage additional drainage or right of way (ROW) and recommended private properties with potential to manage large amounts of drainage areas to apply for stormwater retrofit grants.

4.2 Design Approaches

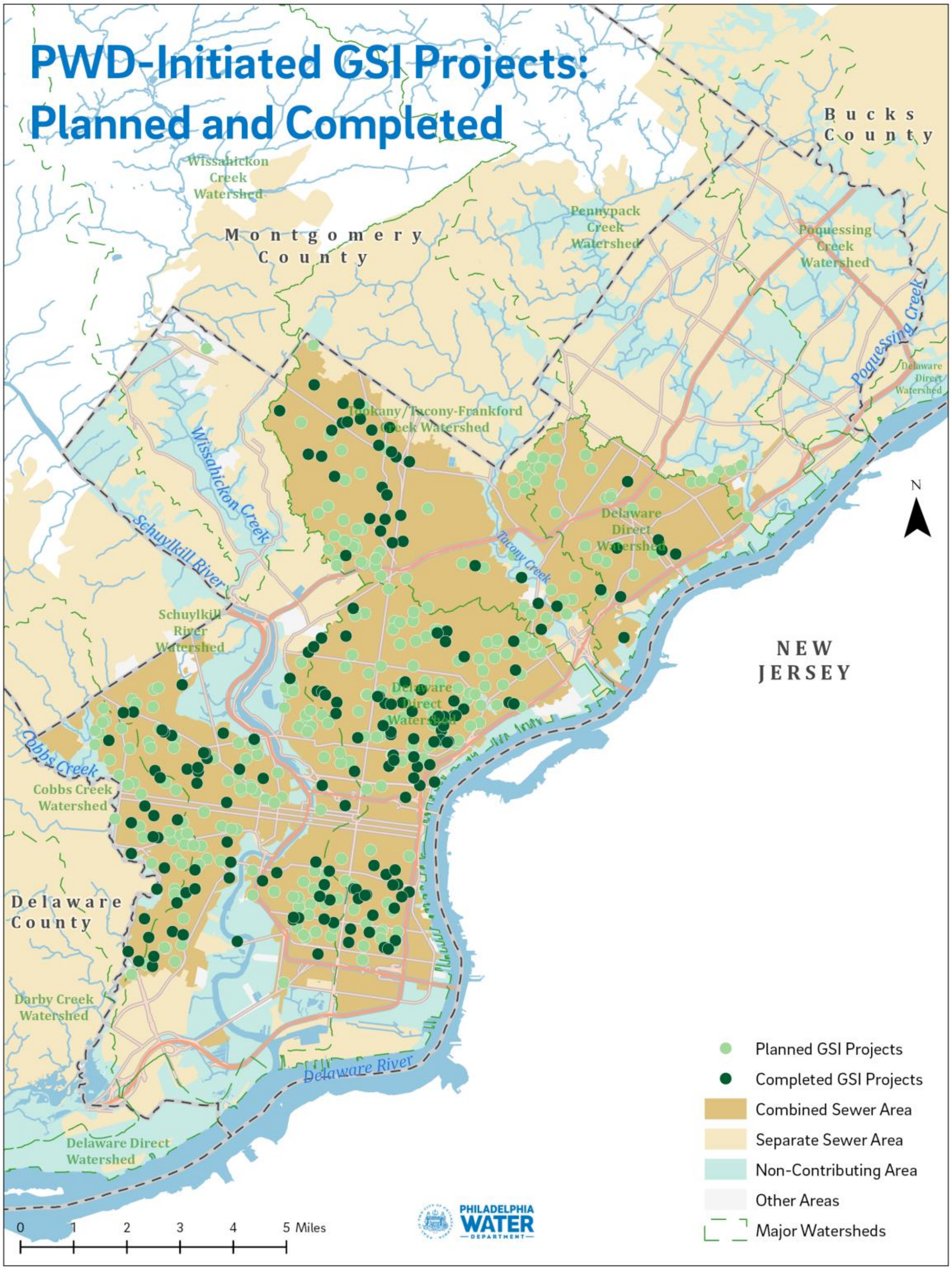
In FY18, PWD continued work on streamlining the design process through coordination and improvement of design guidance:

- Established coordination meetings with the Streets Department as well as between PWD units to facilitate project reviews and improve feedback.
- Worked on advancing large area disconnection and GSI sewer projects, refining the guidance used by planners and designers to select sites, determine initial feasibility, and develop cost-effective designs.
- Released version 2.0 of the GSI Planning & Design Manual, Landscape Design Guidebook, and Typical Details. Updates were based on feedback from planning, design, maintenance, monitoring, and construction. Guidance documents for designing bumpouts and working around vacant lots were also drafted for use on relevant projects.

4.3 Construction

PWD released significant updates to the master green specifications in October 2017 and continues to work on future updates. In FY18, PWD drafted a specification for a small sites contract intended as an on-call contract to construct and retrofit GSI systems for bidding in FY19. The goals of the contract are to increase the speed of system construction and retrofit, reduce cost, increase flexibility, increase drainage area managed by existing systems, and improve PWD's ability to work with partner agencies and private developers. Also in FY18, PWD prepared updates to the separate GSI landscape contract for bidding in early FY19. PWD finished a preliminary draft of the GSI section of a field inspectors' guidebook to provide written direction to inspectors working on green stormwater projects. Ongoing trainings for inspectors and contractors has continued periodically throughout the year covering a variety of topics from As-Built plans to soils and tree protection.

Figure 4-1: Public Green Stormwater Infrastructure Projects



4.4 Public Green Stormwater Infrastructure Maintenance Program

To ensure the function and sustainability of stormwater management infrastructure investments, PWD continues to inspect and/or maintain each system. Within each system, there may be multiple SMPs that are hydraulically connected. **Table 4-2** provides a count of SMPs by SMP type that currently in PWD's maintenance program. These numbers include SMPs on quasi-public properties, such as the School District of Philadelphia, that have a two-year maintenance agreement with PWD. In FY18, PWD updated the *Green Infrastructure Maintenance Manual First Edition, originally submitted to PADEP June 1, 2014.* The updated Green Infrastructure Maintenance Manual Version 2.0 is provided in **Appendix 5.**

Table 4-2: FY18 PWD SMP Types in Maintenance Program

SMP Types	Total Number of SMPs
Green Roof	2
Infiltration/Storage Trench	140
Pervious Paving	12
Rain Garden/Basin	130
Planter	52
Bump-out	23
Stormwater Tree	83
Tree Trench	253
Swale	23
Total Number of SMP's	**718**

4.4.1 Inspections

While PWD has prescribed maintenance frequencies for GSI, practice and experience has determined that pre-maintenance inspections are the best method to determine the level of maintenance required. Each SMP that has surface features completed pre-maintenance surface inspections, while each SMP with subsurface features completed pre-maintenance subsurface inspections.

Inspection of Surface Elements

In FY18, PWD conducted 3,709 pre-maintenance surface inspections. The condition of the site at the time of the pre-maintenance inspection will determine whether maintenance is required.
PWD also performs dry weather and/or wet weather inspections for a more comprehensive assessment. By the conclusion of FY18, PWD completed 2,356 dry weather inspections and 178 wet weather inspections. In FY18, PWD conducted a total of 6,243 inspections.

Inspection of Subsurface Elements

The objective of the pre-maintenance subsurface inspection program is to observe and assess all structural components of SMPs that exist below street level. Inspections are performed in dry weather conditions as capturing discernable video during wet weather conditions is difficult. Inspection staff is certified through the National Association of Sewer Service Companies' (NASSCO) Pipeline, Manhole, and Lateral Assessment Certification Program.

PWD completed a total of 1,118 subsurface inspection work orders associated with the inspection of 367 SMPs and a total of 17.4 miles of pipe during FY18. The condition of the pipe at the time of the inspection will determine whether maintenance will be scheduled.

4.4.2 Maintenance

PWD's GSI maintenance program operates through three types of maintenance activities to adequately address the maintenance needs of PWD's GSI. Maintenance events associated with surface maintenance, subsurface maintenance and porous maintenance are summarized in **Table 4-3**.

Table 4-3: FY18 Summary of Maintenance Events by Type

Maintenance Work Order Type	Number of FY18 Events
Surface	**11,444**
Surface Maintenance -Routine	5,295
Surface - Mulching	454
Surface - Pruning	133
Surface Maintenance -Watering	1,151
Tree Maintenance	315
Surface Inlet Protection Maintenance	3,379
Work Zone Protection	368
Aesthetic	349
Surface Maintenance - Reactive	**229**
Surface Vegetation Repair	37
Surface Structural Repair	86
Green Infrastructure Request	71
Drainage Modification	35
Subsurface	**822**
Subsurface Maintenance	341
Inlet Cleaning	316
Subsurface Inlet Protection Maintenance	165
Porous	**15**
Routine Porous Maintenance	15
Restorative Porous Maintenance	0
Total	**12,510**

PowerCorpsPHL

Over the past decade, the City and PWD have implemented new strategies to promote the economic and social growth of the City and meet environmental, ecological and business missions. In support of these initiatives, and to augment PWD's GSI aesthetic maintenance responsibilities, PWD entered into partnership with PowerCorpsPHL. PowerCorps is a City of Philadelphia AmeriCorps initiative designed to engage youth, ages 18-26, which transforms lives through service and workforce development. **Table 4-4** summarizes the type and amount (in pounds) of material collected by PowerCorps in FY18.

Table 4-4: PowerCorpsPHL Trash Removal in FY18

Type of material collected	Amount collected (in pounds)	Amount collected (in tons)
Trash	9,394	4.7
Leaves and Organic Debris	3,453	1.7
Total	12,847	6.4

5.0 Green Stormwater Infrastructure through Private Development

5.1 Philadelphia Stormwater Management Regulations

The Philadelphia stormwater management regulations (PSWMR) were revised in January of 2006 and July of 2015, providing the foundation of the private sector's role in stormwater management. The City of Philadelphia requires stormwater management for land development projects in the City of Philadelphia with 15,000 or more square feet of earth disturbance. Plans for proposed projects must be submitted for conceptual review to pursue a zoning permit, while the submission of detailed stormwater management plans must receive a technical review and approval prior to pursuing obtaining a building permit. For the projects that proceed to construction, the installations of SMPs are inspected during construction. Active construction inspections are completed for both PSWMR and incentives projects. During FY18, PWD conducted 4,102 inspections during active construction in the combined sewer area. **Figure 5.2** displays the completed green infrastructure installed through private development and incentivized retrofits. A full list of complete private development projects can be found in **Appendix 3**. A summary of constructed GAs through private development projects by watershed are listed below in **Table 5-1**.

Table 5-1: Cumulative Completed Greened Acres by Watershed through Private Development

Watershed	Darby-Cobbs	Delaware	Pennypack	Tookany-Tacony/ Frankford	Schuylkill	Total
PSWMR GAs	10	229	5	60	207	**511**

Expedited Review

PWD offers a service level goal of no more than a fifteen-day review for all projects submitting for post-construction stormwater management plan review. However, projects that use preferred green stormwater management approaches are eligible for an expedited, five-day review. PWD offers two types of expedited review: 1) disconnection green review and 2) surface green review. The disconnection green review ensures redevelopment projects that disconnect 95% or more of the post-construction impervious area (DCIA) using features such as green roofs, porous pavement and new tree canopy will receive a review response within five days. The surface green review expands the number of eligible projects by including both new development and redevelopment projects that manage 100% of the post-construction DCIA through bioinfiltration and bioretention basins as well as the practices that qualify for the disconnection green review. In FY18, a total of twenty-four projects qualified for an expedited review in the combined sewer, with twenty-three projects selecting the disconnection green review and one project selecting the surface green review.

Green Roof Density Bonus

The Philadelphia Zoning Code offers incentives to projects citywide that install green roofs by providing exceptions to certain residential density rules. To be eligible for these exceptions, the project must be located in the designated zoning districts, involve at least 5,000 square feet of disturbance, and propose to cover at least sixty-percent (60%) of the roof with green roof. The green roofs are designed to PWD standards and inspected by PWD during construction. PWD also executes operation & maintenance agreements with the project owners, ensuring long-term maintenance and functionality of the green roof system. To date, the majority of projects submitting for this bonus were sized between 5,000 square feet and 15,000 square feet of disturbance, meaning the projects were not otherwise required to install stormwater management practices to comply with PSWMR. In FY18, a total of twelve projects took advantage of the green roof density bonus, ten of which were located in the combined sewer.

Construction Verification Initiative

PWD continued to refine a construction verification process with the goal of assessing individual projects prior to counting GAs toward compliance totals. This process emphasizes communication efforts from the start of the development project so property owners can adequately plan for record drawing creation. Throughout construction and at the time of construction completion, PWD conducts inspections of the site to observe and document installation of the approved SMPs. PWD also continued to perform outreach at the close of construction to solicit record drawings from project engineers and owners. These record drawings allow PWD to verify SMP installation and function.

In addition to this process, PWD continued to pursue a verification initiative to gather documentation of approvals that have not otherwise been verified and create record drawings to document the constructed conditions. To date, 122 projects totaling 161 GAs have been inspected and verified through this supplemental approach.

I-95 Reconstruction Project

Pennsylvania Department of Transportation (PennDOT) is performing reconstruction and expansion work on Interstate 95 (I-95) in Philadelphia. Three components of the I-95 reconstruction project support stormwater management: 1) disconnection of stormwater from the combined sewer system; 2) ensuring that redevelopment occurs in a manner consistent with the PSWMR; and 3) installation of GSI in the public right-of-way.

The work on I-95 in Philadelphia is broken into two sectors: Sector A and Sector B. The multi-phased work between Bleigh Avenue and Race Street is known collectively as Sector A. Sector A of the I-95 Reconstruction Project is divided into five major design sections, moving from north to south: CPR, BSR, BRI, AFC, and GIR. Each of these sections is further subdivided into a total of twenty-five construction subsections. Sector B encompasses the area from Race Street to Girard Point Bridge (airport side). At present, Sector B has two design sections delineated, Section CAP from Chestnut to Walnut, and Section CSP from Vine Street to Girard Point Bridge (stadium side). Some of the design and construction work for Sector B may be concurrent with the work in Sector A.

A graphic illustrating the I-95 Reconstruction Project sections is featured below in **Figure 5-1**.

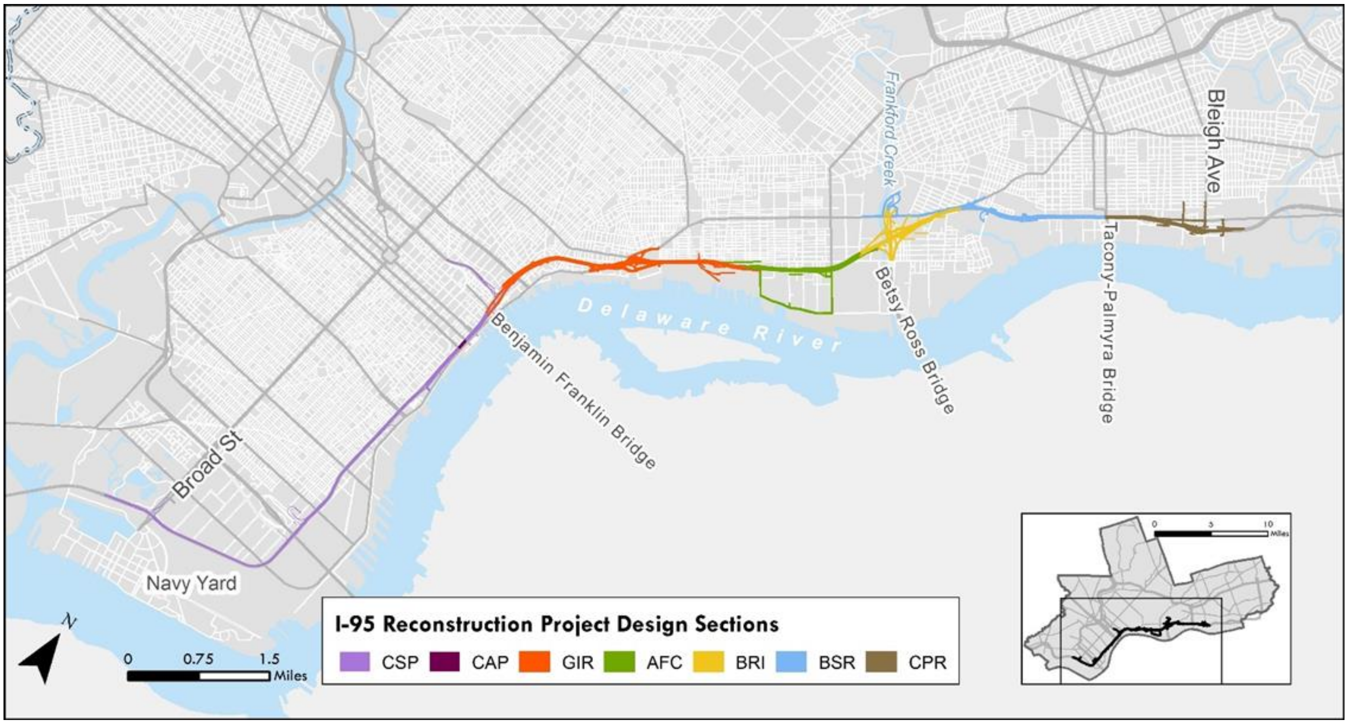


Figure 5-1: I-95 Reconstruction Project Sections

Project updates for the construction subsections with significant design or construction progress in FY18 are summarized in **Table 5-2**.

Table 5.2: I-95 Construction Section FY18 Updates and Anticipated Let Dates

Section	Project Update	Estimated Project Timeline
Sector A – Between Bleigh Avenue and Race Street		
Section CPR (Cottman-Princeton Ramp Area)		
CP2	Six new separate stormwater outfalls are under construction or completed. Pipes have been completed in Cottman Avenue, Princeton Avenue, Magee Avenue, Disston Street, and Unruh Avenue, and work is ongoing in Bleigh Avenue. The stormwater pipes are designed to accept the drainage from the highway as well as the area in between the highway and the Delaware River as development occurs.	2018, estimated completion
Section BSR (Bridge Street Ramp Area)		
BS1	This project is in preliminary design. Work will include the construction of stormwater management practice devices, routing stormwater away from combined flow conveyances, and construction of connections to City stormwater conveyances. Work may include construction of new stormwater trunk lines in City streets and construction of new stormwater discharge pipes to the Delaware River. At present, four bioretention/bioinfiltration basins are proposed; however, PennDOT is investigating whether to construct green streets to replace three of the four smaller basins.	2019, anticipated let date
BS4	New PWD storm sewers, inlets, and new outfalls will be installed to covey the new Adams Street runoff. Three basins with amended soils and impervious liners are being constructed to treat stormwater from the new interchange ramps.	2021, estimated completion
Section BRI (Betsy Ross Interchange Area)		
BR0	Construction is underway. PWD sanitary and storm sewer culverts will be relocated. Stormwater runoff from the reconstructed portions of the highway and ramps is being treated by under-drained bioretention and water quality units then directly discharged to the Frankford Creek, removing the drainage area from the CSO system.	2018, estimated completion
BR2	Basins built in BR0 will be reused in BR2 and new basins will be installed. The new basins will be sized for future phases as well. All basins will have forebays, be non-infiltrating, and have amended soils and underdrains with a rock layer and liner. The PennDOT-owned outfall locations in BR2 will be reconstructed in the same locations as existing outfalls.	2019, anticipated let date
Section AFC (Ann to Frankford Creek Area)		
AF1	Streetscape work within the Richmond Street right-of-way between Allegheny and Westmoreland is not subject to the stormwater regulations. Improvements to Melvale Street will be managed by two infiltration trenches that will be owned and maintained by PWD.	2021, estimated completion
Section GIR (Girard Avenue Interchange Area)		

Section	Project Update	Estimated Project Timeline
Sector A – Between Bleigh Avenue and Race Street		
GR1	The reconstruction of Richmond Street was managed by street trees and a bioretention basin. A new separate sewer system was constructed and connected below the regulators in Dyott Street and Cumberland Street.	2019, estimated completion
GR2	The mainline highway areas are managed by multiple bioretention basins along the side of the highway.	2017, completed
GR3/GR4	One separate sewer outfall was constructed in Cumberland Street, and PennDOT is evaluating whether a separate outfall can be constructed in Berks Street as part of GR4. In Dyott Street, a pipe was constructed and will tie in below the regulating chamber. A sewer was found in the old Leigh Avenue right of way and rehabilitated to separate a portion of the highway drainage. Stormwater will be managed in GR3 using bioretention basins, infiltration basins, and detention basins. The basins are designed to manage the water quality volume.	2019, estimated completion/2023, estimated completion
Sector B – Race Street to Girard Point Bridge (Airport Side)		**Planning Study Underway**
CAP - Bridge spanning I-95 between Chestnut and Walnut		**2021, estimated construction**
CAP - I-95 NB/SB between Race Street and Girard Point Bridge		**To be determined**

5.2 Incentives for Private Property Owners to Implement Green Stormwater Infrastructure

PWD offers incentives to private property owners to implement stormwater management practices on existing properties that reduce stormwater pollution to the City's sewers and surrounding waterways and enhance water quality in the region's watersheds. PWD, in partnership with the Philadelphia Industrial Development Corporation (PIDC), created the Stormwater Management Incentives Program (SMIP) in FY12 and Greened Acre Retrofit Program (GARP) in FY15 to reduce the cost for qualified non-residential PWD customers and contractors to design and install stormwater best management practices (BMP). **Figure 5-2** displays the completed green infrastructure installed through incentivized retrofits. A summary of completed GAs from incentivized retrofit projects by watershed are listed below in **Table 5-3.** A full list of completed incentivized retrofit projects is in Table 2 of **Appendix 3**.

Table 5-3: Cumulative Completed Greened Acres by Watershed through Incentivized Retrofits

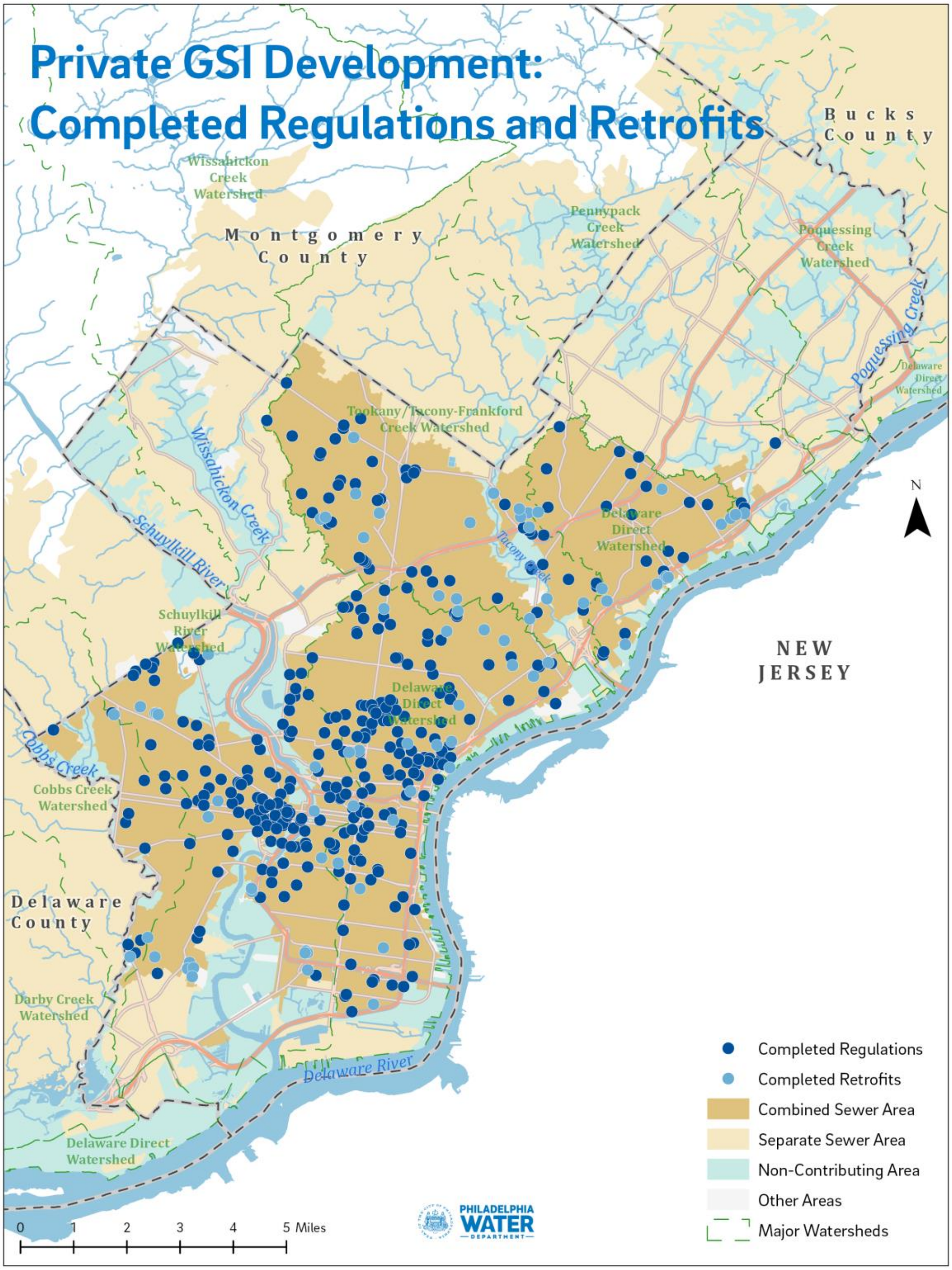
Watershed	Darby-Cobbs	Delaware	Pennypack	Tookany-Tacony/ Frankford	Schuylkill	Total
Incentivized GAs	0.2	113	29	120	129	**391**

Stormwater Pioneers

In 2014, PWD started Stormwater Pioneers, a recognition program for excellence in design and construction of stormwater management practices on private property. In 2018, PWD honored its fourth Stormwater Pioneer, Historic Germantown. The Historic Germantown project was a recipient of a SMIP grant and converted an old asphalt courtyard into a green space that sits atop a stormwater detention basin. In addition, Historic Germantown built a rain garden in their parking lot to manage the runoff that formally drained to the street and PWD's combined sewer.

The Stormwater Pioneers program brings elected officials, community members, private landowners and department officials together to recognize the importance of stormwater management on private property. In addition to coordinating a press event to celebrate each Stormwater Pioneer, PWD also creates a short video and written case study about each project to help other developers and business owners learn from these successful case studies. Visit http://phillywatersheds.org/stormwaterpioneers for more information.

Figure 5-2: Completed Regulations and Retrofit GSI projects



5.3 Post Construction Maintenance of Private Facilities

To ensure ongoing SMP maintenance of private facilities constructed through the stormwater management regulations, SMIP or GARP, PWD continues to use the following combination of tools: executing operation & maintenance agreements, conducting post-construction maintenance inspections, relying on enforcement, and administering stormwater credits.

In FY18, four projects were brought back into compliance in the combined sewer areas of the City using the protocols described below. PWD will continue to work with property owners to ensure that SMPs are inspected and maintained in accordance with regulations and recorded O&M agreements.

An operation & maintenance agreement between the property owner and PWD is executed and recorded against the property as part of the PWD post construction stormwater management plan process. These agreements outline the SMP(s) on the private site and stipulate maintenance requirements. The agreements also include language granting PWD the authority to inspect on-site SMPs and even perform maintenance on behalf of the property owner if necessary. PWD also maintains a comprehensive operations and maintenance manual for SMPs geared toward the private development community, available at: http://www.phila.gov/water/PDF/Retrofit-O.M.Manual.pdf.

Post-construction maintenance inspections of private facilities were conducted through the reporting period. PWD relies on specialized inspection techniques as well as visual inspections to assess the performance of private SMPs. The inspections conducted to date have identified the most effective methods and technologies, including closed-circuit television, ground penetrating radar, surveys of critical system elevation points, confined space, pole-mounted camera photography, and visual and wet weather inspections. In FY18, PWD performed eighty-one post-construction inspections in the combined sewer areas of the City. PWD will continue to evaluate and refine post-construction inspection protocols.

Turning to **enforcement**, PWD will issue notification to the property owner if a post construction stormwater management plan (PCSMP) is found to be insufficiently maintained. This notification includes a description of any issues identified and a timeline to achieve compliance. The City is authorized to compel maintenance of SMPs on private property under the Philadelphia Code and PWD Regulations. Development sites that are subject to PSWMR, as well as properties that have SMPs funded by SMIP and GARP, are required to maintain the SMP(s) to function as designed. If initial notification is unsuccessful at bringing action from the property owner, PWD can compel compliance through several enforcement tools, including notices of violation, fines, court action, and/or a nuisance abatement and lien by the City. For non-compliant projects, PWD will also suspend any applicable stormwater billing credits if the required maintenance is not performed.

Stormwater Credits

Non-residential property owners are eligible for stormwater credits, a direct reduction to the monthly stormwater charge, if they own and maintain stormwater management practices that reduce stormwater flows and volume to the City's sewer systems and surrounding waterways. Retrofit and development projects are eligible for credits against their stormwater charge upon completion of construction, and owners must renew their credits every four years. With the credits renewal application, owners may provide maintenance logs and/or PWD may perform an inspection to demonstrate that the SMPs continue to be functional. PWD approved or renewed 241 stormwater billing credit applications during the reporting period.

6.0 Data Collection and Analysis

6.1 Green Stormwater Infrastructure Post-Construction Monitoring

Proposed methodologies for the *Green City, Clean Waters* monitoring program were outlined in a revised CMP that was submitted on January 10, 2014 and approved on May 28, 2014 by PADEP.

Monitoring and testing green stormwater infrastructure is essential to evaluate its effectiveness in managing stormwater and reducing CSOs. PWD uses post-construction monitoring and post-construction testing at the SMP and system levels to ensure functionality, evaluate the performance of stormwater management practices and to provide information for improvements to design and maintenance. FY18 monitoring activities are described in detail in **Appendix 4 GSI Monitoring Status Report.** FY18 updates on non-green infrastructure components of the CMP can be referenced in **Section F.2 Step 1.b. of the Stormwater Management Program Annual Report.**

PWD has completed its 5-year green stormwater infrastructure pilot program and results were reported in the Year 5 Evaluation and Adaptation Plan. Information on the selected sites, associated variables and results are available here:
http://phillywatersheds.org/doc/Year5_EAPCombinedAppendices_website.pdf.

7.0 Public Outreach and Participation

PWD continues to enhance tools for engaging a broad range of stakeholders. In FY18, PWD engaged approximately 58,800 individuals through a variety of public education, outreach and participation initiatives. The following includes updates on current programs and projects.

7.1 Green Stormwater Infrastructure Notification & Outreach Process for Green Programs

In FY18, public education and outreach for green stormwater infrastructure in Philadelphia's neighborhoods grew with the number of projects going into the ground. During FY18, approximately 8,300 community members participated in 148 community meetings co-hosted with civic partners and events (such as tours, walks and festivals) to learn about green infrastructure projects and hold one-on-one conversations in neighborhoods across the city. Also, 1,912 customers attended Rain Check workshops and 902 green stormwater infrastructure tools were installed on private properties through Rain Check while sixteen organizations participated in Soak It Up Adoption, where they helped maintain the public green stormwater infrastructure at 114 sites and remove 66,380 lbs. of residential waste from these locations.

Furthermore, approximately 46,500 individuals participated in the following education and outreach events that featured *Green City, Clean Waters* and/or urban waters themed content:

- Environmental education programming offered by PWD educators and Fairmount Water Works educators
- Environmental education programming offered by Philadelphia Parks and Recreation (PPR) educators
- Environmental education and outreach programming offered in Philadelphia by the Tookany/Tacony-Frankford Watershed Partnership and Partnership for Delaware Estuary
- Environmental education and outreach by the Land Health Institute

It should be noted that the number of participants associated with Rain Check and Soak It Up Adoption are reported on in more detail in Section 7.2 of this report.

7.2 Public Education and Outreach Programs

Philadelphia Water Department Master List

The Philadelphia Water Department master list is the previously referenced *Green City, Clean Waters* partners master list, which is a distribution list of email addresses that gets updated after collecting contact information at public events and meetings hosted by PWD. By the conclusion of FY18, there were 16,731 live entries on the list. This number reflects the number of individuals confirmed through the email management system as participants with accurate contact information and those specifically interested in receiving email updates and e-newsletters regarding PWD special initiatives and events. Any contacts found to be redundant or nonresponsive were removed from the master list in June 2015 and are not represented in this number.

Green City, Clean Waters Signage

PWD continued to develop the interpretive *Green City, Clean Waters* permanent signage, which included new designs, more fabrication and additional installation of the signage. This process also included site visits, coordination with property owners/partners, and promotion of the signage. To date, PWD has installed a total of 112 *Green City, Clean Waters* interpretive signs at 79 sites. For images of the installed signage, please visit:
https://www.flickr.com/photos/philadelphiawater/sets/72157654299547526.

Stormwater Art

PWD uses design and art as one of many public engagement tools. Projects such as yarn bombing (temporary knitted yarn art) of stormwater tree trenches, rain barrel wrap original designs created by local students, and temporary public street art projects are examples of opportunities to engage residents through visual learning. In FY17, PWD and Mural Arts partnered with muralist, Paul Santoleri, on a concept for a mural for the Roxborough Pocket Park which demonstrates the power of de-paving in a community space. In FY18, PWD, Mural Arts and Paul Santoleri brought the concept to life. Today, the Roxborough pocket park hosts a mural that depicts the watershed theme. In FY18, PWD also teamed up with the Pennsylvania Horticultural Society (PHS) on a concept for a mural at 11th and Arch Streets, which depicts the connections between urban greening and water in Philadelphia. A third concept for a mural was developed with Mural Arts to focus on improving the perception of tap water in the City. PWD and Mural Arts also worked with *Uncover the Green, 2016,* artists to further develop their designs for fabrication-ready purposes. The goal is to place them on sidewalks either adjacent to green stormwater infrastructure, or use them as educational tool at meetings and events.

Figure 7-1: Completed "Watershed" Mural, Spring, 2018, Paul Santoleri

Homeowner's Stormwater Handbook – Smart Stormwater Management: A How-to for Homeowners

In FY17, PWD and the Partnership for the Delaware Estuary distributed an updated version of the original Homeowners Guide to Stormwater Management to residents. This document includes tips and information that can guide homeowners on the latest tools and resources. The document is still relevant and continues to be distributed today.

Soak It Up Adoption

In FY18, two new organizations were accepted into the Soak It Up Adoption program (Centennial Parkside CDC & Make the World Better), creating a program comprised of sixteen organizations with forty-four individuals acting as Adoption representatives. Throughout the fiscal year, Adoption partners engaged residents and completed several community events highlighting their adopted infrastructure. These events included: guided tours, tabling sessions at local public events, and presentations at civic association meetings.

Information and/or photos from Soak It Up events are available at the following links:

http://water.phila.gov/blog/explore-phillys-water-parks-love-story-during-love-your-park-week

https://green-philly-blog.ticketleap.com/climate-change-green-economy-roundtable/

http://planphilly.com/articles/2018/08/02/rain-rain-flows-away-no-longer-puddles-at-malcolm-x-park

http://water.phila.gov/blog/malcolm_x_green_tools_ribboncutting

Table 7-1 Provides metrics used by PWD to track the Soak It Up Adoption program throughout FY18. These figures reflect the variety of adopted SMPs and the amount of trash collected.

Table 7-1: Soak It Up Adoption Metrics for FY18

Soak It Up Adoption Partner List	Number of SMPs Adopted in FY18	*Amount of Residential Waste Collected in FY18 (LBS)	Number of Residents Engaged in FY18
Asociacion Puertorriquenos en Marcha	14	1,105	33
Centennial Commons CDC	7	6,060	50
East Falls Development Corporation	6	483	2
Empowered CDC	1	1,925	20
Frankford CDC	2	9,553	2
Greensgrow-West	17	3137	10
Make the World Better	2	0	0
New Kensington CDC	9	3,778	360
Newbold CDC	9	8.014	25
Northeast Treatment Center	6	10,819	20
Northern Liberties Neighbors Assoc.	11	170	100
Philadelphia Parks Alliance	2	4,705	25
Southwest CDC	14	2,317	610
TTF-Friends of Vernon Park	1	1,689	300
Upper Roxborough Conservancy	2	2,994	100
Urban Tree Connection	11	9,625	3
TOTALS:	**114 SMPs**	**66,380 lbs.**	**1,660 participants**

*All Adoption partners collect trash in 55-gallon bags and the total pounds are converted from this base unit

Urban Waters Curriculum

The Fairmount Water Works (FWW), in partnership with the School District of Philadelphia (SDP) and its GreenFutures Plan for Sustainability, continues to fine-tune its "Understanding the Urban Watershed" curriculum (Curriculum Project) and "sustainabilize" the content. This locally-oriented, field-tested curriculum was developed over three years by SDP teachers, integrating urban watershed education with core science and English standards for middle school students in grades six through eight. This program provided high-quality experiences to fifty-four teachers and at least 1500 students, increasing learning and environmental stewardship and serving as a model for future replication.

The Curriculum Project's educational impact has been broadened by a new design for the curriculum website which is navigable on multiple platforms. To date, approximately 300 usernames and passwords have been requested by individuals representing institutions across the country including: University of Vermont, Chesapeake Bay Foundation, High School of the Hudson Valley, and Great Lakes Stewardship.

Support and interest for the Curriculum Project continues with a 1-year planning grant to develop and pilot a place-based STEM Teacher Leadership Program to support the SDP GreenFutures Plan. Additionally, FWW received a 2-year grant from the PA Department of Environmental Protection to recruit new teachers for the project (one-week summer training sessions were completed in 2017 and 2018).

The Curriculum Project has gained notice both regionally and nationally and was described as cutting edge by the US Green Building Council's Center for Green Schools' Leadership. The work has been presented at several national conferences including place-based education conference in Michigan and the green schools in Denver.

The long-term strategic goals of the Curriculum Project includes: constituency building for PWD (teachers, students, school administration) by connecting the school with PWD projects specific to the neighborhood/school community while integrating the projects into the classroom curriculum, and developing a model program for SDP GreenFutures Five Year Plan to integrate Education for Sustainability in all schools.

GreenSTEM Network

The GreenSTEM Network continues to connect students to the environment through hands-on science and technology projects involving environmental monitoring and data collection.

In FY18, PWD staff worked with more than 100 students from six different groups from a variety of schools and grade levels. The projects ranged from one-day workshops to weekly, year-round instruction centered on coding, sensor technology and robotics.

7.3 Green Homes Initiatives

Green Homes Technical Evaluation and Improvement

PWD continues to pilot, monitor and evaluate residential green tools and tracking technology improvements for these tools. In FY18, several residential tools were evaluated including new designs for rain barrels and cisterns, and vertical planted systems that manage stormwater.

Downspout Planter Technology Improvements

PWD finalized the design for a metal downspout planter made from commercially available stock tanks. This planter can manage more stormwater at a lower cost than previous designs. PWD tested the planter throughout the year and now distributes the planter through the Rain Check program.

The Department has also continued to evaluate other residential stormwater tools including modified rain barrels, cisterns and planters for future use through the Rain Check program.

Figure 7-2: New Metal Downspout Planter

Rain Check Program

In FY18, the number of participants in the Rain Check program increased considerably and PWD made significant improvements in program management and data tracking. PWD also revamped the website and held the first workshop with an interpreter for the deaf community. More information on the program is available at: http://www.pwdraincheck.org.

Table 7-2: Rain Check Program Metrics

Rain Check Metrics	FY18
Workshops Hosted	76
Workshop Attendees*	1,912
Contractor Training Participants	N/A
Rain Barrel Installations**	710
Downspout Planter Installations**	90
Rain Garden Installations**	20
Permeable Paving Installations**	78
Depaving Projects	4

*__Workshop Attendees__: This represents the total number of people who attended a Rain Check workshop. These hour-long educational workshops are mandatory for participation in Rain Check. Some FY18 attendees had their tools installed in FY18 but others will have their tools installed in FY19.

**__Installations Completed__: PWD installed 710 rain barrels and 192 other stormwater tools by the end of FY18. For some participants who signed up this year, the installation of their tools is still in progress.

Appendix 1

Completed Public Green Stormwater Infrastructure Projects

Public Green Infrastructure Reporting Metrics

Table 1: Public Completed Project Tracking Metrics and Reporting Format

Public Completed Project Tracking Metrics											
Work Number	Project ID	Construction Completion Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acres (acre-inch)	SMP Type(s)	Program	Green Construction Cost**	Partner(s)	Watershed

Over the past year, PWD's new capital projects tracking system's (CIPIT) interaction with its GSI tracking system (GreenIT) has slightly changed. To accommodate this change, we have replaced Project Names with a Work Number and a Project ID. The Project ID is unique to individual projects and these projects can be bundled under one Work Number for bidding purposes. Moving forward, Work Numbers will have a 1:1 relationship with projects.

Table 2: Public Reporting Metric Definitions

Metric	Definition
Work Number	Work Number is a unique assigned identifier from the CIPIT program. A CIPIT work number is attached to construction proposals, bids, work orders, contracts and invoices.
Project ID	This is a unique number, which is assigned automatically by the system when the project is created.
Status	Current project status. Statuses include: In Design, In Projects Control (Under Contract Management), In Construction, and Construction Complete.
Storage Volume	The volume of runoff managed by the system. For all systems, the entire depth of the system is counted, except for detention/slow-release systems that are completely lined with an impermeable liner. For those systems, only the depth above the orifice is counted.
New Trees	Total number of new trees planted in association with a system. This number also includes non-SMP trees, which are trees planted as part of a project but are not part of a stormwater management system.
Drainage Area	Area, in square footage, of impervious and/or pervious surface(s) flowing into a system(s) and SMP(s).
Greened Acres (GAs)	Greened Acres is a metric that accounts for the conversion of a highly impervious urban landscape through the implementation of projects that reduce storm water runoff. A Greened Acre is described as an acre of impervious cover connected (tributary) to a combined sewer that subsequently is reconfigured to utilize green stormwater infrastructure to manage at least one inch of stormwater runoff. If storage is provided, systems can credit up to two inches of the storm water runoff from that acre. The best available Greened Acre value is pulled from the database for regulatory reporting.
Stormwater Management Practice (SMP) Type	A Stormwater Management Practice is a technique that controls the rate and volume of stormwater runoff and/or improves runoff water quality. Multiple SMP types can be grouped together in a larger GSI system. The SMP types were originally defined in Table 2-1 of the IAMP.
Program	Current public programs which a greened acre can be assigned to include: • Alleys/Driveways • Campuses

Metric	Definition
	• Facilities • Industry and Business • Open Space • Parking • Schools • Streets • Vacant Land
Construction Cost	Projects with a status of Construction Complete will have a finalized cost of construction provided.
Partner(s)	External entities involved in a project.
Watershed	The City of Philadelphia watershed where the project is located. Four of the City's seven watersheds fall at least partially within the combined sewer area. These watersheds are: • Cobbs Creek Watershed • Delaware Direct Watershed • Tookany/Tacony-Frankford Creek Watershed • Schuylkill River Watersheds

Table 3: Public SMP Definitions

Public SMP Type Definitions	
Field/Metric	**Definition/Purpose**
Basin*	A stormwater basin is a basin or depression that is vegetated with mowed grass. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Blue Roof	A blue roof is a storage system designed into a roof surface such that the roof retains stormwater. Blue roofs are designed to reduce the rate of stormwater runoff.
Bump-out*	A stormwater bump-out is a vegetated curb extension that intercepts gutter flow. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Cistern/Rain Barrel	A cistern/rain barrel is a tank or storage receptacle that captures and stores runoff and can thereby reduce runoff volume. The stored water may be used to serve a variety of non-potable water needs (e.g., irrigation).
Depaving	Depaving projects remove existing impervious pavement and restore the surface with grass, other types of vegetation, or loose materials (stone, mulch, etc.) such that the area can thereafter be considered pervious area. Depaving projects remove contributing impervious area from the sewer system.
Drainage Well	A stormwater drainage well is manhole structure designed to manage stormwater runoff by receiving stormwater from upstream collection and pretreatment systems and then discharging the stormwater into the surrounding soils through perforations in the manhole. It is designed to infiltrate stormwater.
Green Gutter	A green gutter is a narrow and shallow landscaped strip along a street’s curb line. It is designed to manage stormwater runoff by placing the top of the planting media in the green gutter lower than the street’s gutter elevation allowing stormwater runoff from both the street and sidewalk to flow directly into the green gutter. It is designed to slowly infiltrate stormwater.
Green Roof	A green roof is a vegetated surface installed over a roof surface.

Public SMP Type Definitions	
Infiltration/Storage Trench	An infiltration/storage trench is a subsurface structure designed to detain and release stormwater runoff and/or infiltrate where feasible.
Non-SMP Tree	A non-SMP tree is a planted tree that does not have stormwater directed to it.
Pervious Paving	Pervious paving is a hard permeable surface commonly composed of concrete, asphalt or pavers. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Planter*	A stormwater planter is a structure filled with soil media and planted with vegetation or trees. It is designed to detain and release stormwater runoff and/or infiltrate where feasible. Planters often contain curb edging or fencing as barrier protection around the planter.
Rain Garden	A rain garden is a shallow vegetated area designed to detain and release stormwater runoff and/or infiltrate where feasible. Rain gardens may also be referred to as bio-infiltration basins and bio-retention basins. They are typically integrated into landscape features (e.g. median strips) and are non-mowed areas.
Stormwater Tree	A stormwater tree is planted in a specialized tree pit that has stormwater runoff directed to its pit. It is designed to manage stormwater by placing the top of the planting media in a tree pit lower than the street's gutter elevation and connecting the tree pit to an inlet which directs runoff from the street into the tree pit. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Swale	A swale is a channel designed to convey stormwater. It can be designed to attenuate and/or infiltrate where feasible.
Tree Trench*	A stormwater tree trench is a subsurface infiltration/storage trench that is planted with trees. They are typically linear features that are constructed between the curb and the sidewalk. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Wetland*	A stormwater wetland is a vegetated basin designed principally for pollutant removal. It typically holds runoff for periods longer than 72 hours and may include a permanent pool. Wetlands can also detain and release stormwater runoff.

*The word 'stormwater' was previously included in these types but was removed because it was redundant.

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50016	196	5/1/2006	360	4	0.32	0.1	Rain Garden, Swale	Streets	$57,850	Pennsylvania Department of Environmental Protection, Philadelphia Water Department, Pennsylvania Horticulture Society	Schuylkill
50013	208	7/1/2006	830	4	0.40	0.2	Pervious Pavement, Tree Trench	Streets	$66,050	Pennsylvania Department of Environmental Protection, Pennsylvania Horticulture Society, Philadelphia Department of Recreation	Schuylkill
50014	181	4/1/2007	1260	7	0.44	0.3	Rain Garden	Vacant Land	$16,000	Pennsylvania Department of Environmental Protection, Pennsylvania Horticulture Society, University City Green	Schuylkill
50012	186	10/1/2007	4563	0	1.20	1.3	Rain Garden	Open Space	$175,000	Pennsylvania Department of Environmental Protection, Pennsylvania Horticulture Society, Philadelphia Department of Parks & Recreation	TTF
50015	185	11/1/2007	3080	0	0.75	0.8	Infiltration Storage Trench	Open Space	Cost Not Available	Pennsylvania Department of Environmental Protection, Pennsylvania Department of Conservation & Natural Resources, Philadelphia Department of Parks & Recreation	Schuylkill
50131	1131	6/1/2008	347	3	0.08	0.1	Rain Garden	Streets	Cost Not Available		Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
40659	207	7/1/2008	1836	8	0.31	0.5	Pervious Pavement, Planter, Tree Trench	Streets	$50,000	Pennsylvania Horticulture Society, Philadelphia Department of Recreation	TTF
50011	194	6/1/2009	849	24	0.18	0.2	Rain Garden	Open Space	$22,236	Northern Liberties Neighborhood Association, Pennsylvania Department of Environmental Protection, Pennsylvania Horticulture Society, Philadelphia Department of Parks & Recreation	Delaware
40330	289*	1/27/2010	1601	17	0.63	0.4	Infiltration Storage Trench, Stormwater Tree	Streets	$209,000		Delaware
50006	187	5/26/2010	922	0	0.18	0.3	Infiltration Storage Trench, Planter	Streets	$65,506	Department of Public Property, Department of Recreation, Friends of Columbus Square	Delaware
50024	170	10/10/2010	3033	6	0.40	0.8	Tree Trench	Open Space	$50,000	New Kensington Community Development Corporation, Pennsylvania Horticulture Society, Philadelphia Department of Parks & Recreation	Delaware
50033	46	11/1/2010	6091	17	0.96	1.6	Bump-out, Rain Garden, Swale, Tree Trench	Streets	Partner-project, no capital investment by PWD	Environmental Protection Agency, Philadelphia Department of Commerce, Philadelphia Industrial Development Corporation	Schuylkill
50005	1*	11/10/2010	3556	6	1.02	1.0	Tree Trench	Streets	$402,396	Pennsylvania Horticulture Society	Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50005	9*	11/10/2010	1273	5	0.21	0.3	Tree Trench	Streets		New Kensington Community Development Corporation, Pennsylvania Horticulture Society	Delaware
50005	18*	11/10/2010	609	8	0.34	0.2	Tree Trench	Streets			Schuylkill
40577	441*	4/8/2011	6976	29	4.11	1.9	Infiltration Storage Trench, Stormwater Tree	Streets	$924,000		TTF
50009	20*	5/14/2011	4423	13	1.20	0.4	Infiltration Storage Trench, Planter, Tree Trench	Streets	$112,477		TTF
50035	45	6/1/2011	3561	0	0.68	1.0	Infiltration Storage Trench	Streets	$215,600	Fairmount Park Commission	Schuylkill
40224	240	7/18/2011	657	0	0.11	0.2	Pervious Pavement	Streets	$48,283		Delaware
50002	8*	11/4/2011	3386	3	1.13	0.9	Rain Garden, Tree Trench	Streets	$173,494	Department of Recreation, New Kensington Community Development Corporation, Pennsylvania Horticulture Society	Delaware
50032	180	11/5/2011	646	4	0.11	0.2	Tree Trench	Streets	Partner-project, no capital investment by PWD	Pennsylvania Horticulture Society	Delaware
50032	324	11/5/2011	768	4	0.16	0.2	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware
50032	325	11/5/2011	1088	4	0.22	0.3	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware
50032	326	11/5/2011	1047	6	0.41	0.3	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50032	327	11/5/2011	1029	4	0.21	0.3	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware
50032	342	11/5/2011	1292	4	0.29	0.4	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware
50022	13	12/16/2011	402	13	0.16	0.1	Infiltration Storage Trench	Open Space	Partner-project, no capital investment by PWD	City Play, Digsau, Northern Liberties Neighborhood Association, Philadelphia Department of Parks & Recreation	Delaware
50063	310	5/2/2012	10798	20	1.97	2.9	Rain Garden	Parking	All done in house by PWD; No bid costs.	Department of Public Property	Delaware
50046	243*	9/27/2012	3539	7	1.06	1.0	Infiltration Storage Trench, Rain Garden, Swale	Open Space	$574,200	Tookany/Tacony-Frankford Watershed Partnership, Philadelphia Department of Parks & Recreation, Frankford Civic Association	TTF
50023	192	10/2/2012	2689	12	0.33	0.5	Infiltration Storage Trench, Pervious Pavement, Rain Garden	Open Space	$190,959	Philadelphia Capital Program Office, Philadelphia Department of Parks & Recreation	Delaware
50027	59*	11/23/2012	3251	5	0.52	0.9	Tree Trench	Streets	$1,083,720	Pennsylvania Environmental Council	Cobbs-Darby
50027	212*	11/23/2012	4222	15	0.79	1.2	Tree Trench	Streets		Pennsylvania Environmental Council	Cobbs-Darby
50027	213*	11/23/2012	5456	19	0.99	1.5	Tree Trench	Streets		Department of Recreation, Pennsylvania Environmental Council	Cobbs-Darby

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50027	214*	11/23/2012	2804	11	0.45	0.8	Tree Trench	Streets			Cobbs-Darby
50027	215*	11/23/2012	6421	16	1.04	1.8	Tree Trench	Streets		Pennsylvania Environmental Council	Cobbs-Darby
50043	279*	12/4/2012	2996	0	0.56	0.8	Basin	Open Space	$521,400	Philadelphia Department of Parks & Recreation	TTF
50043	281*	12/4/2012	4567	0	0.89	1.3	Rain Garden	Open Space		Philadelphia Department of Parks & Recreation	TTF
50054	285	12/6/2012	1497	6	0.35	0.4	Tree Trench	Streets	Unknown		Delaware
50026	210*	12/13/2012	7551	42	1.49	2.1	Infiltration Storage Trench, Tree Trench	Streets	$1,717,800	Pennsylvania Environmental Council	Cobbs-Darby
50026	211*	12/13/2012	9624	27	1.47	2.4	Bump-out, Planter, Tree Trench	Streets		Pennsylvania Environmental Council	Schuylkill
50026	216*	12/13/2012	4551	14	1.02	1.3	Tree Trench	Streets		Pennsylvania Environmental Council	Cobbs-Darby
50026	231*	12/13/2012	9728	39	1.82	2.7	Bump-out, Planter, Tree Trench	Streets		Pennsylvania Environmental Council	Cobbs-Darby, Schuylkill
40599	233	12/20/2012	1263	1	0.34	0.3	Infiltration Storage Trench	Streets	$26,835		Delaware
50028	175*	12/24/2012	4045	20	0.74	1.1	Tree Trench	Streets	$672,320		Delaware
50028	176*	12/24/2012	2401	14	0.47	0.7	Tree Trench	Streets			Delaware
50028	177*	12/24/2012	6106	10	0.97	1.6	Tree Trench	Streets			Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50028	178*	12/24/2012	3566	6	0.48	0.9	Tree Trench	Streets		Fairmount Park Commission, Pennsylvania Horticulture Society	Delaware
40796	1086	12/27/2012	1006	35	0.00	0.3	Stormwater Tree	Streets	$150,000		Delaware
50031	123	1/15/2013	4825	12	1.06	1.3	Rain Garden, Tree Trench	Streets	$218,321		Cobbs-Darby, Schuylkill
50003	12*	2/8/2013	2593	11	0.77	0.7	Infiltration Storage Trench, Planter, Tree Trench	Streets	$458,633	City Play, Mural Arts Program, Northern Liberties Neighborhood Association	Delaware
50003	91*	2/8/2013	1463	7	0.36	0.4	Bump-out, Tree Trench	Streets	$458,633	Northern Liberties Neighborhood Association	Delaware
40662	218	3/5/2013	10468	0	1.30	1.0	Bump-out	Streets	Partner-project, no capital investment by PWD	Philadelphia Streets Department	Schuylkill
50020	2*	4/23/2013	1817	7	0.54	0.5	Infiltration Storage Trench, Rain Garden, Tree Trench	Streets	$745,800	Pennsylvania Horticulture Society	Delaware
50020	157*	4/23/2013	3077	19	0.73	0.8	Tree Trench	Streets		Department of Recreation	Delaware
50020	245*	4/23/2013	974	7	0.21	0.3	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware
50020	296*	4/23/2013	1034	4	0.19	0.3	Tree Trench	Streets		Pennsylvania Horticulture Society	Delaware
50020	312*	4/23/2013	2313	7	0.55	0.6	Tree Trench	Streets		Department of Recreation	Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50029	147*	5/10/2013	1016	32	0.49	0.2	Infiltration Storage Trench	Streets	$1,577,800	Department of Recreation	TTF
	179*	5/10/2013	31170	80	5.27	8.6	Tree Trench	Streets			TTF
50038	247*	5/16/2013	3566	7	0.52	1.0	Tree Trench	Streets	$1,348,200	Department of Public Property	Schuylkill
	258*	5/16/2013	3728	23	0.68	1.0	Tree Trench	Streets			Schuylkill
	259*	5/16/2013	8933	18	1.27	2.5	Tree Trench	Streets			Schuylkill
	260*	5/16/2013	4471	20	0.74	1.2	Tree Trench	Streets			Schuylkill
	261*	5/16/2013	1604	6	0.21	0.4	Tree Trench	Streets			Schuylkill
	262*	5/16/2013	2029	4	0.38	0.6	Tree Trench	Streets			Delaware
50047	366	5/29/2013	6510	5	1.20	1.8	Infiltration Storage Trench, Planter, Rain Garden	Streets	$357,687	Philadelphia Department of Parks & Recreation, Philadelphia Zoo	Schuylkill
50080	588	6/13/2013	2265	25	0.88	0.5	Rain Garden	Streets	Partner-project, no capital investment by PWD	DRWC	Delaware
50082	597	7/31/2013	481	0	0.09	0.1	Infiltration Storage Trench	Streets	Partner-project, no capital investment by PWD	Southeastern Transportation Authority	Schuylkill

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50056	403	9/8/2013	3556	10	0.43	0.9	Infiltration Storage Trench, Pervious Pavement, Rain Garden, Swale	Schools	$362,000	Environmental Protection Agency	Delaware
50037	250*	9/9/2013	6497	29	1.10	1.8	Tree Trench	Streets	$1,627,500		Schuylkill
50037	251*	9/9/2013	3614	13	0.56	1.0	Tree Trench	Streets			Schuylkill
50037	252*	9/9/2013	2933	15	0.61	0.8	Tree Trench	Streets			Schuylkill
50037	253*	9/9/2013	5890	39	1.31	1.6	Tree Trench	Streets			Schuylkill
50037	254*	9/9/2013	2869	4	0.55	0.8	Tree Trench	Streets			Schuylkill
50037	255*	9/9/2013	5776	9	0.97	1.6	Tree Trench	Streets			Cobbs-Darby
50037	256*	9/9/2013	3189	3	0.61	0.9	Tree Trench	Streets			Schuylkill
50037	257*	9/9/2013	2921	12	0.58	0.8	Tree Trench	Streets			Schuylkill
50001	14*	9/17/2013	1977	0	0.45	0.5	Infiltration Storage Trench, Rain Garden	Streets	$965,800	Department of Recreation, Passyunk Square Civic Association	Delaware
50001	15*	9/17/2013	2930	5	0.55	0.4	Planter, Tree Trench	Streets		Passyunk Square Civic Association	Delaware
50001	16*	9/17/2013	1112	5	0.22	0.3	Tree Trench	Streets		Department of Recreation, Passyunk Square Civic Association, South Philadelphia Older Adult Center	Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50001	162*	9/17/2013	5197	13	0.96	1.4	Bump-out, Tree Trench	Streets		Department of Recreation	Delaware, Schuylkill
50001	313*	9/17/2013	1452	0	0.27	0.4	Infiltration Storage Trench, Planter	Streets		Department of Recreation, Passyunk Square Civic Association, South Philadelphia Older Adult Center	Delaware
50034	10*	9/20/2013	3921	4	0.80	1.1	Bump-out, Tree Trench	Streets	$638,960	New Kensington Community Development Corporation, Pennsylvania Horticulture Society	Delaware
50034	88*	9/20/2013	3866	1	0.71	1.1	Infiltration Storage Trench, Rain Garden, Tree Trench	Streets		New Kensington Community Development Corporation, Pennsylvania Horticulture Society	Delaware
50042	271*	9/30/2013	7709	3	1.19	2.0	Infiltration Storage Trench, Rain Garden, Tree Trench	Streets	$1,875,300	Philadelphia Department of Parks & Recreation, Tacony Civic Association	Delaware
50042	272*	9/30/2013	12714	13	2.03	3.4	Infiltration Storage Trench, Tree Trench	Streets		Tacony Civic Association	Delaware, TTF
50042	273*	9/30/2013	5752	35	0.82	1.6	Tree Trench	Streets		Tacony Civic Association	Delaware
50042	274*	9/30/2013	8439	6	1.27	2.2	Infiltration Storage Trench, Planter, Tree Trench	Streets		Roosevelt Playground Park Advisory Council, Tacony Civic Association	Delaware
50042	275*	9/30/2013	1968	2	0.27	0.5	Tree Trench	Streets		Tacony Civic Association	Delaware
50010	19*	10/14/2013	16144	36	2.50	4.2	Tree Trench	Streets	$1,039,450	Department of Recreation	Schuylkill

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50025	223*	10/22/2013	2573	18	0.52	0.7	Tree Trench	Streets	$1,184,930	Lower Moyamensing Civic Association	Delaware
50025	224*	10/22/2013	6569	12	1.10	1.8	Tree Trench	Streets			Delaware
50025	226*	10/22/2013	2905	20	0.54	0.8	Tree Trench	Streets			Schuylkill
50025	227*	10/22/2013	4723	19	0.97	1.3	Tree Trench	Streets			Schuylkill
40368	234	10/24/2013	7215	35	1.44	2.0	Tree Trench	Streets	$184,925		Delaware
50007	21*	10/31/2013	2189	6	0.60	0.6	Rain Garden	Open Space	$297,000	Fairmount Park Commission, Pennsylvania Horticulture Society, Philadelphia Department of Parks & Recreation	Cobbs-Darby
50041	167*	1/13/2014	9885	33	1.74	2.7	Tree Trench	Streets	$1,272,600	Snyderville Community Development Corporation	Schuylkill
50041	264*	1/13/2014	4488	13	0.81	1.2	Planter, Tree Trench	Streets		Snyderville Community Development Corporation	Cobbs-Darby
50041	265*	1/13/2014	8287	12	1.45	2.3	Infiltration Storage Trench, Tree Trench	Streets		Snyderville Community Development Corporation	Cobbs-Darby
50041	266*	1/13/2014	3312	6	0.77	1.5	Infiltration Storage Trench, Rain Garden	Streets		Snyderville Community Development Corporation	Cobbs-Darby
50036	50*	4/25/2014	3353	5	0.64	0.9	Bump-out, Tree Trench	Streets	$693,670	Philadelphia Department of Parks & Recreation	Delaware, Schuylkill
50036	228*	4/25/2014	1189	2	0.21	0.3	Tree Trench	Streets		Philadelphia Department of Parks & Recreation	Delaware
50036	277*	4/25/2014	4880	11	0.84	1.3	Tree Trench	Streets			Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50036	278*	4/25/2014	4885	5	0.88	1.3	Tree Trench	Streets			TTF
50075	479	6/13/2014	8738	0	1.50	2.4	Rain Garden	Schools	$207,000	Philadelphia School District, Philadelphia Department of Parks & Recreation, Trust for Public Land	Delaware
50057	417	7/8/2014	2326	0	0.28	0.6	Rain Garden	Streets	$34,123	Philadelphia Streets Department, Ogontz Avenue Revitalization Corporation, Mayors Office of Transportation & Utilities	TTF
50039	268*	8/1/2014	4225	9	0.89	1.2	Infiltration Storage Trench, Tree Trench	Streets	$978,020		Delaware
50039	269*	8/1/2014	7687	21	1.11	2.0	Tree Trench	Streets			Delaware
50039	270*	8/1/2014	6641	11	0.61	1.2	Tree Trench	Streets			Delaware
50039	283*	8/1/2014	1985	1	0.34	0.5	Tree Trench	Streets		Philadelphia Housing Authority	Delaware
50019	17*	11/25/2014	3650	5	0.64	1.0	Bump-out, Infiltration Storage Trench, Tree Trench	Streets	$1,059,450	Department of Recreation, Friends of Dickinson Park, Southeastern Transportation Authority	Delaware
50019	79*	11/25/2014	619	1	0.10	0.2	Infiltration Storage Trench,	Streets		Lower Moyamensing Civic Association	Delaware
50019	81*	11/25/2014	2980	2	0.56	0.8	Infiltration Storage Trench, Tree Trench	Streets		Lower Moyamensing Civic Association	Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50019	154*	11/25/2014	9882	15	1.67	2.7	Tree Trench	Streets		Tookany/Tacony-Frankford Watershed Partnership	TTF
50044	280	1/21/2015	37176	69	5.21	10.2	Infiltration Storage Trench, Rain Garden, Swale	Open Space	$2,360,400	Philadelphia Department of Parks & Recreation	TTF
50044	282	1/21/2015	41165	7	4.77	9.5	Rain Garden	Open Space		Philadelphia Department of Parks & Recreation	TTF
50051	392	2/3/2015	9534	8	1.69	2.6	Tree Trench	Streets	$2,686,122		Cobbs-Darby
50051	393	2/3/2015	14315	9	3.08	3.9	Infiltration Storage Trench, Rain Garden, Tree Trench	Streets		Philadelphia Department of Parks & Recreation	Schuylkill
50051	394	2/3/2015	5490	6	0.94	1.5	Infiltration Storage Trench, Tree Trench	Streets			Schuylkill
50051	396	2/3/2015	6555	17	1.63	1.8	Tree Trench	Streets			Schuylkill
50051	397	2/3/2015	5678	8	1.13	1.6	Tree Trench	Streets			Schuylkill
50051	398	2/3/2015	12399	18	2.59	3.1	Tree Trench	Streets			Cobbs-Darby, Schuylkill
50065	367	5/14/2015	2726	7	0.85	0.8	Infiltration Storage Trench, Rain Garden	Open Space	$235,015	Department of Public Property, Philadelphia Department of Parks & Recreation	Delaware
40771	301	8/26/2015	4630	10	0.70	1.3	Pervious Pavement, Tree Trench	Streets	$133,192		Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50085	574	10/8/2015	1609	5	0.33	0.4	Infiltration Storage Trench, Rain Garden	Open Space	$152,300	Philadelphia Department of Parks & Recreation, Councilman Johnson, Urban Roots	Schuylkill
50070	524	11/13/2015	1653	0	0.25	0.4	Infiltration Storage Trench, Pervious Pavement, Tree Trench	Open Space	$199,104	Department of Public Property, Philadelphia Department of Parks & Recreation	Delaware
50062	470	12/14/2015	6732	15	1.41	1.9	Tree Trench	Streets	$458,168	Philadelphia Streets Department	Cobbs-Darby, Schuylkill
50069	511	2/5/2016	272	10	0.10	0.1	Stormwater Tree	Streets	$0.00	Philadelphia Streets Department	Delaware
40669	329	2/8/2016	1364	0	0.21	0.4	Pervious Pavement	Streets	$240,171		Delaware
40669	331	2/8/2016	1274	0	0.24	0.4	Pervious Pavement	Streets			Delaware
50061	471	2/8/2016	2650	0	0.47	0.7	Infiltration Storage Trench	Streets	$179,530.37	Philadelphia Streets Department	Delaware
20422	517	5/6/2016	2410	5	0.50	0.7	Tree Trench	Streets	$164,932		Schuylkill
40900	1058	5/31/2016	2473	0	0.50	0.7	Infiltration Storage Trench	Streets	$178,903		TTF
50091	589	7/6/2016	3033	15	0.62	0.8	Infiltration Storage Trench, Rain Garden	Open Space	$255,000	Philadelphia Department of Parks & Recreation	Schuylkill
40607	235	7/15/2016	2511	16	1.09	0.6	Stormwater Planter, Tree Trench	Streets	$474,785		Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
20461	1066	8/22/2016	7911	0	1.54	2.2	Infiltration Storage Trench	Streets	$569,557		Delaware, TTF
50059	410	9/1/2016	12731	0	1.80	3.5	Rain Garden	Open Space	$849,370	Southeastern Transportation Authority, Philadelphia Department of Parks & Recreation	Delaware
40903	656	9/7/2016	571	0	0.15	0.2	Tree Trench	Streets	$78,980		Schuylkill
50077	322	9/16/2016	5574	10	1.15	1.5	Rain Garden, Swale, Tree Trench	Vacant Land	$724,900		Schuylkill
50077	530	9/16/2016	1417	0	0.26	0.4	Infiltration Storage Trench, Rain Garden	Open Space		Philadelphia Department of Parks & Recreation	Schuylkill
50077	558	9/16/2016	3638	4	0.66	1.0	Infiltration Storage Trench, Rain Garden	Vacant Land		Department of Public Property, Philadelphia Department of Parks & Recreation	Schuylkill
50078	303	10/7/2016	3531	0	0.73	1.0	Infiltration Storage Trench, Rain Garden	Vacant Land	$887,337	Tookany/Tacony-Frankford Watershed Partnership	TTF
50078	642	10/7/2016	6342	13	1.41	1.7	Infiltration Storage Trench, Rain Garden, Tree Trench	Open Space		Philadelphia Department of Parks & Recreation	TTF
50067	276	10/31/2016	8510	27	1.63	2.3	Swale, Tree Trench	Streets	$1,030,985		Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50068	244	11/8/2016	5738	15	0.98	1.6	Infiltration Storage Trench, Rain Garden, Swale	Open Space	$762,467	Community Ventures, Department of Public Property, Philadelphia Department of Parks & Recreation	Delaware
50083	151	12/9/2016	1181	9	0.31	0.4	Depaving, Infiltration Storage Trench, Rain Garden	Open Space	$122,000	Philadelphia Department of Parks & Recreation	Delaware
50113	600	12/16/2016	2006	5	0.27	0.5	Infiltration Storage Trench, Rain Garden	Open Space	$90,000	Philadelphia Department of Parks & Recreation	Schuylkill
50150	1015	2/10/2017	4417	0	0.72	1.2	Infiltration Storage Trench, Rain Garden	Open Space	$285,550	Philadelphia Department of Parks & Recreation	Delaware
50045	292	3/16/2017	13098	0	1.94	3.5	Infiltration Storage Trench,	Streets	$300,000	Department of Public Property, Philadelphia Department of Parks & Recreation	Schuylkill
20400	306	3/24/2017	5445	9	0.95	1.5	Tree Trench	Streets	$460,792		Delaware
40891	1062	5/25/2017	17994	15	3.50	4.9	Infiltration Storage Trench, Tree Trench	Streets	$684,311		Schuylkill
40828	657	6/7/2017	970	2	0.34	0.3	Infiltration Storage Trench	Streets	$118,305		Delaware, Schuylkill
50071	475	6/23/2017	9863	16	1.17	2.3	Infiltration Storage Trench, Rain Garden	Open Space	$242,000	Philadelphia School District, Philadelphia Department of Parks & Recreation, Trust for Public Land	Delaware
50049	291	9/27/2017	5961	3	0.95	1.6	Infiltration Storage Trench, Tree Trench	Streets	$1,251,475	Community Design Collaborative	Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50049	388	9/27/2017	5964	5	1.17	1.7	Infiltration Storage Trench, Tree Trench	Streets			Delaware
50049	389	9/27/2017	3483	3	0.75	1.0	Infiltration Storage Trench, Tree Trench	Streets			Delaware
40918	1149	9/28/2017	1954	0	0.50	0.5	Infiltration Storage Trench	Streets	$138,348		TTF
50048	375	10/26/2017	6067	10	1.10	1.7	Tree Trench	Streets	$1,156,260		TTF
50048	377	10/26/2017	1898	0	0.49	0.5	Infiltration Storage Trench, Rain Garden, Swale	Streets			TTF
50048	378	10/26/2017	3260	9	0.63	0.9	Tree Trench	Streets			TTF
50048	379	10/26/2017	5370	11	1.00	1.5	Tree Trench	Streets			TTF
20443	411	12/8/2017	53074	2	7.31	14.6	Infiltration Storage Trench, Rain Garden, Swale	Open Space	$2,743,251	Philadelphia Department of Parks & Recreation	TTF
20456	994	12/14/2017	6350	0	1.30	1.7	Infiltration Storage Trench	Streets	$568,491		TTF
50143	1195	1/19/2018	21329	0	2.59	5.2	Infiltration Storage Trench, Rain Garden	Streets	$1,163,250	Fairmount Park Conservancy	Schuylkill
40817	1293	1/29/2018	4096	0	0.96	1.1	Tree Trench	Streets	$285,800		Delaware

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50112	1055	2/9/2018	10534	20	2.48	2.7	Infiltration Storage Trench, Rain Garden	Streets	$500,000	Philadelphia Department of Parks & Recreation	Schuylkill
50098	1007	2/15/2018	6740	25	1.58	1.9	Infiltration Storage Trench, Rain Garden	Open Space	$745,500	Philadelphia Department of Parks & Recreation	Delaware
50052	335	3/12/2018	6081	2	1.03	1.7	Bump-out, Infiltration Storage Trench	Streets	$2,415,060	Southeastern Transportation Authority	TTF
50052	380	3/12/2018	29798	0	4.67	8.0	Stormwater Bump-out, Infiltration Storage Trench, Swale	Streets			TTF
50052	383	3/12/2018	6574	0	1.21	1.8	Infiltration Storage Trench	Streets			TTF
50053	295	3/28/2018	1213	0	0.18	0.3	Infiltration Storage Trench	Streets	$1,926,357		TTF
50053	314	3/28/2018	6144	16	1.48	1.7	Tree Trench	Streets			TTF
50053	384	3/28/2018	4170	9	0.66	1.1	Tree Trench	Streets			Delaware
50053	385	3/28/2018	2959	7	0.50	0.8	Tree Trench	Streets			Delaware
50053	386	3/28/2018	5569	8	0.79	1.5	Tree Trench	Streets			Delaware
50053	413	3/28/2018	2458	0	0.41	0.7	Stormwater Bump-out, Infiltration Storage Trench	Streets		Department of Public Property	TTF

Work Number	Project ID	Construction Complete Date	Storage Volume (cf)	New Trees	Drainage Area (acres)	Greened Acre (acre-inches)	SMP Types	Program	Green Construction Cost**	Partner(s)	Watershed
50053	439	3/28/2018	2770	3	0.38	0.8	Tree Trench	Streets			Delaware
50155	488	5/22/2018	10724	8	1.93	3.0	Infiltration Storage Trench, Rain Garden, Tree Trench	Open Space	$745,800	Department of Public Property, Philadelphia Department of Parks & Recreation, Councilman Johnson, Urban Roots	Schuylkill
Total Greened Acres						**256.8**					

* Pennvest project

** Reported construction costs may vary from past fiscal years. Green Construction Costs are reported for FY18, as PWD now has the capability to track the costs associated specifically with Green Stormwater Infrastructure line items.

Appendix 2

Planned Public Green Stormwater Infrastructure Projects

Table 1: Public Planned Project Tracking Metrics and Reporting Format

Public Project Tracking Metrics										
Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partners	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost

Over the past year, PWD's new capital projects tracking system's (CIPIT) interaction with its GSI tracking system (GreenIT) has slightly changed. To accommodate this change, we have replaced Project Names with a Work Number and a Project ID. The Project ID is unique to individual projects and these projects can be bundled under one Work Number for bidding purposes. Moving forward, Work Numbers will have a 1:1 relationship with projects.

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
20407	351	Combined	Cobbs-Darby	Streets	In Design	Infiltration Storage Trench		0.3	2021	TBD
20407	492	Combined	Cobbs-Darby	Streets	In Design	Bump-out, Tree Trench		1.1	2021	TBD
20437	1124	Combined	Delaware	Streets	In Design	Tree Trench		3.6	2021	$860,840.00
20464	1381	Combined, Separate	Schuylkill, TTF, Wissahickon	Streets	In Design	Tree Trench		2.3	2021	TBD
20472	1040	Combined	Schuylkill	Streets	In Design	Tree Trench		0.4	2021	$93,645.00
20480	1266	Combined	Delaware	Streets	In Design	Tree Trench		0.8	2021	TBD
20485	1126	Combined	Schuylkill	Streets	In Design	Tree Trench		2.4	2021	TBD
20487	1133	Combined	Schuylkill	Streets	In Design	Tree Trench		0.9	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
20496	1212	Combined	Schuylkill	Streets	In Design	Tree Trench		1.0	2021	TBD
20517	1418	Combined, Separate, Non-Contributing	TTF	Streets	In Design	Stormwater Tree		2.4	2021	TBD
20532	1417	Combined	Cobbs-Darby	Streets	In Design	Bump-out, Stormwater Tree		3.0	2021	TBD
20536	1330	Combined	TTF	Streets	In Design	Infiltration Storage Trench, Stormwater Tree, Tree Trench		2.6	2021	TBD
20540	1422	Combined, Separate	Pennypack	Streets	In Design	Rain Garden		0.4	2021	TBD
20558	1376	Combined	TTF	Streets	In Design	Infiltration Storage Trench, Tree Trench		1.1	2021	TBD
20562	1395	Combined	Delaware, Schuylkill	Streets	In Design	Tree Trench		0.8	2021	TBD
20564	1419	Combined	TTF	Streets	In Design	Bump-out		3.3	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40736	236	Combined	Delaware	Streets	In Design	Planter, Tree Trench		1.7	2021	TBD
40775	426	Combined	TTF	Streets	In Design	Pervious Pavement		0.4	2021	TBD
40794	168	Combined, Separate, Non-Contributing	TTF	Open Space	In Design	Rain Garden	Tookany/Tacony-Frankford Watershed Partnership, Philadelphia Department of Parks & Recreation	13.3	2021	TBD
40826	1063	Combined	Schuylkill	Streets	In Design	Tree Trench		3.1	2021	TBD
40852	1207	Combined	Schuylkill	Streets	In Design	Bump-out		0.3	2021	TBD
40855	1400	Combined	Delaware, TTF	Streets	In Design	Pervious Pavement		1.5	2021	TBD
40856	1060	Combined	Schuylkill	Streets	In Design	Bump-out		0.6	2021	$84,660.00
40857	1008	Combined	Delaware	Streets	In Design	Tree Trench		1.3	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40864	1132	Combined	Schuylkill	Streets	In Design	Tree Trench		0.6	2021	TBD
40869	1289	Combined	TTF	Streets	In Design	Tree Trench		0.8	2021	TBD
40882	1245	Combined	Delaware	Streets	In Design	Tree Trench		2.1	2021	TBD
40898	1130	Combined	Schuylkill	Streets	In Design	Tree Trench		0.2	2021	TBD
40899	1219	Combined	Delaware	Streets	In Design	Tree Trench		1.3	2021	TBD
40902	1305	Combined	TTF	Streets	In Design	Pervious Pavement, Tree Trench		0.5	2021	TBD
40904	1134	Combined	Delaware	Streets	In Design	Planter, Tree Trench		0.4	2021	TBD
40908	1370	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Bump-out, Tree Trench		2.9	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40922	1238	Combined	Delaware	Streets	In Design	Pervious Pavement, Tree Trench		2.1	2021	TBD
40923	1244	Combined	Delaware	Streets	In Design	Infiltration Storage Trench, Planter, Tree Trench		4.4	2021	TBD
40926	1270	Combined	Delaware	Streets	In Design	Pervious Pavement, Tree Trench		0.7	2021	TBD
40935	1210	Combined	Delaware	Streets	In Design	Pervious Pavement		1.3	2021	TBD
40946	1295	Combined	Delaware	Streets	In Design	Pervious Pavement		2.0	2021	TBD
40951	1280	Combined	Schuylkill	Streets	In Design	Infiltration Storage Trench, Tree Trench		1.5	2021	TBD
40965	1369	Combined	Schuylkill	Streets	In Design	Planter		1.8	2021	TBD
40975	1377	Combined	Schuylkill	Streets	In Design	Infiltration Storage Trench, Tree Trench		1.5	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40981	1344	Combined	Delaware	Streets	In Design	Pervious Pavement		0.5	2021	TBD
40984	1367	Combined	Schuylkill	Streets	In Design	Pervious Pavement		1.0	2021	TBD
40985	1375	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Pervious Pavement, Tree Trench		2.2	2021	TBD
40989	1340	Combined	Pennypack	Streets	In Design	Tree Trench		3.2	2021	TBD
40990	1355	Combined	Cobbs-Darby	Streets	In Design	Pervious Pavement, Tree Trench		1.5	2021	TBD
40996	1366	Combined	Delaware	Streets	In Design	Pervious Pavement, Tree Trench		1.8	2021	TBD
40999	1391	Combined	Delaware, Schuylkill	Streets	In Design	Pervious Pavement, Tree Trench		2.2	2021	TBD
41008	1402	Combined	Schuylkill	Streets	In Design	Bump-out, Tree Trench		0.4	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
41025	1409	Combined	Delaware	Streets	In Design	Tree Trench		3.1	2021	TBD
41031	1432	Combined	Delaware, TTF	Streets	In Design	Tree Trench		4.8	2021	TBD
41034	1399	Combined	Schuylkill	Streets	In Design	Pervious Pavement, Tree Trench		1.4	2021	TBD
41049	1398	Combined	Delaware	Streets	In Design	Tree Trench		1.5	2021	TBD
41068	1407	Combined	Cobbs-Darby	Streets	In Design	Infiltration Storage Trench, Tree Trench		0.5	2021	TBD
41070	1435	Combined	Delaware, Schuylkill	Streets	In Design	Tree Trench	Delaware Valley Regional Planning Commission (DVRPC), Philadelphia Free Library	0.9	2021	TBD
41073	1426	Combined	Delaware	Streets	In Design	Tree Trench		1.4	2021	TBD
50081	408	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Rain Garden, Swale	Department of Public Property, Philadelphia Department of Parks & Recreation, Councilwoman Sanchez	0.6	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50088	546	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Planter, Swale, Tree Trench		5.9	2021	TBD
50088	595	Combined, Separate	Delaware, Pennypack	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		12.3	2021	TBD
50088	596	Combined, Separate	Pennypack	Streets	In Design	Bump-out, Infiltration Storage Trench		3.1	2021	TBD
50090	539	Combined	Delaware	Streets	In Design	Bump-out, Planter		3.0	2021	TBD
50090	540	Combined	Delaware	Streets	In Design	Bump-out, Planter, Tree Trench		2.9	2021	TBD
50100	1013	Combined	Schuylkill	Open Space	In Design	Basin, Infiltration Storage Trench	Philadelphia Department of Parks & Recreation	23.0	2021	TBD
50105	643	Combined	Cobbs-Darby	Open Space	In Design		Philadelphia Department of Parks & Recreation	0.0	2021	TBD
50105	1051	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Bump-out, Green Gutter, Infiltration Storage Trench, Tree Trench		16.4	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50107	1052	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Tree Trench		14.3	2021	TBD
50108	1053	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Planter, Tree Trench		4.7	2021	TBD
50108	1054	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Rain Garden	Philadelphia School District	0.5	2021	TBD
50110	242	Combined	Cobbs-Darby	Open Space	In Design	Infiltration Storage Trench, Rain Garden	Philadelphia Department of Parks & Recreation	6.4	2021	TBD
50116	1045			Open Space	In Design	Infiltration Storage Trench, Rain Garden, Swale, Tree Trench		4.1	2021	TBD
50116	1046	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Swale		0.8	2021	TBD
50116	1047	Combined	Delaware	Streets	In Design	Tree Trench		0.5	2021	TBD
50118	1059	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Rain Garden, Tree Trench		3.4	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50120	1069			Open Space	In Design	Infiltration Storage Trench, Planter, Rain Garden, Tree Trench		3.2	2021	TBD
50120	1070	Combined	Delaware	Streets	In Design	Infiltration Storage Trench, Tree Trench		7.9	2021	TBD
50125	1087	Combined	Delaware, TTF	Streets	In Design	Bump-out		11.9	2021	TBD
50126	1088	Combined	TTF	Streets	In Design	Bump-out		1.6	2021	TBD
50126	1089	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench		1.7	2021	TBD
50126	1262	Combined	Delaware	Streets	In Design	Bump-out, Tree Trench		2.3	2021	TBD
50128	1090	Combined	Delaware	Streets	In Design	Tree Trench		5.7	2021	TBD
50128	1107	Combined	Delaware	Open Space	In Design	Bump-out, Tree Trench	Philadelphia Department of Parks & Recreation	1.4	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50128	1269	Combined	Delaware	Streets	In Design	Tree Trench		0.6	2021	TBD
50133	1139	Combined, Separate	TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		17.1	2021	TBD
50133	1298	Combined	TTF	Streets	In Design	Infiltration Storage Trench,		2.5	2021	TBD
50136	1143	Combined, Separate	TTF	Open Space	In Design	Infiltration Storage Trench, Planter, Rain Garden, Tree Trench	Philadelphia Department of Parks & Recreation	6.3	2021	TBD
50139	1147	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Stormwater Bump-out, Infiltration Storage Trench, Planter, Rain Garden, Tree Trench		7.3	2021	$1,457,636.00
50140	1148	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		2.1	2021	TBD
50141	1150	Combined	TTF	Streets	In Design	Bump-out, Planter, Tree Trench		5.2	2021	TBD
50141	1151	Combined	TTF	Open Space	In Design	Rain Garden, Tree Trench		2.3	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50144	1165	Combined	Schuylkill	Streets	In Design	Bump-out, Infiltration Storage Trench, Rain Garden, Swale	Philadelphia Planning Commission	4.7	2021	TBD
50145	1163	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Rain Garden,		2.8	2021	TBD
50147	1201	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		3.3	2021	TBD
50148	1200	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Planter, Rain Garden, Swale		6.5	2021	TBD
50154	1211	Combined	TTF	Streets	In Design	Infiltration Storage Trench, Planter, Tree Trench		8.4	2021	TBD
50157	1240	Combined	Delaware	Streets	In Design	Tree Trench		4.4	2021	TBD
50158	1221	Combined	Cobbs-Darby	Streets	In Design	Infiltration Storage Trench, Rain Garden	Philadelphia Streets Department	2.1	2021	TBD
50160	1242	Combined	Delaware	Streets	In Design	Tree Trench		5.7	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50162	1265	Combined	Cobbs-Darby	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		6.6	2021	TBD
50164	1258	Combined	TTF	Facilities	In Design	Infiltration Storage Trench, Rain Garden		1.2	2021	TBD
50166	1264	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Planter, Tree Trench		4.8	2021	TBD
50167	1267	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Wetland		53.5	2021	TBD
50168	1271	Combined	Cobbs-Darby	Streets	In Design	Bump-out, Tree Trench		4.0	2021	TBD
50169	1365	Combined	Schuylkill	Streets	In Design	Tree Trench		65.3	2021	TBD
50170	1272	Combined	Schuylkill	Streets	In Design	Bump-out		1.2	2021	TBD
50170	1273	Combined	Schuylkill	Open Space	In Design	Infiltration Storage Trench, Rain Garden	Philadelphia Department of Parks & Recreation, Fairmount Park Conservancy	6.2	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50171	1274	Combined	Delaware	Streets	In Design	Infiltration Storage Trench,	Department of Public Property, Philadelphia Streets Department	2.3	2021	TBD
50172	1277	Combined	Schuylkill	Streets	In Design	Bump-out, Green Gutter, Planter, Rain Garden, Stormwater Tree		7.0	2021	TBD
50173	1278	Combined	Delaware	Streets	In Design	Drainage Well, Stormwater Tree		3.8	2021	TBD
50174	1279	Combined	Delaware	Streets	In Design	Planter, Tree Trench,		8.5	2021	TBD
50177	1287	Combined, Separate	Schuylkill, TTF	Streets	In Design	Infiltration Storage Trench, Tree Trench		5.8	2021	TBD
50178	1284			Streets	In Design			0.0	2021	TBD
50180	1285	Combined	Schuylkill	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		5.7	2021	TBD
50181	1290	Combined	Schuylkill	Streets	In Design	Infiltration Storage Trench, Tree Trench		1.0	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50181	1291	Combined	Schuylkill	Facilities	In Design	Infiltration Storage Trench, Planter, Swale		3.9	2021	TBD
50182	1296	Combined	TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Rain Garden, Stormwater Tree, Tree Trench		5.6	2021	TBD
50183	1297	Combined	TTF	Streets	In Design	Infiltration Storage Trench, Tree Trench		2.9	2021	TBD
50184	1299	Combined, Separate	Delaware, TTF	Streets	In Design	Stormwater Tree		6.4	2021	TBD
50186	1301	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Infiltration Storage Trench, Tree Trench		9.7	2021	TBD
50187	1302	Combined	Delaware	Open Space	In Design	Stormwater Basin	Philadelphia Department of Parks & Recreation	0.7	2021	TBD
50187	1303	Combined	Delaware	Streets	In Design	Infiltration Storage Trench, Planter, Tree Trench		1.3	2021	TBD
50188	1306	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Rain Garden	Trust for Public Land	1.1	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50189	1307	Combined	Schuylkill	Streets	In Design	Stormwater Tree		3.9	2021	TBD
50190	1308	Combined	Schuylkill	Streets	In Design	Planter, Tree Trench		5.7	2021	TBD
50190	1309	Combined	Schuylkill	Open Space	In Design	Planter, Rain Garden		0.8	2021	TBD
50192	1311			Open Space	In Design	Infiltration Storage Trench	Philadelphia Department of Parks & Recreation	14.0	2021	TBD
50192	1312			Streets	In Design	Infiltration Storage Trench, Tree Trench		4.5	2021	TBD
50194	1315	Combined	Schuylkill	Streets	In Design	Bump-out, Tree Trench		6.8	2021	TBD
50196	1318	Combined,S eparate	Schuylkill,TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Planter, Tree Trench		10.4	2021	TBD
50196	1319	Combined, Separate	Schuylkill, TTF	Open Space	In Design	Rain Garden, Swale, Tree Trench	Philadelphia Department of Parks & Recreation	4.6	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50197	1322	Combined	Delaware	Streets	In Design	Rain Garden, Tree Trench		2.0	2021	TBD
50198	1327	Combined	Schuylkill	Streets	In Design	Planter, Tree Trench		10.9	2021	TBD
50199	1328	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench		11.0	2021	TBD
50200	1329	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench		7.2	2021	TBD
50201	1335	Combined	TTF	Vacant Land	In Design	Infiltration Storage Trench, Rain Garden, Swale		3.5	2021	TBD
50202	1333	Combined	TTF	Open Space	In Design	Infiltration Storage Trench, Rain Garden		1.1	2021	TBD
50202	1334	Combined	TTF	Streets	In Design	Infiltration Storage Trench		1.0	2021	TBD
50203	1336	Combined, Non-Contributing	Schuylkill	Streets	In Design	Infiltration Storage Trench, Rain Garden, Swale, Tree Trench		12.0	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50204	1339	Combined	Delaware	Open Space	In Design	Planter, Rain Garden, Tree Trench		5.3	2021	TBD
50205	1341	Combined	Schuylkill	Streets	In Design	Bump-out, Infiltration Storage Trench, Planter, Rain Garden, Tree Trench		11.8	2021	TBD
50206	1343	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench	Drexel University	7.9	2021	TBD
50207	1342	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench		9.2	2021	TBD
50208	1352	Combined	Delaware	Schools	In Design	Bump-out, Stormwater Tree Trench	School District of Philadelphia	9.5	2021	TBD
50210	1345	Combined	Schuylkill	Streets	In Design	Infiltration Storage Trench, Rain Garden		11.1	2021	TBD
50211	1346	Combined	Delaware	Open Space	In Design	Planter		1.5	2021	TBD
50211	1347	Combined	Delaware	Streets	In Design	Infiltration Storage Trench, Tree Trench		3.5	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50212	1348	Combined	Delaware, Schuylkill	Streets	In Design	Tree Trench		4.7	2021	TBD
50212	1349	Combined	Schuylkill	Facilities	In Design	Infiltration Storage Trench		1.5	2021	TBD
50213	1351	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench		4.1	2021	TBD
50214	1353	Combined, Non-Contributing	Pennypack	Streets	In Design	Infiltration Storage Trench	Philadelphia Department of Parks & Recreation	0.8	2021	TBD
50215	1354	Combined	Schuylkill	Streets	In Design	Bump-out, Tree Trench		5.0	2021	TBD
50217	1359	Combined	Delaware, TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Stormwater Tree, Tree Trench		5.6	2021	TBD
50218	1357	Combined	Cobbs-Darby	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		9.2	2021	TBD
50219	1360	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		8.9	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50220	1361	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		11.3	2021	TBD
50221	1363	Combined	Delaware, TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		6.3	2021	TBD
50222	1374	Combined	Cobbs-Darby, Schuylkill	Streets	In Design	Bump-out, Infiltration Storage Trench, Rain Garden, Stormwater Tree		2.4	2021	TBD
50226	1382	Combined	Delaware, TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Swale		20.7	2021	TBD
50229	1383	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Swale		5.5	2021	TBD
50231	1384	Combined	Delaware	Streets	In Design	Tree Trench		6.4	2021	TBD
50232	1387	Combined	Delaware	Open Space	In Design	Infiltration Storage Trench, Rain Garden, Tree Trench	Department of Public Property	1.6	2021	TBD
50233	1389	Combined	Cobbs-Darby	Streets	In Design	Bump-out, Infiltration Storage Trench, Planter, Rain Garden, Tree Trench		8.8	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50233	1390	Combined	Cobbs-Darby	Open Space	In Design	Rain Garden		0.6	2021	TBD
50234	1388	Combined	Delaware	Streets	In Design	Bump-out, Planter, Tree Trench	Impact Services CDC	4.7	2021	TBD
50235	1392	Combined	Delaware, TTF	Streets	In Design	Tree Trench		5.0	2021	TBD
50236	1393	Combined	TTF	Parking, Streets, Vacant Land	In Design	Tree Trench	Frankford Community Development Corporation	6.7	2021	TBD
50238	1396	Combined	Delaware	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		5.6	2021	TBD
50239	1397	Combined	Delaware	Open Space, Streets	In Design	Infiltration Storage Trench, Planter, Tree Trench	Department of Parks & Recreation (PPR), Office of Housing & Community Development (OHCD)	6.8	2021	TBD
50240	1401	Combined	Cobbs-Darby	Open Space, Streets	In Design	Bump-out, Tree Trench		12.7	2021	TBD
50241	1403	Combined	TTF	Open Space, Streets	In Design	Infiltration Storage Trench, Rain Garden, Swale		6.3	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50242	1404	Combined	TTF	Open Space, Streets	In Design	Basin, Bump-out, Planter, Swale	PennDOT, Department of Parks & Recreation (PPR), Councilwoman Bass, Nicetown CDC, Philadelphia Redevelopment Authority (PRA)	9.3	2021	TBD
50243	1405	Combined	Schuylkill	Streets	In Design	Infiltration Storage Trench, Tree Trench		10.9	2021	TBD
50245	1410	Combined	Delaware	Open Space, Streets	In Design	Tree Trench	Councilwoman Sanchez, Department of Parks & Recreation (PPR)	3.7	2021	TBD
50246	1412	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench		12.3	2021	TBD
50247	1413	Combined, Separate	Delaware, TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		7.2	2021	TBD
50248	1414	Combined	Schuylkill	Streets	In Design	Bump-out, Planter, Tree Trench		7.2	2021	TBD
50250	1415	Combined	Delaware	Streets, Vacant Land	In Design	Rain Garden		1.6	2021	TBD
50251	1416	Combined	Delaware	Open Space, Streets	In Design	Rain Garden	Department of Parks & Recreation (PPR)	2.0	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50252	1420	Combined	TTF	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		9.2	2021	TBD
50253	1421	Combined	Schuylkill	Streets, Vacant Land	In Design	Infiltration Storage Trench, Planter, Rain Garden, Tree Trench	Philadelphia Redevelopment Authority (PRA)	5.4	2021	TBD
50255	1425	Combined, Non-Contributing	Cobbs-Darby	Open Space, Streets	In Design	Bump-out, Rain Garden, Tree Trench		11.4	2021	TBD
50257	1428	Combined	Delaware	Open Space, Streets	In Design	Infiltration Storage Trench, Rain Garden	Department of Parks & Recreation (PPR)	1.2	2021	TBD
50258	1429	Combined	Schuylkill	Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		14.0	2021	TBD
50260	1433	Combined, Non-Contributing	Cobbs-Darby	Open Space, Streets	In Design	Rain Garden, Tree Trench		11.6	2021	TBD
50261	1434	Combined	Delaware	Open Space, Streets	In Design	Infiltration Storage Trench, Tree Trench	Department of Parks & Recreation (PPR), Department of Public Property (DPP)	0.3	2021	TBD
50262	1436	Combined, Non-Contributing	Cobbs-Darby	Open Space, Streets	In Design	Bump-out, Rain Garden, Tree Trench		9.6	2021	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50263	1437	Combined, Separate	Delaware, Pennypack	Streets	In Design	Bump-out, Tree Trench		18.2	2021	TBD
50264	1438			Streets, Vacant Land	In Design	Infiltration Storage Trench, Rain Garden, Tree Trench	Arcadia Commons, Neighborhood Gardens Trust (NGT)	2.1	2021	TBD
50265	1439			Open Space, Streets	In Design	Bump-out, Rain Garden, Tree Trench		9.4	2021	TBD
50266	1440			Open Space, Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench	Department of Parks & Recreation (PPR)	10.1	2021	TBD
50267	1441			Streets	In Design	Bump-out, Infiltration Storage Trench, Tree Trench		8.0	2021	TBD
20391	1056	Combined	Delaware, Pennypack	Streets	In Contract Managemen t	Infiltration Storage Trench		2.7	2020	$495,259.00
20417	1061	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		1.7	2020	$424,665.00
20474	1243	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		3.4	2020	$807,630.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
20475	1042	Combined	Schuylkill	Streets	In Contract Managemen t	Tree Trench		0.7	2020	$322,825.00
20483	1294	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		0.6	2020	$174,995.00
20486	1282	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		0.7	2020	$254,785.00
20497	1215	Combined	Schuylkill	Streets	In Contract Managemen t	Tree Trench		0.4	2020	$114,820.00
20499	1248	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		0.3	2020	$159,666.00
20513	1338	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		1.1	2020	$244,200.92
20525	1310	Combined	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench		0.4	2020	$114,900.00
20546	1350	Combined	TTF	Parking, Open Space	In Contract Managemen t	Infiltration Storage Trench		0.6	2020	$229,050.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40747	352	Combined	Schuylkill	Streets	In Contract Management	Pervious Pavement		1.8	2020	TBD
40750	304	Combined	TTF	Streets	In Contract Management	Infiltration Storage Trench, Stormwater Tree		0.5	2020	$197,056.16
40784	406	Combined	Schuylkill	Streets	In Contract Management	Infiltration Storage Trench		0.5	2020	$169,388.00
40791	1304	Combined	Schuylkill	Streets	In Contract Management	Infiltration Storage Trench		0.5	2020	$168,905.00
40798	518	Combined	Cobbs-Darby	Streets	In Contract Management	Infiltration Storage Trench, Pervious Pavement		1.4	2020	$552,767.00
40824	525	Combined	Schuylkill	Streets	In Contract Management	Tree Trench		1.4	2020	$323,600.00
40829	990	Combined	Delaware	Streets	In Contract Management	Infiltration Storage Trench		0.5	2020	$237,465.00
40839	995	Combined	Cobbs-Darby, Schuylkill	Streets	In Contract Management	Infiltration Storage Trench		1.3	2020	$354,487.80

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40844	989	Combined	Schuylkill	Streets	In Contract Management	Infiltration Storage Trench		1.2	2020	$206,840.00
40858	1123	Combined	Delaware	Streets	In Contract Management	Infiltration Storage Trench		0.5	2020	$137,800.00
40862	1064	Combined	Delaware	Streets	In Contract Management	Infiltration Storage Trench, Tree Trench		1.0	2020	$219,595.00
40866	1065	Combined	Cobbs-Darby	Streets	In Contract Management	Tree Trench		1.8	2020	$115,105.00
40906	1246	Combined	TTF	Streets	In Contract Management	Infiltration Storage Trench		0.2	2020	$96,244.46
40939	1331	Combined	Delaware	128	In Contract Management	Infiltration Storage Trench		1.3	2020	$310,720.00
40971	1316	Combined	Delaware	Streets	In Contract Management	Infiltration Storage Trench		0.3	2020	$83,170.00
50060	416	Combined	Delaware	Open Space	In Contract Management	Infiltration Storage Trench, Rain Garden	Philadelphia Department of Parks & Recreation	12.7	2020	$1,609,292.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50089	455	Combined	TTF	Streets	In Contract Management	Bump-out, Infiltration Storage Trench, Planter		2.3	2020	$1,804,157.00
50089	459	Combined	TTF	Streets	In Contract Management	Infiltration Storage Trench, Planter, Tree Trench		3.0	2020	$1,804,157.00
50089	586	Combined	TTF	Streets	In Contract Management	Infiltration Storage Trench, Planter, Tree Trench		2.0	2020	$1,804,157.00
50095	644	Combined	Delaware	Schools	In Contract Management	Infiltration Storage Trench, Rain Garden, Tree Trench	Community Design Collaborative, Pennsylvania Horticulture Society, School District of Philadelphia	5.1	2020	$1,255,852.11
50109	1023	Combined	Schuylkill	Streets	In Contract Management	Stormwater Tree		0.1	2020	$189,047.50
50119	1067	Combined	Delaware	Parking, Streets	In Contract Management	Infiltration Storage Trench, Planter, Rain Garden		2.7	2020	$1,155,558.00
50119	1068	Combined	Delaware	Streets	In Contract Management	Infiltration Storage Trench, Planter		0.4	2020	$1,155,558.00
50122	1077	Combined	Delaware	Open Space, Vacant Land	In Contract Management	Infiltration Storage Trench, Stormwater Tree Trench		2.1	2020	$2,891,182.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50122	1083	Combined	Delaware	Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Stormwater Planter, Swale, Tree Trench	Philadelphia Department of Parks & Recreation	12.5	2020	$2,891,182.00
50124	1085	Combined	Delaware	Open Space	In Contract Managemen t	Infiltration Storage Trench		15.2	2020	$2,468,050.00
50129	1127	Combined	Schuylkill	Vacant Land	In Contract Managemen t	Rain Garden, Tree Trench	Philadelphia Department of Parks & Recreation	1.5	2020	$1,802,798.00
50129	1128	Combined	Schuylkill	Streets	In Contract Managemen t	Bump-out, Tree Trench	Philadelphia Department of Parks & Recreation	3.9	2020	$1,802,798.00
50129	1129	Combined	Schuylkill	Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Tree Trench		4.0	2020	$1,802,798.00
50130	1135	Combined	Delaware	Streets	In Contract Managemen t	Bump-out, Depaving, Infiltration Storage Trench, Planter	Philadelphia Streets Department, Mayors Office of Transportation & Utilities	0.8	2020	$111,107.90
50132	1137	Combined	Delaware	Open Space, Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Planter, Rain Garden, Tree Trench,		12.9	2020	$2,766,292.00
50132	1138	Combined	Delaware	Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Tree Trench		4.0	2020	$2,766,292.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50134	1140	Combined	Schuylkill	Open Space	In Contract Managemen t	Infiltration Storage Trench, Rain Garden, Tree Trench		6.2	2020	$1,086,717.00
50152	1208	Combined	Schuylkill	Open Space	In Contract Managemen t	Tree Trench		0.5	2020	$642,478.00
50152	1209	Combined	Schuylkill	Streets	In Contract Managemen t	Infiltration Storage Trench, Planter, Tree Trench		2.7	2020	$642,478.00
50176	1283	Combined	Schuylkill	Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Tree Trench		7.5	2020	$1,714,047.00
50179	1288	Combined	Schuylkill	Streets	In Contract Managemen t	Basin, Infiltration Storage Trench, Planter, Rain Garden, Tree Trench		5.7	2020	$1,370,010.00
50256	1430	Combined, Separate, Non-Contributing	Delaware, Pennypack, Poquessing, TTF	Streets	In Contract Managemen t	Tree Trench		0.0	2020	$878,417.00
50138	1145	Combined	Schuylkill	Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Tree Trench	Philadelphia Department of Parks & Recreation	6.1	2019	$2,481,045.50
50138	1146	Combined	Schuylkill	Open Space	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Rain Garden		2.2	2019	$2,481,045.50

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50146	1196	Combined	Schuylkill	Vacant Land	In Contract Managemen t	Infiltration Storage Trench, Rain Garden		0.6	2019	$2,135,753.00
50146	1197	Combined	Schuylkill	Vacant Land	In Contract Managemen t	Infiltration Storage Trench, Rain Garden		0.5	2019	$2,135,753.00
50146	1198	Combined	Schuylkill	Streets	In Contract Managemen t	Bump-out, Infiltration Storage Trench, Rain Garden, Tree Trench		5.4	2019	$2,135,753.00
50149	1202	Combined, Separate	Delaware	Streets	In Contract Managemen t	Infiltration Storage Trench, Planter, Tree Trench		4.9	2019	$1,614,000.00
50149	1379	Combined	Delaware	Open Space	In Contract Managemen t	Infiltration Storage Trench, Rain Garden		1.6	2019	$1,614,000.00
20439	584	Combined	Delaware, Schuylkill	Streets	In Construction	Infiltration Storage Trench, Tree Trench		2.0	2019	$568,465.00
20444	563	Combined	Delaware, Schuylkill	Streets	In Construction	Infiltration Storage Trench		2.5	2019	$750,420.00
20458	1006	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench, Tree Trench		4.4	2019	$1,213,184.39

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
20489	1136	Combined	Cobbs-Darby	Streets	In Construction	Infiltration Storage Trench		1.2	2019	$403,050.00
20490	1206	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench		1.1	2019	$309,780.00
40713	288	Combined	Delaware	Streets	In Construction	Pervious Pavement		0.3	2019	$147,625.00
40735	484	Combined	Delaware	Streets	In Construction	Tree Trench		0.4	2019	$97,950.00
40755	305	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench, Tree Trench	Philadelphia Department of Parks & Recreation	0.8	2019	$226,750.00
40773	469	Combined	Delaware	Streets	In Construction	Tree Trench		0.4	2019	$106,759.05
40790	1358	Non-Contributing	Wissahickon	Streets	In Construction	Infiltration Storage Trench, Rain Garden		0.0	2019	TBD
40795	443	Combined, Non-Contributing	Cobbs-Darby	Open Space, Streets	In Construction	Basin, Bump-out, Infiltration Storage Trench, Rain Garden, Tree Trench	Philadelphia Department of Parks & Recreation	12.6	2019	$3,500,000.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40799	556	Combined	TTF	Streets	In Construction	Infiltration Storage Trench		1.2	2019	$293,887.50
40800	502	Combined	Cobbs-Darby, Schuylkill	Streets	In Construction	Pervious Pavement, Tree Trench		1.2	2019	$488,725.00
40816	554	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench, Stormwater Tree, Tree Trench		2.6	2019	$638,040.00
40819	503	Combined	Delaware	Streets	In Construction	Pervious Pavement		1.5	2019	$798,660.00
40821	504	Combined	Delaware	Streets	In Construction	Pervious Pavement, Tree Trench		1.4	2019	$782,150.00
40827	555	Combined	Schuylkill	Streets	In Construction	Pervious Pavement		1.5	2019	$556,550.00
40863	1010	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench, Tree Trench		1.4	2019	$477,220.00
40865	1057	Combined	TTF	Streets	In Construction	Infiltration Storage Trench		1.5	2019	$533,775.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
40888	1011	Combined	Schuylkill	Streets	In Construction	Infiltration Storage Trench, Tree Trench		2.9	2019	TBD
40928	1275	Combined	TTF	Streets	In Construction	Tree Trench		4.4	2019	TBD
40938	1423	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench		0.9	2019	TBD
40945	1292	Combined	Schuylkill	Streets	In Construction	Infiltration Storage Trench		2.2	2019	TBD
50030	171	Combined	Delaware	Streets	In Construction	Tree Trench	Fairmount Park Commission, Pennsylvania Horticulture Society	1.4	2019	$1,428,730.00
50030	172	Combined	Delaware	Streets	In Construction	Bump-out, Infiltration Storage Trench, Tree Trench	Fairmount Park Commission, Pennsylvania Horticulture Society	3.0	2019	$1,428,730.00
50030	173	Combined	Delaware	Streets	In Construction	Tree Trench		0.7	2019	$1,428,730.00
50040	153	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench, Planter		2.4	2019	$1,399,315.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50055	246	Combined	Schuylkill	Streets	In Construction	Tree Trench	Drexel University	1.4	2019	$1,936,962.75
50055	344	Combined	Schuylkill	Streets	In Construction	Tree Trench		0.6	2019	$1,936,962.75
50055	399	Combined	Cobbs-Darby, Schuylkill	Streets	In Construction	Tree Trench	Philadelphia Planning Commission, Philadelphia Department of Parks & Recreation	3.0	2019	$1,936,962.75
50055	400	Combined	Schuylkill	Streets	In Construction	Stormwater Bump-out, Infiltration Storage Trench, Swale	American Cities Foundation	3.0	2019	$1,936,962.75
50079	401	Combined	Schuylkill	Open Space	In Construction	Depaving, Infiltration Storage Trench	Philadelphia Department of Parks & Recreation	4.2	2019	$1,019,044.50
50084	487	Combined	Delaware	Open Space	In Construction	Infiltration Storage Trench, Rain Garden, Tree Trench	Philadelphia Department of Parks & Recreation	4.8	2019	$1,480,870.00
50084	580	Combined	Delaware	Open Space	In Construction	Infiltration Storage Trench, Rain Garden	Philadelphia Department of Parks & Recreation	5.3	2019	$1,480,870.00
50097	483	Combined	Delaware	Open Space	In Construction	Infiltration Storage Trench	Philadelphia Department of Parks & Recreation	0.7	2019	$1,194,310.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50097	634	Combined	Delaware	Streets	In Construction	Tree Trench		0.5	2019	$1,194,310.00
50097	636	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench		0.3	2019	$1,194,310.00
50097	637	Combined	Delaware	Streets	In Construction	Tree Trench		1.5	2019	$1,194,310.00
50097	638	Combined	Delaware	Streets	In Construction	Tree Trench		1.3	2019	$1,194,310.00
50097	993	Combined	Delaware	Streets	In Construction	Tree Trench		0.4	2019	$1,194,310.00
50101	608	Combined	Schuylkill	Open Space	In Construction	Infiltration Storage Trench, Rain Garden	Philadelphia Department of Parks & Recreation	9.4	2019	$1,765,200.00
50101	1049	Combined	Cobbs-Darby, Schuylkill	Streets	In Construction	Tree Trench		1.7	2019	$1,765,200.00
50103	1024	Combined	Cobbs-Darby	Streets	In Construction	Drainage Well		0.1	2019	$582,900.00

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50103	1025	Combined	Delaware	Streets	In Construction	Drainage Well		0.1	2019	$582,900.00
50103	1029	Combined	Delaware	Streets	In Construction	Drainage Well		0.3	2019	$582,900.00
50104	578	Combined	TTF	Open Space	In Construction	Infiltration Storage Trench, Rain Garden, Tree Trench	Philadelphia Department of Parks & Recreation	6.4	2019	$2,252,260.00
50104	1050	Combined	TTF	Streets	In Construction	Infiltration Storage Trench, Tree Trench		5.1	2019	$2,252,260.00
50111	376	Combined	TTF	Streets	In Construction	Bump-out, Infiltration Storage Trench, Tree Trench		3.8	2019	$942,274.00
50123	1084	Combined	Delaware	Streets	In Construction	Infiltration Storage Trench, Rain Garden	PennDOT	3.2	2019	TBD
50135	1142	Combined	Schuylkill	Streets	In Construction	Bump-out, Infiltration Storage Trench, Planter	Philadelphia Housing Authority	3.0	2019	$305,000.00
50151	1204	Combined	Delaware	Streets	In Construction	Bump-out, Infiltration Storage Trench	Center City District	0.3	2019	TBD

Work Number	Project ID	Sewer Type	Watershed	Program	Status	Estimated SMP Type(s)	Potential Partner(s)	Greened Acre (acre-inches)	Completion Date Estimate	Estimated Construction Cost
50175	1281	Combined	Delaware	Streets	In Construction	Basin, Infiltration Storage Trench, Rain Garden, Swale		50.8	2019	$5,430,545.42
50195	290	Combined	TTF	Streets	In Construction	Bump-out, Infiltration Storage Trench	Philadelphia Planning Commission, Southeastern Transportation Authority, Nicetown Community Development Corporation	2.7	2019	$925,640.00
64056	564	Combined	Schuylkill	Open Space	In Construction	Rain Garden	Southeastern Transportation Authority, Philadelphia Department of Parks & Recreation	0.5	2019	TBD

Appendix 3

Complete Redevelopment and Incentivized Green Stormwater Infrastructure Projects

Table 1: Private Project Tracking Metrics and Reporting Format

Private Project Tracking Metrics						
Tracking Number	**Sewer Type**	**Category**	**Watershed**	**Zip Code**	**SMP Type (s)**	**Greened Acres (acre-inch)**

Table 2: Private/Incentives SMP Type Definitions

Private / Incentives SMP Type Definitions	
Basin	A surface basin or depression that is vegetated with mowed grass. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Bioinfiltration / Bioretention	A bioinfiltration/bioretention basin is a vegetated basin or depression designed to either infiltrate or release stormwater runoff.
Blue Roof	A blue roof is a storage system designed into a roof surface such that the roof retains stormwater. Blue roofs are designed to reduce the rate of stormwater runoff.
Cistern	Cisterns are storage tanks, located either above or below ground, that captures and stores runoff and can thereby reduce runoff volume. Stored water may drain by gravity or be pumped to its ultimate end use for a variety of non-potable water needs.
Depaving	Depaving projects remove existing impervious pavement and restore the surface with grass, other types of vegetation, or loose materials (stone, mulch, etc.) such that the area can thereafter be considered pervious area. Depaving projects remove contributing impervious area from the sewer system. Categorized as a Disconnection and logged in square feet.
Green Roof	A green roof is a vegetated surface installed over a roof surface. Green roofs are effective in reducing the volume and rates of stormwater runoff.
Planters	At or above grade planter area and number of planters tracked as "Disconnection" practice. Do not contribute to water quality.
Porous Pavement	Porous pavement is a hard permeable surface commonly composed of concrete, asphalt or pavers. It is designed to detain and release stormwater runoff and/or infiltrate where feasible.
Total Rooftop Area Disconnected	Tracked as the square footage of roof runoff directed to a pervious area.
Total Pavement Disconnections	Tracked as the square footage of runoff from impervious surfaces directed to a pervious area.
Tree Credit	Tracked as either "existing" or "new" tree credits, where each tree is credited with 100 square feet of management per tree.

Table 3: Complete Private Development Green Stormwater Infrastructure

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2005-0052-01	Combined	Verified	Lower Schuylkill River	19139	Subsurface Infiltration	2.5
2005-0099-01	Combined	Verified	Lower Schuylkill River	19131	Surface Detention	37.4
2006-0017-01	Combined	Verified	Lower Schuylkill River	19142	Subsurface Infiltration, Porous Pavement	1.2
2006-0057-01	Combined	Verified	Delaware Direct	19123	Subsurface Detention	0.0
2006-0063-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration	1.9
2006-0074-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Infiltration	0.7
2006-0084-01	Combined	Verified	Delaware Direct	19121	Subsurface Infiltration	2.5
2006-0110-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration, Subsurface Detention	0.7
2006-129-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	0.5
2006-132-01	Combined	Verified	Delaware Direct	19133	Subsurface Detention	0.2
2006-30TH-236-01	Combined	Verified	Lower Schuylkill River	19104	Surface Infiltration	0.6
2006-777L-326-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration, Porous Pavement	2.0
2006-9349-349-01	Combined	Verified	Delaware Direct	19123	Subsurface Detention	0.1
2006-94-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention	2.3
2006-96-01	Combined	Verified	Lower Schuylkill River	19140	Subsurface Detention	0.1
2006-ANGE-268-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration	0.8
2006-ANNE-209-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention	0.2
2006-BCRC-246-01	Combined	Verified	Delaware Direct	19134	Subsurface Infiltration	0.2
2006-BEAZ-250-01	Combined	Verified	Delaware Direct	19134	Subsurface Detention	1.6
2006-BOOT-310-01	Combined	Verified	Cobbs Creek	19139	Subsurface Infiltration, Subsurface Detention	0.7
2006-BRID-200-01	Combined	Verified	Delaware Direct	19137	Subsurface Infiltration, Disconnected Impervious Area	0.7

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2006-CCPO-276-01	Combined	Verified	Delaware Direct	19122	Surface Infiltration, Surface Detention	4.5
2006-CINT-431-01	Combined	Verified	Lower Schuylkill River	19131	Surface Detention	9.5
2006-COMM-328-01	Combined	Verified	Cobbs Creek	19139	Subsurface Detention, Cistern, Porous Pavement	0.9
2006-EDWI-215-01	Combined	Verified	Delaware Direct	19136	Subsurface Detention, Disconnected Impervious Area	0.8
2006-FAIR-175-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration	1.2
2006-FEDE-409-01	Combined	Verified	Delaware Direct	19106	Subsurface Detention, Green Roof, Disconnected Impervious Area	0.3
2006-FRON-290-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration	0.5
2006-GENE-192-01	Combined	Verified	Delaware Direct	19123	Subsurface Detention, Disconnected Impervious Area	0.3
2006-HESS-267-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Detention	0.6
2006-HOPE-447-01	Combined	Verified	Delaware Direct	19122	Porous Pavement	0.5
2006-HUNT-445-01	Combined	Verified	Delaware Direct	19133	Subsurface Infiltration, Porous Pavement	1.4
2006-LAWT-291-01	Combined	Verified	Delaware Direct	19135	Subsurface Detention	1.2
2006-LE22-460-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration, Porous Pavement	0.7
2006-MANT-306-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Porous Pavement	0.5
2006-MARS-381-01	Combined	Verified	Lower Schuylkill River		Subsurface Detention	0.1
2006-MARS-407-01	Combined	Verified	Lower Schuylkill River		Subsurface Detention	0.0
2006-MICH-419-01	Combined	Verified	Delaware Direct	19125	Subsurface Infiltration, Porous Pavement	0.4
2006-NATI-441-01	Combined	Verified	Delaware Direct	19106	Subsurface Detention	0.5
2006-NEWF-343-01	Combined	Verified	Pennypack Creek	19136	Subsurface Infiltration	2.5
2006-OVER-462-01	Combined	Verified	Lower Schuylkill River	19151	Subsurface Infiltration	1.8
2006-PASQ-416-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Detention	0.3

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2006-PENN-421-01	Combined	Verified	Lower Schuylkill River	19107	Subsurface Detention	2.3
2006-PHIL-205-01	Combined	Verified	Delaware Direct	19123	Subsurface Detention, Porous Pavement	0.1
2006-PILG-444-01	Combined	Verified	Delaware Direct	19111	Subsurface Infiltration	1.1
2006-PIZZ-242-01	Combined	Verified	Tacony-Frankford Creek	19138	Subsurface Infiltration, Disconnected Impervious Area	0.2
2006-PREF-176-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention	1.6
2006-PROG-400-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration	3.7
2006-PROP-233-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration	1.0
2006-REBA-275-01	Combined	Verified	Lower Schuylkill River	19143	Subsurface Infiltration	2.1
2006-SAFE-234-01	Combined	Verified	Delaware Direct	19134	Subsurface Detention, Bioretention	0.6
2006-SOLI-300-01	Combined	Verified	Delaware Direct	19149	Subsurface Infiltration, Bioretention	2.0
2006-STHE-171-01	Combined	Verified	Lower Schuylkill River	19130	Subsurface Infiltration	0.4
2006-STJO-273-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration, Porous Pavement	1.1
2006-TACO-337-01	Combined	Verified	Delaware Direct	19149	Subsurface Infiltration	0.2
2006-TEMP-197-01	Combined	Verified	Tacony-Frankford Creek	19138	Subsurface Detention, Porous Pavement	0.2
2006-TEMP-210-01	Combined	Verified	Delaware Direct	19122	Subsurface Detention, Porous Pavement	0.6
2006-TEMP-245-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration	1.1
2006-UNIO-235-01	Combined	Verified	Lower Schuylkill River	19104	Surface Infiltration, Subsurface Detention, Porous Pavement, Disconnected Impervious Area	1.1
2006-VAUX-338-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Detention	1.3
2006-WALN-251-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof, Porous Pavement, Disconnected Impervious Area	0.7
2007-1615-544-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration, Porous Pavement	0.6

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2007-4839-625-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Detention	1.0
2007-AROU-626-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Infiltration	0.5
2007-CECI-556-01	Combined	Verified	Delaware Direct	19121	Subsurface Detention	1.1
2007-CECI-561-01	Combined	Verified	Delaware Direct	19121	Subsurface Infiltration, Subsurface Detention	0.8
2007-DREX-669-01	Combined	Verified	Lower Schuylkill River	19104	Cistern, Porous Pavement, Disconnected Impervious Area	0.8
2007-EYEI-616-01	Combined	Verified	Tacony-Frankford Creek	19141	Subsurface Detention	0.4
2007-GAMB-624-01	Combined	Verified	Tacony-Frankford Creek	19124	Porous Pavement	0.1
2007-GAMB-701-01	Combined	Verified	Tacony-Frankford Creek	19124	Bioinfiltration, Porous Pavement	1.5
2007-GERM-647-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Detention, Bioinfiltration, Bioretention, Cistern, Green Roof, Disconnected Impervious Area	0.8
2007-GUIO-721-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Detention, Porous Pavement, Disconnected Impervious Area	1.4
2007-HACE-731-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration, Disconnected Impervious Area	0.5
2007-HERR-690-01	Combined	Verified	Delaware Direct	19147	Porous Pavement, Disconnected Impervious Area	0.6
2007-HOWI-498-01	Combined	Verified	Delaware Direct	19123	Subsurface Detention, Disconnected Impervious Area	0.3
2007-LASA-593-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	10.6
2007-MCDO-558-01	Combined	Verified	Delaware Direct	19133	Subsurface Detention	0.5
2007-MCDO-560-01	Combined	Verified	Delaware Direct	19135	Subsurface Detention	0.1
2007-MTTA-480-01	Combined	Verified	Delaware Direct	19123	Green Roof, Porous Pavement	0.3
2007-PASH-524-01	Combined	Verified	Cobbs Creek	19142	Subsurface Infiltration	0.8

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2007-POWE-679-01	Combined	Verified	Lower Schuylkill River	19104	Disconnected Impervious Area	0.4
2007-PRAD-489-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration	1.5
2007-SAIN-553-01	Combined	Verified	Lower Schuylkill River	19131	Porous Pavement, Disconnected Impervious Area	3.6
2007-SIMO-496-01	Combined	Verified	Tacony-Frankford Creek	19138	Bioinfiltration, Porous Pavement	0.5
2007-SOUT-557-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention	0.1
2007-THEC-538-01	Combined	Verified	Cobbs Creek	19143	Green Roof, Porous Pavement	0.6
2007-THEL-606-01	Combined	Verified	Tacony-Frankford Creek	19119	Subsurface Detention	0.5
2007-THEM-495-01	Combined	Verified	Lower Schuylkill River	19131	Surface Detention, Subsurface Detention	6.4
2007-UNIV-633-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Bioinfiltration, Disconnected Impervious Area	0.4
2007-WARN-646-01	Combined	Verified	Delaware Direct	19133	Subsurface Infiltration	2.1
2007-WARN-651-01	Combined	Verified	Delaware Direct	19133	Subsurface Infiltration	2.7
2007-WASH-642-01	Combined	Verified	Delaware Direct	19146	Subsurface Infiltration	1.0
2007-WEST-684-01	Combined	Verified	Cobbs Creek	19139	Subsurface Detention	0.0
2007-WILL-699-01	Combined	Verified	Delaware Direct	19134	Subsurface Detention, Bioretention	5.0
2008-1600-898-01	Combined	Verified	Delaware Direct	19122	Bioretention	0.5
2008-20UN-767-01	Combined	Verified	Lower Schuylkill River	19104	Green Roof, Porous Pavement	0.4
2008-2116-992-01	Combined	Verified	Lower Schuylkill River	19103	Surface Detention, Bioretention, Green Roof, Disconnected Impervious Area	0.5
2008-2552-873-01	Combined	Verified	Delaware Direct	19134	Subsurface Infiltration	0.7
2008-4014-979-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration, Disconnected Impervious Area	0.5
2008-BARN-986-01	Combined	Verified	Lower Schuylkill River	19130	Subsurface Infiltration, Green Roof, Disconnected Impervious Area	3.5

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2008-CAST-875-01	Combined	Verified	Delaware Direct	19149	Subsurface Detention	0.0
2008-CLAS-765-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	0.3
2008-COMM-763-01	Combined	Verified	Lower Schuylkill River	19130	Subsurface Infiltration, Green Roof, Porous Pavement, Disconnected Impervious Area	2.3
2008-DREX-788-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Bioinfiltration, Porous Pavement	1.5
2008-DREX-950-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof, Disconnected Impervious Area	0.2
2008-FRAN-921-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement	0.3
2008-FRAN-994-01	Combined	Verified	Delaware Direct	19130	Subsurface Infiltration, Porous Pavement	0.7
2008-MART-980-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration	0.6
2008-NAVA-893-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration	5.7
2008-NEWK-958-01	Combined	Verified	Delaware Direct	19122	Subsurface Detention, Bioinfiltration, Green Roof, Porous Pavement	5.2
2008-NEWL-778-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration	0.5
2008-NEWL-839-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration	0.5
2008-NORT-1012-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Disconnected Impervious Area	0.4
2008-PROP-824-01	Combined	Verified	Lower Schuylkill River	19139	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	5.4
2008-ROLA-813-01	Combined	Verified	Tacony-Frankford Creek	19141	Subsurface Infiltration, Green Roof	0.2
2008-ROTE-960-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention, Bioretention, Porous Pavement	1.6
2008-SCHM-902-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration, Green Roof, Porous Pavement, Disconnected Impervious Area	4.4

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2008-SHER-926-01	Combined	Verified	Delaware Direct	19122	Green Roof, Porous Pavement	0.2
2008-STRA-799-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration, Porous Pavement	0.4
2008-STRA-802-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration, Porous Pavement	0.3
2008-THEC-806-01	Combined	Verified	Delaware Direct	19103	Subsurface Detention, Green Roof	0.2
2008-WALG-838-01	Combined	Verified	Delaware Direct	19146	Subsurface Detention, Bioretention	0.5
2008-WOOD-864-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement	0.5
2009-2007-1090-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention	17.7
2009-7149-1186-01	Combined	Verified	Delaware Direct	19135	Subsurface Infiltration, Disconnected Impervious Area	0.4
2009-CANC-1145-01	Combined	Verified	Tacony-Frankford Creek	19124	Surface Detention, Bioretention	6.1
2009-CONG-1210-01	Combined	Verified	Delaware Direct	19133	Subsurface Infiltration, Porous Pavement	2.8
2009-DORA-1041-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration, Porous Pavement	0.4
2009-FRAN-1130-01	Combined	Verified	Delaware Direct	19137	Subsurface Infiltration, Disconnected Impervious Area	4.1
2009-GLOB-1016-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Detention, Bioretention	1.8
2009-HAWT-1102-01	Combined	Verified	Delaware Direct	19147	Porous Pavement, Disconnected Impervious Area	0.3
2009-HELP-1138-01	Combined	Verified	Lower Schuylkill River	19153	Subsurface Infiltration	3.7
2009-IATS-1023-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention, Green Roof	0.8
2009-JANN-1141-01	Combined	Verified	Lower Schuylkill River	19104	Green Roof, Porous Pavement, Disconnected Impervious Area	0.3
2009-LAWR-1044-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration, Porous Pavement	3.0
2009-MANT-1033-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration	3.6
2009-NEWH-1079-01	Combined	Verified	Lower Schuylkill River	19139	Subsurface Infiltration, Disconnected Impervious Area	0.3

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2009-NEWP-1166-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration, Disconnected Impervious Area	0.7
2009-NICE-1136-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Detention, Bioretention	0.4
2009-PARK-1197-01	Combined	Verified	Lower Schuylkill River	19104	Bioinfiltration, Disconnected Impervious Area	0.1
2009-PASC-1226-01	Combined	Verified	Cobbs Creek	19142	Subsurface Infiltration, Porous Pavement	3.3
2009-PECO-1133-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration	2.8
2009-PENN-1019-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Bioretention	3.9
2009-PENN-1144-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof, Porous Pavement, Disconnected Impervious Area	0.4
2009-PHIL-1101-01	Combined	Verified	Lower Schuylkill River	19102	Subsurface Detention, Bioretention	0.3
2009-PHIL-1205-01	Combined	Verified	Delaware Direct	19148	Porous Pavement	14.6
2009-PRES-1037-01	Combined	Verified	Tacony-Frankford Creek	19150	Subsurface Infiltration, Bioretention, Porous Pavement	1.9
2009-PRIN-1147-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration, Green Roof	0.5
2009-RODI-1176-01	Combined	Verified	Lower Schuylkill River	19130	Subsurface Infiltration	0.2
2009-SCHU-1140-01	Combined	Verified	Lower Schuylkill River	19103	Disconnected Impervious Area	0.7
2009-SIST-1062-01	Combined	Verified	Lower Schuylkill River	19103	Disconnected Impervious Area	0.2
2009-SIST-1131-01	Combined	Verified	Lower Schuylkill River	19103	Subsurface Infiltration, Green Roof, Disconnected Impervious Area	0.4
2009-STRA-1050-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration	0.2
2009-STRA-1055-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration	0.3
2009-TDBA-1072-01	Combined	Verified	Delaware Direct	19149	Subsurface Infiltration, Bioinfiltration, Disconnected Impervious Area	1.1
2009-TEMP-1077-01	Combined	Verified	Delaware Direct	19122	Subsurface Detention, Bioretention, Porous Pavement	0.9

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2009-TEMP-1096-01	Combined	Verified	Delaware Direct	19122	Porous Pavement	1.5
2009-THEC-1174-01	Combined	Verified	Delaware Direct	19135	Bioretention, Green Roof, Disconnected Impervious Area	0.6
2009-THEM-1167-01	Combined	Verified	Delaware Direct	19121	Green Roof, Porous Pavement	0.4
2009-THEP-1173-01	Combined	Verified	Lower Schuylkill River	19140	Green Roof	0.1
2009-WALM-1045-01	MS4	Verified	Delaware Direct	19148	Direct Discharge	8.0
2009-WEST-1222-01	Combined	Verified	Lower Schuylkill River	19139	Green Roof, Porous Pavement, Disconnected Impervious Area	1.4
2009-WOLC-1169-01	Combined	Verified	Tacony-Frankford Creek	19138	Subsurface Detention, Bioinfiltration	1.7
2010-1800-1260-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration, Disconnected Impervious Area	0.8
2010-1940-1435-01	Combined	Verified	Delaware Direct	19140	Subsurface Infiltration, Porous Pavement	0.6
2010-3737-1331-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	0.3
2010-4109-1277-01	Combined	Verified	Lower Schuylkill River	19104	Green Roof, Porous Pavement	0.2
2010-411W-1300-01	Combined	Verified	Delaware Direct	19122	Subsurface Detention, Bioretention	0.2
2010-4FRA-1464-01	Combined	Verified	Lower Schuylkill River	19103	Subsurface Detention, Green Roof	0.9
2010-5526-1348-01	Combined	Verified	Darby Creek	19139	Subsurface Infiltration, Porous Pavement	0.5
2010-8828-1321-01	Combined	Verified	Pennypack Creek	19136	Subsurface Infiltration	1.2
2010-AGIL-1461-01	Combined	Verified	Delaware Direct	19121	Subsurface Infiltration, Disconnected Impervious Area	1.4
2010-ARCH-1393-01	Combined	Verified	Delaware Direct	19122	Green Roof	0.2
2010-BRID-1233-01	Combined	Verified	Delaware Direct	19137	Subsurface Infiltration, Porous Pavement	1.1
2010-BROA-1347-01	Combined	Verified	Tacony-Frankford Creek	19141	Subsurface Infiltration	0.9
2010-CHOP-1367-01	Combined	Verified	Lower Schuylkill River	19104	Surface Detention, Green Roof, Disconnected Impervious Area	2.6

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2010-CREA-1427-01	Combined	Verified	Delaware Direct	19125	Green Roof, Porous Pavement	0.3
2010-DICK-1410-01	Combined	Verified	Delaware Direct	19148	Porous Pavement, Disconnected Impervious Area	0.7
2010-DILW-1442-01	Combined	Verified	Lower Schuylkill River	19107	Subsurface Detention	0.7
2010-DREX-1399-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	1.5
2010-EARL-1460-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration, Disconnected Impervious Area	0.5
2010-ESPE-1288-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Infiltration	1.1
2010-GEST-1346-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Detention	1.1
2010-GRAN-1432-01	Combined	Verified	Lower Schuylkill River	19130	Subsurface Detention, Green Roof	0.6
2010-HUNT-1351-01	Combined	Verified	Tacony-Frankford Creek	19140-2107	Disconnected Impervious Area	0.1
2010-MOYE-1306-01	Combined	Verified	Delaware Direct	19125	Green Roof, Porous Pavement	0.6
2010-NORR-1475-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Disconnected Impervious Area	2.1
2010-NORT-1449-01	Combined	Verified	Tacony-Frankford Creek	19124-3024	Subsurface Infiltration	0.9
2010-PASC-1238-01	Combined	Verified	Cobbs Creek	19142	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	2.2
2010-PHIL-1362-01	Combined	Verified	Delaware Direct	19148	Surface Detention, Bioretention	2.2
2010-PHIL-1469-01	Combined	Verified	Delaware Direct	19148	Subsurface Detention, Bioretention, Disconnected Impervious Area	3.4
2010-PLEA-1444-01	Combined	Verified	Tacony-Frankford Creek	19119	Subsurface Detention, Green Roof, Disconnected Impervious Area	0.2
2010-PNKW-1360-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Infiltration, Porous Pavement	2.3
2010-PROP-1376-01	Combined	Verified	Delaware Direct	19141	Subsurface Infiltration, Bioinfiltration	2.4
2010-PSDC-1234-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration	1.1

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2010-PSPH-1353-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration, Green Roof	8.4
2010-STJO-1239-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration, Bioinfiltration, Green Roof	1.0
2010-TEMP-1302-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Cistern, Disconnected Impervious Area	2.9
2010-THEF-1254-01	Combined	Verified	Lower Schuylkill River	19103	Subsurface Detention, Bioretention, Disconnected Impervious Area	0.4
2010-UNIV-1312-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	0.7
2010-UNIV-1385-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Bioretention, Disconnected Impervious Area	1.4
2010-WATE-1343-01	Combined	Verified	Delaware Direct	19123	Disconnected Impervious Area	0.1
2010-WIST-1397-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	0.4
2011-3343-1653-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Infiltration, Porous Pavement	0.7
2011-33RD-1697-01	Combined	Verified	Lower Schuylkill River	19132	Bioretention, Green Roof	0.1
2011-4240-1543-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration	0.7
2011-8318-1655-01	Combined	Verified	Lower Schuylkill River	19121	Green Roof, Porous Pavement	0.2
2011-BOTT-1646-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Detention, Bioretention	2.7
2011-CANC-1485-01	Combined	Verified	Tacony-Frankford Creek	19124	Green Roof	0.2
2011-CCTD-1535-01	Combined	Verified	Lower Schuylkill River	19139	Subsurface Infiltration	1.0
2011-CHRI-1545-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration, Green Roof, Porous Pavement	1.0
2011-CONV-1491-01	Combined	Verified	Lower Schuylkill River	19107	Subsurface Detention, Green Roof	0.3
2011-DIAM-1617-01	Combined	Verified	Delaware Direct	19140	Subsurface Detention, Green Roof	0.4
2011-DOLL-1636-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Infiltration	0.3
2011-DREX-1638-01	Combined	Verified	Lower Schuylkill River	19104	Bioretention, Green Roof, Disconnected Impervious Area	0.8

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2011-FAIR-1488-01	Combined	Verified	Delaware Direct	19130	Subsurface Detention, Green Roof	0.4
2011-GREE-1706-01	Combined	Verified	Tacony-Frankford Creek	19138	Surface Infiltration, Subsurface Detention, Porous Pavement	1.9
2011-HAGE-1562-01	Combined	Verified	Delaware Direct	19125	Subsurface Infiltration, Porous Pavement	1.5
2011-HAMI-1518-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Cistern, Green Roof, Disconnected Impervious Area	1.9
2011-HOME-1571-01	Combined	Verified	Delaware Direct	19107	Subsurface Detention, Bioretention, Green Roof	0.2
2011-I95S-1699-01	Combined	Verified	Delaware Direct	19125	Surface Detention, Bioinfiltration, Bioretention	4.7
2011-JWSD-1674-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Disconnected Impervious Area	1.8
2011-KARA-1505-01	Combined	Verified	Lower Schuylkill River	19139	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	4.0
2011-LOCU-1503-01	Combined	Verified	Lower Schuylkill River	19104	Disconnected Impervious Area	0.2
2011-MONT-1516-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration	2.8
2011-NEWN-1620-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration, Green Roof, Porous Pavement	0.9
2011-NICE-1728-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Infiltration, Porous Pavement	0.3
2011-NICE-1729-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Detention, Porous Pavement	0.5
2011-NICE-1730-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Infiltration, Porous Pavement	1.1
2011-NORT-1700-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Detention, Porous Pavement	0.9
2011-PENN-1664-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement	0.2
2011-PHIL-1596-01	Combined	Verified	Lower Schuylkill River	19104	Surface Infiltration, Bioretention, Porous Pavement, Disconnected Impervious Area	3.2
2011-PROP-1483-01	Combined	Verified	Tacony-Frankford Creek	19144	Surface Infiltration, Porous Pavement	1.6
2011-PROP-1662-01	Combined	Verified	Lower Schuylkill River	19130	Surface Infiltration, Subsurface Infiltration	3.7

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2011-SAMU-1569-01	Combined	Verified	Delaware Direct	19111	Porous Pavement	0.4
2011-STMA-1508-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration, Subsurface Detention, Green Roof,Porous Pavement	0.5
2011-TEMP-1622-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Green Roof, Blue Roof, Porous Pavement	1.9
2011-TEMP-1739-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Subsurface Detention, Bioretention, Cistern, Porous Pavement	2.1
2011-TOLL-1586-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration, Green Roof, Disconnected Impervious Area	2.4
2012-1213-1925-01	Combined	Verified	Delaware Direct	19107	Subsurface Detention, Cistern, Green Roof	0.3
2012-1220-1913-01	Combined	Verified	Delaware Direct	19123	Green Roof, Porous Pavement	0.4
2012-1426-1805-01	Combined	Verified	Lower Schuylkill River	19102	Green Roof, Blue Roof	0.3
2012-1900-1754-01	Combined	Verified	Lower Schuylkill River	19145	Green Roof, Porous Pavement	0.6
2012-2549-1840-01	Combined	Verified	Delaware Direct	19125	Porous Pavement	1.0
2012-3601-2053-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Bioretention	0.4
2012-412N-1844-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration, Green Roof, Porous Pavement	1.2
2012-701W-2002-01	Combined	Verified	Delaware Direct	19133	Subsurface Infiltration, Subsurface Detention, Disconnected Impervious Area	4.7
2012-810A-1974-01	Combined	Verified	Delaware Direct	19107	Subsurface Detention, Bioretention	0.2
2012-915N-1854-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration, Porous Pavement	0.8
2012-BUIL-1807-01	Combined	Verified	Tacony-Frankford Creek	19111	Disconnected Impervious Area	0.1
2012-CANC-1770-01	Combined	Verified	Tacony-Frankford Creek	19124	Bioinfiltration, Green Roof	0.6
2012-CENT-1791-01	Combined	Verified	Delaware Direct	19122	Porous Pavement	1.3
2012-CIRA-1937-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	2.1

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2012-EPIS-1888-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof	0.2
2012-ESPE-1947-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Detention, Porous Pavement, Disconnected Impervious Area	3.7
2012-GARY-1938-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Detention, Bioinfiltration, Bioretention, Disconnected Impervious Area	1.3
2012-HUNT-1764-01	Combined	Verified	Tacony-Frankford Creek	19140-2107	Porous Pavement, Disconnected Impervious Area	1.8
2012-INGE-1798-01	Combined	Verified	Delaware Direct	19121	Subsurface Infiltration, Disconnected Impervious Area	0.9
2012-INGL-1949-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration, Bioretention, Porous Pavement, Disconnected Impervious Area	2.6
2012-LINC-2012-01	Combined	Verified	Delaware Direct	19148	Bioinfiltration, Porous Pavement	1.8
2012-PENN-1774-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Bioinfiltration	0.9
2012-PROP-1883-01	Combined	Verified	Tacony-Frankford Creek	19138	Subsurface Infiltration	1.0
2012-RIVE-2027-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement, Disconnected Impervious Area	3.3
2012-RODE-1835-01	Combined	Verified	Delaware Direct	19130	Subsurface Infiltration	0.7
2012-SCHU-2065-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Detention, Bioretention, Disconnected Impervious Area	4.1
2012-SENI-1900-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Detention, Bioretention, Disconnected Impervious Area	0.4
2012-SOUT-1782-01	Combined	Verified	Delaware Direct	19102	Subsurface Detention, Green Roof	0.8
2012-SPRU-1813-01	Combined	Verified	Delaware Direct	19107	Subsurface Detention, Green Roof, Disconnected Impervious Area	0.1
2012-STFR-1986-01	Combined	Verified	Delaware Direct	19125	Subsurface Detention, Bioretention, Disconnected Impervious Area	0.3
2012-SYSC-1931-01	Combined	Verified	Delaware Direct	19148	Bioretention	3.9

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2012-TDBA-2047-01	Combined	Verified	Delaware Direct	19149	Subsurface Infiltration, Bioinfiltration, Disconnected Impervious Area	0.8
2012-TOLL-1898-01	Combined	Verified	Delaware Direct	19147	Green Roof, Disconnected Impervious Area	1.2
2012-UNIV-1848-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Bioinfiltration, Green Roof, Porous Pavement, Disconnected Impervious Area	1.6
2012-WISS-1891-01	Combined	Verified	Tacony-Frankford Creek	19138	Bioretention, Disconnected Impervious Area	1.3
2013-1118-2248-01	Combined	Verified	Delaware Direct	19107	Surface Detention, Green Roof, Porous Pavement	0.8
2013-1601-2261-01	Combined	Verified	Delaware Direct	19148	Subsurface Infiltration, Disconnected Impervious Area	0.9
2013-1901-2109-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Infiltration, Green Roof, Porous Pavement	0.6
2013-2012-2072-01	Combined	Verified	Lower Schuylkill River	19121	Green Roof, Porous Pavement	0.2
2013-2300-2240-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Detention, Bioretention	0.9
2013-23RD-2272-01	Combined	Verified	Lower Schuylkill River	19140	Subsurface Infiltration, Disconnected Impervious Area	0.4
2013-3541-2376-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration, Disconnected Impervious Area	0.6
2013-4783-2339-01	Combined	Verified	Pennypack Creek	19136	Subsurface Detention, Porous Pavement	1.8
2013-8268-2116-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration	0.4
2013-900S-2174-01	Combined	Verified	Delaware Direct	19147	Subsurface Infiltration, Bioinfiltration, Porous Pavement, Disconnected Impervious Area	1.2
2013-9THS-2075-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration	4.6
2013-ALDI-2287-01	Combined	Verified	Darby Creek	19151	Bioretention	0.3
2013-CECI-2157-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration, Green Roof, Disconnected Impervious Area	0.9

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2013-CHOP-2288-01	Combined	Verified	Delaware Direct	19145	Subsurface Detention, Bioretention, Porous Pavement	1.2
2013-CIRA-2405-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Green Roof, Disconnected Impervious Area	0.6
2013-COBB-2080-01	Combined	Verified	Cobbs Creek	19143	Subsurface Detention, Bioretention, Disconnected Impervious Area	0.8
2013-DREX-2081-01	Combined	Verified	Lower Schuylkill River	19104	Surface Detention, Subsurface Detention	1.3
2013-EDBE-2293-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration	4.2
2013-FIRS-2202-01	Combined	Verified	Delaware Direct	19124	Bioinfiltration, Disconnected Impervious Area	4.9
2013-HALP-2134-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration	1.6
2013-HELP-2241-01	Combined	Verified	Lower Schuylkill River	19153	Surface Infiltration	1.8
2013-MAST-2259-01	Combined	Verified	Lower Schuylkill River	19121	Disconnected Impervious Area	0.6
2013-NEUR-2140-01	Combined	Verified	Lower Schuylkill River	19104	Bioinfiltration, Bioretention, Green Roof, Porous Pavement, Disconnected Impervious Area	0.4
2013-PROP-2163-01	Combined	Verified	Tacony-Frankford Creek	19141	Subsurface Infiltration	0.9
2013-RESI-2173-01	Combined	Verified	Cobbs Creek	19143	Green Roof, Disconnected Impervious Area	0.1
2013-SETT-2085-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Detention, Bioinfiltration, Porous Pavement, Disconnected Impervious Area	2.1
2013-STCH-2103-01	Combined	Verified	Delaware Direct	19134	Bioinfiltration, Bioretention, Disconnected Impervious Area	4.6
2013-STCH-2149-01	Combined	Verified	Delaware Direct	19134	Bioretention, Disconnected Impervious Area	3.8
2013-TACO-2197-01	Combined	Verified	Delaware Direct	19135	Subsurface Detention, Bioinfiltration, Disconnected Impervious Area	2.1
2013-TEMP-2178-01	Combined	Verified	Delaware Direct	19140	Subsurface Detention, Bioretention	1.1
2013-THES-2177-01	Combined	Verified	Delaware Direct	19123	Subsurface Infiltration	1.2
2014-1325-2469-01	Combined	Verified	Delaware Direct	19121	Subsurface Detention, Bioretention	0.8

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2014-2013-2751-01	Combined	Verified	Delaware Direct	19125	Subsurface Infiltration, Porous Pavement	0.4
2014-2322-2715-01	Combined	Verified	Lower Schuylkill River	19130	Subsurface Infiltration, Porous Pavement	0.4
2014-5800-2463-01	Combined	Verified	Lower Schuylkill River	19131	Surface Infiltration, Disconnected Impervious Area	1.0
2014-ALLE-2455-01	Combined	Verified	Delaware Direct	19125	Green Roof, Porous Pavement, Disconnected Impervious Area	0.4
2014-CHIC-2755-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Infiltration	0.5
2014-DREX-2457-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement	2.6
2014-ENVI-2646-01	Combined	Verified	Delaware Direct	19148-5607	Surface Infiltration, Subsurface Detention, Bioretention	2.0
2014-GSTR-2443-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Infiltration	1.1
2014-INDE-2590-01	Combined	Verified	Delaware Direct	19106	Disconnected Impervious Area	0.0
2014-NORT-2603-01	Combined	Verified	Delaware Direct	19123	Subsurface Detention, Bioretention	0.5
2014-PAND-2762-01	Combined	Verified	Delaware Direct	19134	Subsurface Infiltration	0.3
2014-PERE-2472-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Disconnected Impervious Area	0.6
2014-PHAG-2547-01	Combined	Verified	Lower Schuylkill River	19132	Subsurface Detention, Bioretention	0.3
2014-PHAO-2459-01	Combined	Verified	Lower Schuylkill River	19132	Subsurface Detention, Bioretention, Porous Pavement	0.4
2014-STJO-2424-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Disconnected Impervious Area	5.6
2014-TEMP-2699-01	Combined	Verified	Delaware Direct	19121	Disconnected Impervious Area	0.4
2014-UNIV-2747-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement	0.5
2014-VERN-2690-01	Combined	Verified	Tacony-Frankford Creek	19144	Porous Pavement, Disconnected Impervious Area	0.6
2014-WEST-2612-01	Combined	Verified	Lower Schuylkill River	19121	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	1.9

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2015-4050-2828-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Detention, Bioretention, Disconnected Impervious Area	0.4
2015-CAMD-2769-01	Combined	Verified	Delaware Direct	19134	Surface Infiltration	3.4
2015-GAUD-2962-01	Combined	Verified	Lower Schuylkill River	19140	Subsurface Detention, Bioretention, Porous Pavement	0.6
2015-TEMP-2829-01	Combined	Verified	Delaware Direct	19122	Subsurface Infiltration, Porous Pavement	0.2
2015-UCHS-2939-01	Combined	Verified	Lower Schuylkill River	19104	Subsurface Infiltration, Subsurface Detention, Bioretention, Disconnected Impervious Area	2.2
2015-WAYN-2771-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	1.2
FY16-ADAM-4220-01	Combined	Verified	Tacony-Frankford Creek	19120	Bioinfiltration	1.0
FY16-DREX-4244-01	Combined	Verified	Lower Schuylkill River	19104	Porous Pavement, Disconnected Impervious Area	1.0
FY16-FIVE-4029-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Infiltration, Bioretention	1.1
FY16-FRAN-4076-01	Combined	Verified	Tacony-Frankford Creek	19124	Disconnected Impervious Area	0.0
FY16-HANO-4040-01	Combined	Verified	Lower Schuylkill River	19107	Subsurface Detention	2.1
FY16-KENS-4216-01	Combined	Verified	Delaware Direct	19125	Bioinfiltration, Porous Pavement	0.7
FY16-LASA-4354-01	Combined	Verified	Tacony-Frankford Creek	19141	Porous Pavement, Disconnected Impervious Area	0.2
FY16-TEMP-4277-01	Combined	Verified	Delaware Direct	19122	Porous Pavement	0.4
FY17-CAMP-4378-01	Combined	Verified	Lower Schuylkill River	19140	Subsurface Infiltration, Disconnected Impervious Area	0.7
FY17-STPI-4413-01	Combined	Verified	Cobbs Creek	19143	Bioinfiltration, Disconnected Impervious Area	0.2
FY17-THAN-4446-01	Combined	Verified	Lower Schuylkill River	19146	Subsurface Detention	0.8
FY17-WGOD-4567-01	Combined	Verified	Tacony-Frankford Creek	19141	Subsurface Infiltration, Porous Pavement, Disconnected Impervious Area	1.1
Total Greened Acres:						**510.5**

Table 4: Complete SMIP and GARP Green Stormwater Infrastructure Projects

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2010-COMM-1370-01	Combined	Verified	Delaware Direct	19140	Green Roof	0.1
2011-1518-1561-01	Combined	Verified	Delaware Direct	19130	Subsurface Infiltration	0.2
2011-2150-1616-01	Combined	Verified	Delaware Direct	19134	Subsurface Infiltration	1.4
2011-RETR-001-01	Combined	Verified	Lower Schuylkill River	19142	Disconnected Impervious Area	0.3
2012-6225-1857-01	Combined	Verified	Delaware Direct	19135	Bioinfiltration	0.3
2012-GSFS-2028-01	Combined	Verified	Tacony-Frankford Creek	19144	Bioretention, Depave	1.0
2012-NEWM-1776-01	Combined	Verified	Delaware Direct	19135	Cistern	1.0
2012-ROOF-1869-01	Combined	Verified	Delaware Direct	19125	Direct Discharge	0.9
2012-THEE-1746-01	Combined	Verified	Lower Schuylkill River	19139	Green Roof	0.1
2012-WOLF-1792-01	Combined	Verified	Delaware Direct	19137	Direct Discharge	11.7
2013-1148-2105-01	Combined	Verified	Delaware Direct	19127	Surface Infiltration, Subsurface Infiltration, Green Roof	0.7
2013-6225-2400-01	Combined	Verified	Delaware Direct	19135	Subsurface Infiltration	3.0
2013-CARD-2076-01	Combined	Verified	Delaware Direct	19124	Surface Detention, Subsurface Detention	53.0
2013-CARD-2220-01	Combined	Verified	Tacony-Frankford Creek	19124	Surface Detention	15.4
2013-METH-2117-01	Combined	Verified	Lower Schuylkill River	19131	Bioinfiltration	1.7
2013-SITE-2387-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration	5.2
2013-SITE-2401-01	Combined	Verified	Lower Schuylkill River	19131	Subsurface Infiltration	3.4
2014-GLOB-2467-01	Combined	Verified	Tacony-Frankford Creek	19124	Surface Detention	0.6
2014-SITE-2501-01	Combined	Verified	Lower Schuylkill River	19131	Bioinfiltration	35.5
2014-SITE-2549-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Infiltration	3.3
2014-SITE-2550-01	Combined	Verified	Delaware Direct	19135	Subsurface Infiltration	1.7
2014-SITE-2592-01	Combined	Verified	Lower Schuylkill River	19153	Subsurface Infiltration	9.1
2014-SITE-2665-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Infiltration, Subsurface Detention	8.9
2014-SITE-2666-01	Combined	Verified	Lower Schuylkill River	19153	Subsurface Infiltration	2.7
2014-SITE-2682-01	Combined	Verified	Lower Schuylkill River	19131	Surface Infiltration, Subsurface Detention	7.4

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
2014-WARR-2757-01	Combined	Verified	Tacony-Frankford Creek	19124	Bioretention	3.1
2014-WILL-2541-01	Combined	Verified	Delaware Direct	19140	Depave	0.2
2015-FRAN-2954-01	Combined	Verified	Delaware Direct	19130	Surface Detention	0.6
2015-LASA-2865-01	Combined	Verified	Tacony-Frankford Creek	19141	Surface Detention	7.4
2015-LEAE-2888-01	Combined	Verified	Lower Schuylkill River	19036	Subsurface Infiltration, Bioinfiltration, Porous Pavement	2.0
2015-LIGH-2907-01	Combined	Verified	Delaware Direct	19140	Surface Detention	0.7
2015-LUTH-2836-01	Combined	Verified	Delaware Direct	19125	Depave	0.1
2015-MART-2832-01	Combined	Verified	Tacony-Frankford Creek	19138	Subsurface Infiltration, Bioinfiltration	3.8
2015-MAYF-2796-01	Combined	Verified	Delaware Direct	19149	Bioretention	4.8
2015-MINK-2844-01	Combined	Verified	Lower Schuylkill River	19145	Surface Infiltration	0.7
2015-NORT-2977-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Infiltration, Subsurface Detention	17.6
2015-SITE-2809-01	Combined	Verified	Tacony-Frankford Creek	19120	Subsurface Infiltration, Subsurface Detention	21.9
2015-SITE-2810-01	Combined	Verified	Lower Schuylkill River	19153	Subsurface Detention	9.9
2015-SITE-2812-01	Combined	Verified	Pennypack Creek	19136	Subsurface Detention	10.8
2015-STJA-2895-01	Combined	Verified	Tacony-Frankford Creek	19120	Surface Infiltration, Surface Detention, Subsurface Detention	0.5
2015-TAGG-2931-01	Combined	Verified	Delaware Direct	19148	Subsurface Infiltration, Bioinfiltration, Depave, Disconnected Impervious Area	0.9
FY16-ADAI-4164-01	Combined	Verified	Delaware Direct	19125	Depave	2.3
FY16-ADAM-4101-01	Combined	Verified	Tacony-Frankford Creek	19124	Surface Detention, Disconnected Impervious Area	1.8
FY16-CHES-4233-01	Combined	Verified	Lower Schuylkill River	19146	Surface Infiltration, Subsurface Infiltration, Porous Pavement, Depave	1.0
FY16-EMST-4198-01	Combined	Verified	Delaware Direct	19146	Depave	0.1
FY16-ESSI-4357-01	Combined	Verified	Lower Schuylkill River	19153	Subsurface Detention	8.0
FY16-FRIE-4238-01	Combined	Verified	Lower Schuylkill River	19102	Green Roof	0.2
FY16-GAUL-4273-01	Combined	Verified	Delaware Direct	19134	Subsurface Infiltration	1.2
FY16-ISTR-4292-01	Combined	Verified	Delaware Direct	19134	Blue Roof	1.3
FY16-JMPA-4286-01	Combined	Verified	Lower Schuylkill River	19142	Bioinfiltration, Depave	0.8

Tracking Number	Sewer Type	Category	Watershed Type	Zip	SMP Types	Greened Acres
FY16-JOMA-4143-01	Combined	Verified	Tacony-Frankford Creek	19124	Surface Detention	1.3
FY16-LASA-4274-01	Combined	Verified	Tacony-Frankford Creek	19144	Surface Detention, Subsurface Detention	9.5
FY16-MIDA-4019-01	Combined	Verified	Delaware Direct	19123	Surface Infiltration, Depave	1.4
FY16-NAME-4323-01	Combined	Verified	Tacony-Frankford Creek	19140	Subsurface Detention	7.5
FY16-NFRA-4325-01	Combined	Verified	Delaware Direct	19125	Porous Pavement	0.1
FY16-PECO-4145-01	Combined	Verified	Lower Schuylkill River	19103	Green Roof	0.8
FY16-PHIL-4130-01	Combined	Verified	Darby Creek	19142	Depave	0.2
FY16-PHIL-4134-01	Combined	Verified	Lower Schuylkill River	19130	Green Roof	0.1
FY16-SITE-4016-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Detention	6.4
FY16-SITE-4020-01	Combined	Verified	Delaware Direct	19136	Subsurface Infiltration	1.5
FY16-SITE-4025-01	Combined	Verified	Pennypack Creek	19136	Subsurface Detention	13.7
FY16-SITE-4039-01	Combined	Verified	Delaware Direct	19148	Surface Detention, Subsurface Detention	5.7
FY16-SITE-4189-01	Combined	Verified	Tacony-Frankford Creek	19120	Surface Detention, Subsurface Detention	12.9
FY16-STHS-4226-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Detention, Bioretention	4.5
FY16-USGS-4133-01	Combined	Verified	Delaware Direct	19106	Green Roof	0.4
FY16-WAKE-4282-01	Combined	Verified	Delaware Direct	19137	Subsurface Detention	8.1
FY17-BAKE-4685-01	Combined	Verified	Delaware Direct	19134	Subsurface Infiltration	2.7
FY17-CAST-4743-01	Combined	Verified	Delaware Direct	19134	Subsurface Detention	7.1
FY17-EDMU-4680-01	Combined	Verified	Pennypack Creek	19136	Subsurface Infiltration	4.3
FY17-EERI-4396-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Detention	3.6
FY17-ELUZ-4412-01	Combined	Verified	Tacony-Frankford Creek	19124	Subsurface Infiltration	8.1
FY17-FSFA-4510-01	Combined	Verified	Delaware Direct	19122	Green Roof	0.1
FY17-HIST-4671-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Detention, Bioretention, Depave	0.6
FY17-OVER-4682-01	Combined	Verified	Lower Schuylkill River	19151	Subsurface Infiltration, Bioinfiltration	2.1
FY17-STEN-4469-01	Combined	Verified	Tacony-Frankford Creek	19144	Subsurface Detention	3.9
FY17-STHS-4442-01	Combined	Verified	Lower Schuylkill River	19145	Subsurface Detention	14.7
Total Greened Acres:						**391.2**

Appendix 4

Green Stormwater Infrastructure Monitoring Status Report

1.0 Introduction

During the reporting period of July 1, 2017 to June 30, 2018, the City's *Green City, Clean Waters* program addressed stormwater runoff reductions in urbanized areas using a combination of traditional infrastructure and green stormwater infrastructure (GSI). GSI systems vary in size, complexity, and interconnectedness to the existing drainage system, but the objective is to evapotranspire, infiltrate, reuse, or detain stormwater rather than to convey it directly to the sewer system. Monitoring and testing GSI systems is therefore essential to determine the effectiveness of various SMP types in managing stormwater and reducing combined sewer overflows.

The focus of the *Green City, Clean Waters* monitoring program is post-construction performance monitoring and testing. The primary goal of GSI monitoring and testing is to measure the performance of GSI systems for reducing stormwater runoff volume. Secondary goals include providing information for improvements to GSI design and maintenance and developing appropriate monitoring methods for the variety of GSI projects installed city-wide.

Project characteristics such as contributing drainage area, storage volume, inlet capture efficiency, and (when present) slow release discharge parameters can be observed, allowing for a more complete view of a system's functionality. The comprehensive understanding of GSI through monitoring and testing allows the Water Department to make informed decisions for current and future projects regarding the GSI design standards, type and frequency of maintenance activities, and program optimization.

From July 1, 2017 to June 30, 2018, the Water Department performed monitoring and testing of GSI stormwater management practices (SMPs) using methods described in the Comprehensive Monitoring Plan (CMP) submitted January 10, 2014 and approved by PADEP May 28, 2014. In selecting monitoring locations, the Water Department has attempted to allocate monitoring effort roughly according to the types of SMPs that are being constructed for the *Green City, Clean Waters* program as a whole (Table 1-1).

Table 1-1: Monitored SMPs by Type

SMP Type	Monitored SMPs Before or During FY18	Total Constructed Public SMPs
Stormwater Tree Trench	196	246
Stormwater Planter	7	53
Stormwater Bump-out	2	25
Rain Garden	61*	99
Infiltration/Storage Trench	57*	137
Pervious Paving	2	13
Swale	3	23
Total	328*	596

*Number contains privately constructed GSI

2.0 Data Tracking

The data tracking mechanism for *Green City, Clean Waters* GSI monitoring data has evolved significantly since the inception of the program. Raw data are stored on an SMP-by-SMP basis in a filesystem directory tree that is backed up periodically. Derived data from quality assurance calculations are stored in spreadsheets and relational databases, to be used by various data analysis groups. System metrics and design characteristics are stored in other relational databases managed by PWD.

3.0 Comprehensive Monitoring Plan Implementation Status

Proposed methods for performance monitoring were outlined in both the draft Comprehensive Monitoring Plan submitted December 1, 2012 and in a comment response sent to PADEP and the EPA on July 31, 2013. A revised CMP was submitted on January 10th, 2014 and approved by PADEP on May 28, 2014. The following sections summarize the status of monitoring activities described in the CMP for July 1, 2017 through June 30, 2018. Updated monitoring procedures from the 2014 revision to the CMP will be described in a forthcoming CMP update.

3.1 Green Stormwater Infrastructure Performance Monitoring

Continuous water level and storage volume monitoring of GSI systems is the primary way that the Water Department is evaluating performance of constructed SMPs. Up through FY18, the Water Department has deployed 279 unique HOBO U20-001-04 water level loggers (Onset Computer Corp, Bourne MA) during its GSI monitoring program. Individual sensors can be deployed in various locations throughout their useful life, and are often used to monitor multiple SMPs before retirement. Of these 279 loggers, 267 loggers have been deployed in 328 GSI SMPs (Tables 3-1 and 3-2, Figure 3-1) for the purposes of measuring water level data. Additionally, 81 of the 279 loggers have been deployed, at one time or another, to measure barometric pressure throughout the City. Each barometric sensor can provide data for multiple water level sensors.

Table 3-1: Continuous Water Level Monitoring Sensors

Sensor Type	Number Deployed Through FY18
Barometric Pressure Sensor	81
Water Level Sensor	267
Total Unique Sensors	279

Table 3-2: SMP Attributes for Continuous Water Level Monitoring SMPs

SMP ID	SMP Type	Project Name
1-1-1	Tree Trench	Hartranft
1-2-1	Tree Trench	Hartranft
1-3-1	Tree Trench	Hartranft
2-1-1	Rain Garden	Welsh School
2-1-2	Infiltration/Storage Trench	Welsh School
2-2-1	Tree Trench	Welsh School
3-1-1	Tree Trench	Belfield
3-2-1	Tree Trench	Belfield
3-3-1	Tree Trench	Belfield
3-4-1	Tree Trench	Belfield
3-5-1	Tree Trench	Belfield
3-6-1	Tree Trench	Belfield
8-1-1	Tree Trench	Montgomery
8-2-1	Rain Garden	Shissler, south basin
8-2-2	Rain Garden	Shissler, north basin
9-1-1	Tree Trench	Palmer
9-2-1	Tree Trench	Palmer
10-1-1	Tree Trench	Thompson and Columbia
10-2-1	Tree Trench	Columbia and Livingston
12-1-3	Infiltration/Storage Trench	Bodine
12-3-1	Tree Trench	Bodine
12-4-1	Tree Trench	Bodine
12-5-1	Tree Trench	Bodine
13-1-1	Infiltration/Storage Trench	Madison Memorial Park
14-1-2	Infiltration/Storage Trench	12th and Reed

SMP ID	SMP Type	Project Name
15-1-1	Tree Trench	12th St from Dickinson to Tasker
15-2-1	Tree Trench	12th St from Dickinson to Tasker
16-1-1	Tree Trench	10th St from Wilder to Reed
18-1-1	Tree Trench	16th St.
19-4-1	Tree Trench	Barry Playground
19-5-1	Tree Trench	Barry Playground
20-1-1	Planter	BLS
20-2-1	Planter	BLS
20-3-1	Planter	BLS
20-4-1	Planter	BLS
20-5-1	Planter	BLS
20-6-1	Planter	BLS
20-7-1	Planter	BLS
20-8-1	Infiltration/Storage Trench	BLS
20-9-1	Tree Trench	BLS
20-10-1	Tree Trench	BLS
21-1-1	Rain Garden	Blue Bell Inn
46-3-1	Rain Garden	Lancaster Ave from N 58th St to N 63rd St
46-3-2	Swale	Lancaster Ave from N 58th St to N 63rd St
46-4-1	Swale	Lancaster Ave from N 58th St to N 63rd St
50-1-1	Tree Trench	Chalmers
59-1-1	Tree Trench	Baltimore Ave Island
88-1-1	Infiltration/Storage Trench	Trenton and Norris
88-1-2	Rain Garden	Trenton and Norris
91-1-1	Tree Trench	3th and Fairmont
91-1-2	Bumpout	3rd and Fairmount
123-1-1	Rain Garden	Elmwood and Lindberg
123-2-1	Tree Trench	59th and Chester
123-3-1	Tree Trench	59th and Florence
154-1-1	Tree Trench	Anna B Day
154-2-1	Tree Trench	Anna B Day
154-3-1	Tree Trench	Anna B Day
154-4-1	Tree Trench	Anna B Day
157-1-1	Tree Trench	Wakisha Charter School
157-2-1	Tree Trench	Wakisha Charter School
157-3-1	Tree Trench	Wakisha Charter School
162-3-1	Tree Trench	Chew Playground

SMP ID	SMP Type	Project Name
162-4-1	Tree Trench	Chew Playground
167-1-1	Tree Trench	Little Sisters of the Poor
167-2-1	Tree Trench	Little Sisters of the Poor
167-3-1	Tree Trench	Little Sisters of the Poor
170-1-1	Tree Trench	Blair
170-2-1	Tree Trench	Hewson
175-1-1	Tree Trench	Frederick Douglas Elem.
176-1-1	Tree Trench	Philadelphia Military Academy
177-1-1	Tree Trench	MLK Rec Center
177-2-1	Tree Trench	MLK Rec Center
178-1-1	Tree Trench	Towey Rec., Berks
178-2-1	Tree Trench	Towey Rec., Masher St
179-1-1	Tree Trench	Morris Leeds
179-2-1	Tree Trench	Morris Leeds
179-3-1	Tree Trench	Morris Leeds
179-4-1	Tree Trench	Morris Leeds
179-5-1	Tree Trench	Morris Leeds
179-6-1	Tree Trench	Morris Leeds
179-7-1	Tree Trench	Morris Leeds
179-8-1	Tree Trench	Morris Leeds
179-9-1	Tree Trench	Morris Leeds
179-10-1	Tree Trench	Morris Leeds
179-11-1	Tree Trench	Morris Leeds
179-12-1	Tree Trench	Morris Leeds
179-13-1	Tree Trench	Morris Leeds
179-14-1	Tree Trench	Morris Leeds
180-1-1	Tree Trench	Reese & Norris
181-1-1	Rain Garden	47th & Grays Ferry
185-1-1	Infiltration/Storage Trench	Clark Park Basketball Court
194-1-1	Rain Garden	Liberty Lands
186-1-1	Rain Garden	Cliveden Park
186-2-1	Rain Garden	Cliveden Park
187-3-3	Infiltration/Storage Trench	Columbus Sq.
192-1-1	Infiltration/Storage Trench	Herron Playground
207-1-1	Tree Trench	Waterview
207-1-2	Tree Trench	Waterview
210-1-1	Infiltration/Storage Trench	Sayer HS

SMP ID	SMP Type	Project Name
210-2-1	Infiltration/Storage Trench	Sayer HS
210-3-1	Tree Trench	Sayer HS
211-1-1	Bumpout	Shepard Rec
211-1-2	Tree Trench	Shepard Rec
211-2-1	Tree Trench	Shepard Rec
211-3-1	Tree Trench	Shepard Rec
212-1-1	Tree Trench	Samuel B. Huey
212-2-1	Tree Trench	Samuel B. Huey
212-3-1	Tree Trench	Samuel B. Huey
213-1-1	Tree Trench	Christy Rec
213-2-1	Tree Trench	Christy Rec
213-3-1	Tree Trench	Christy Rec
214-1-1	Tree Trench	William Harrity
214-2-1	Tree Trench	William Harrity
215-1-1	Tree Trench	Bryant Elementary School
215-2-1	Tree Trench	Bryant Elementary School
216-1-1	Tree Trench	Andrew Hamilton School
223-1-1	Tree Trench	A.S. Jenks School
223-2-1	Tree Trench	A.S. Jenks School
224-1-1	Tree Trench	Sacks Playgound
224-2-1	Tree Trench	Sacks Playgound
224-3-1	Tree Trench	Sacks Playgound
226-1-1	Tree Trench	Smith Elementary
227-1-1	Tree Trench	St Thomas Aquinas School
227-2-1	Tree Trench	St Thomas Aquinas School
227-3-1	Tree Trench	St Thomas Aquinas School
231-1-1	Tree Trench	Daroff School
231-2-1	Tree Trench	Daroff
233-1-1	Tree Trench	Belgrade and Marlborough
233-2-1	Tree Trench	Belgrade and Marlborough
234-1-1	Tree Trench	Franklin St. from Diamond to Norris
234-2-1	Tree Trench	Franklin St. from Diamond to Norris
234-3-1	Tree Trench	Franklin St. from Diamond to Norris
234-4-1	Tree Trench	Franklin St. from Diamond to Norris
234-5-1	Tree Trench	Franklin St. from Diamond to Norris
235-2-1	Tree Trench	Germantown Ave. and Laurel
235-4-1	Tree Trench	Germantown Ave. and New Market

SMP ID	SMP Type	Project Name
240-1-1	Pervious Pavement	Percy Street
245-1-1	Tree Trench	25th and Diamond
247-1-1	Tree Trench	Julian Abele Park
250-1-1	Tree Trench	Belmont School
250-2-1	Tree Trench	Belmont School
250-3-1	Tree Trench	Belmont School
251-1-1	Tree Trench	James Rhoads School
252-1-1	Tree Trench	Sister Clara Muhammad School
252-2-1	Tree Trench	Sister Clara Muhammad School
253-1-1	Tree Trench	Muhammad Square
253-2-1	Tree Trench	Muhammad Square
253-3-1	Tree Trench	Muhammad Square
254-1-1	Tree Trench	Mastery Charter School
254-2-1	Tree Trench	Mastery Charter School
255-1-1	Tree Trench	Cassidy Elementary School
255-2-1	Tree Trench	Cassidy Elementary School
256-1-1	Tree Trench	Overbrook Elementary
257-1-1	Tree Trench	Old Cathedral Cemetary
258-1-1	Tree Trench	Donald Finnegan Playground
260-1-1	Tree Trench	E.H. Vare Middle School
260-2-1	Tree Trench	E.H. Vare Middle School
261-1-1	Tree Trench	Stephen Girard School
262-1-1	Tree Trench	Southwark School
264-1-1	Tree Trench	Longstreth
265-1-1	Tree Trench	McCreesh Playground
265-2-1	Tree Trench	McCreesh Playground
265-3-1	Tree Trench	McCreesh Playground
265-4-1	Tree Trench	McCreesh Playground
265-5-1	Tree Trench	McCreesh Playground
266-1-1	Rain Garden	Springfield and Cobbs Creek
266-1-2	Infiltration/Storage Trench	Springfield and Cobbs Creek
266-1-3	Rain Garden	Springfield and Cobbs Creek
268-1-1	Tree Trench	William Gray Youth Center
269-1-1	Tree Trench	Parking Lot- 12th, Marvine, and Diamond
269-2-1	Tree Trench	Parking Lot- 12th, Marvine, and Diamond
269-3-1	Tree Trench	Parking Lot- 12th, Marvine, and Diamond
269-4-1	Tree Trench	Parking Lot- 12th, Marvine, and Diamond

SMP ID	SMP Type	Project Name
269-5-1	Tree Trench	Parking Lot- 12th, Marvine, and Diamond
270-1-1	Tree Trench	Dick Elementary
270-2-1	Tree Trench	Dick Elementary
271-1-1	Infiltration/Storage Trench	Bridesburg Rec
271-2-1	Tree Trench	Bridesburg Rec
271-3-1	Tree Trench	Bridesburg Rec
272-1-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
272-2-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
272-3-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
272-4-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
272-5-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
272-6-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
272-7-1	Tree Trench	White Hall Commons/Carmella Playground/Gambrell Recreation Center/Warren G Harding School
273-1-1	Tree Trench	Dorsey Playground
273-2-1	Tree Trench	Dorsey Playground
273-3-1	Tree Trench	Dorsey Playground
274-1-1	Tree Trench	Roosevelt Playground
274-2-1	Tree Trench	Roosevelt Playground
274-3-1	Tree Trench	Roosevelt Playground
274-4-1	Infiltration/Storage Trench	Roosevelt Playground
275-1-1	Tree Trench	Magnolia Cemetery
277-1-1	Tree Trench	William Cramp
277-2-1	Tree Trench	William Cramp
279-1-1	Rain Garden	Harpers Hollow
280-1-1	Rain Garden	Kemble Park
280-1-2	Swale	Kemble Park
280-1-3	Rain Garden	Kemble Park
280-2-1	Infiltration/Storage Trench	Kemble Park
280-3-1	Infiltration/Storage Trench	Kemble Park
280-4-1	Infiltration/Storage Trench	Kemble Park
281-1-1	Rain Garden	Wakefield
281-2-1	Rain Garden	Wakefield
282-1-1	Rain Garden	Wister Woods

SMP ID	SMP Type	Project Name
282-2-1	Rain Garden	Wister Woods
282-3-1	Rain Garden	Wister Woods
282-4-1	Rain Garden	Wister Woods
285-1-1	Tree Trench	21st and Venango
291-2-1	Tree Trench	Taggert School
291-3-1	Infiltration/Storage Trench	Taggert School
296-1-1	Tree Trench	Poplar, 8th to Franklin
301-2-1	Tree Trench	Dauphin, Frankford to Tulip
312-1-1	Tree Trench	Dendy Rec Center
312-2-1	Tree Trench	Dendy Rec Center
313-1-2	Infiltration/Storage Trench	Passyunk Ave from Dickinson to Reed
322-1-1	Tree Trench	Haverford Triangle
322-2-1	Rain Garden	Haverford Triangle
324-1-1	Tree Trench	Earl & Thompson
325-1-1	Tree Trench	8th & Poplar
326-1-1	Tree Trench	Front St.
327-1-1	Tree Trench	9th & Brown
342-1-1	Tree Trench	Diamond St., 24th to 25th
366-2-1	Tree Trench	Philadelphia Zoo
366-2-2	Infiltration/Storage Trench	Philadelphia Zoo
366-3-1	Rain Garden	Philadelphia Zoo
366-4-1	Rain Garden	Philadelphia Zoo
366-5-1	Rain Garden	Philadelphia Zoo
366-6-1	Rain Garden	Philadelphia Zoo
366-9-1	Infiltration/Storage Trench	Philadelphia Zoo
366-10-3	Infiltration/Storage Trench	Philadelphia Zoo
367-1-1	Rain Garden	Panati Playground
367-1-2	Rain Garden	Panati Playground
367-1-3	Rain Garden	Panati Playground
367-1-4	Infiltration/Storage Trench	Panati Playground
375-1-1	Tree Trench	Kinsey School
378-1-1	Tree Trench	Rowan School
388-1-1	Infiltration/Storage Trench	Wolf and American
388-2-1	Tree Trench	Wolf and 2nd
388-3-1	Tree Trench	Ritner and American
388-4-1	Infiltration/Storage Trench	Ritner and 3rd
389-1-1	Infiltration/Storage Trench	St. Monica Manor

SMP ID	SMP Type	Project Name
392-1-1	Tree Trench	73rd & Grays Ave.
392-2-1	Tree Trench	73rd & Grays Ave.
393-1-1	Rain Garden	Elmwood Park
393-1-2	Tree Trench	Elmwood Park
393-2-1	Tree Trench	Elmwood Park
393-3-1	Tree Trench	Elmwood Park
393-3-2	Rain Garden	Elmwood Park
393-4-1	Infiltration/Storage Trench	Elmwood Park
393-5-1	Tree Trench	Elmwood Park
394-1-1	Tree Trench	Patterson School
394-2-1	Tree Trench	Patterson School
394-3-1	Infiltration/Storage Trench	Patterson School
396-1-1	Tree Trench	Connell Park
396-2-1	Tree Trench	Connell Park
396-3-1	Tree Trench	Connell Park
397-1-1	Tree Trench	Mother Mary
397-2-1	Tree Trench	Mother Mary
398-1-1	Tree Trench	St. James Episcopal
398-2-1	Tree Trench	St. James Episcopal
403-1-3	Infiltration/Storage Trench	Nebinger
403-1-4	Rain Garden	Nebinger
403-2-1	Infiltration/Storage Trench	Nebinger
410-1-1	Rain Garden	Harrowgate Park
410-2-1	Rain Garden	Harrowgate Park
410-3-1	Rain Garden	Harrowgate Park
410-4-1	Rain Garden	Harrowgate Park
410-4-2	Rain Garden	Harrowgate Park
417-1-1	Rain Garden	Stenton and Washington
445-1-1	Pervious Pavement	SW Parking Lot
470-1-1	Tree Trench	Woodland Ave
470-2-1	Tree Trench	Woodland Ave
470-3-1	Tree Trench	Woodland Ave
470-4-1	Tree Trench	Woodland Ave
471-1-1	Infiltration/Storage Trench	Bustleton Ave (Tiger III)
475-1-2	Infiltration/Storage Trench	Callazo Park
479-1-1	Rain Garden	William Dick
517-1-1	Tree Trench	56th from Greenway to Paschall

SMP ID	SMP Type	Project Name
517-2-1	Tree Trench	56th from Greenway to Paschall
524-2-1	Infiltration/Storage Trench	Benson Park
530-1-1	Rain Garden	Baker Playground
530-1-2	Infiltration/Storage Trench	Baker Playground
558-1-1	Rain Garden	Heston Lot
558-1-2	Infiltration/Storage Trench	Heston Lot
574-1-1	Infiltration/Storage Trench	Ralph Brooks
574-1-2	Rain Garden	Ralph Brooks
589-1-1	Infiltration/Storage Trench	Stinger Square
589-2-1	Rain Garden	Stinger Square
589-2-2	Infiltration/Storage Trench	Stinger Square
597-1-1	Tree Trench	33rd and Dauphin
656-1-1	Infiltration/Storage Trench	43th and Market
657-1-1	Infiltration/Storage Trench	Melon St. and Broad
1015-1-1	Rain Garden	Hagert Playground
1015-1-2	Infiltration/Storage Trench	Hagert Playground
1015-2-1	Rain Garden	Hagert Playground
1015-2-2	Infiltration/Storage Trench	Hagert Playground
1058-1-1	Infiltration/Storage Trench	Broad and Medary
1058-2-1	Infiltration/Storage Trench	13th and Medary
1066-1-1	Infiltration/Storage Trench	Frankford Ave.
1066-2-1	Infiltration/Storage Trench	Frankford Ave.
1066-3-1	Infiltration/Storage Trench	Frankford Ave.
1066-4-1	Infiltration/Storage Trench	Frankford Ave.
1066-5-1	Infiltration/Storage Trench	Frankford Ave.
1066-6-1	Infiltration/Storage Trench	Frankford Ave.
61369	Subsurface Basin	Dependable Distribution
61609	Subsurface Basin	Quaker City
62138	Bioinfiltration/Bioretention	MLK High School
62139	Bioinfiltration/Bioretention	MLK High School
62140	Bioinfiltration/Bioretention	MLK High School
62141	Bioinfiltration/Bioretention	MLK High School
62142	Bioinfiltration/Bioretention	MLK High School
61823	Bioinfiltration/Bioretention	Warren G Harding
61824	Bioinfiltration/Bioretention	Warren G Harding
61825	Bioinfiltration/Bioretention	Warren G Harding
61826	Bioinfiltration/Bioretention	Warren G Harding

SMP ID	SMP Type	Project Name
62843	Bioinfiltration/Bioretention	Mayfair Elementary
62844	Bioinfiltration/Bioretention	Mayfair Elementary
62845	Bioinfiltration/Bioretention	Mayfair Elementary
62262	Subsurface Basin	Novick Brothers
62263	Subsurface Basin	Novick Brothers
62624	Subsurface Basin	Baptist Worship Center
59550	Bioinfiltration/Bioretention	Germantown Friends School
59552	Bioinfiltration/Bioretention	Germantown Friends School
62089	Bioinfiltration/Bioretention	La Salle University

Figure 3-1: Continuous Water Level Monitoring Project Locations, PWD Rain Gauge Network and Radar Rainfall Grid.

3.2 Green Stormwater Infrastructure Performance Testing

The Water Department uses two Sensus Water Meter Testers, a WL-1250[1] and Omni V-2[1], for measuring flow applied to an SMP during SRT. The water meter is capable of estimating flows from 0.04 CFM to 167 CFM (WL-1250[1]) and 0.67 CFM to 66 CFM (Omni V2[1]). SRTs have been performed for 34 GSI systems for July 1, 2017 to June 30, 2018. Monitoring locations are shown in **Table 3-3** and **Figure 3-2**.

Table 3-3: SMP Attributes for SMPs tested with SRT in FY18

SMP ID	SMP Type	Project Name	Test Date
179-4-1	Tree Trench	Morris Leeds	7/7/2017
179-2-1	Tree Trench	Morris Leeds	7/7/2017
179-1-1	Tree Trench	Morris Leeds	7/12/2017
179-9-1	Tree Trench	Morris Leeds	7/13/2017
179-14-1	Tree Trench	Morris Leeds	7/14/2017
207-1-1	Tree Trench	Waterview	7/17/2017
123-3-1	Tree Trench	59th and Florence	7/18/2017
179-5-1	Tree Trench	Morris Leeds	8/1/2017
3-4-1	Tree Trench	Belfield	8/2/2017
3-2-1	Tree Trench	Belfield	8/2/2017
3-6-1	Tree Trench	Belfield	8/11/2017
3-3-1	Tree Trench	Belfield	8/11/2017
3-5-1	Tree Trench	Belfield	8/16/2017
211-1-2	Tree Trench	Shepard Rec.	10/18/2017
61485	Subsurface Basin	Drexel Pearlman Plaza	10/25/2017
61486	Subsurface Basin	Drexel Pearlman Plaza	10/25/2017
366-1-1	Raingarden	Philadelphia Zoo	11/1/2017
366-2-1	Raingarden	Philadelphia Zoo	11/1/2017
274-4-1	Infiltration/Storage Trench	Roosevelt Playground	11/2/2017
170-1-1	Tree Trench	Blair	11/14/2017
264-1-1	Tree Trench	Longstreth	12/7/2017
61609	Subsurface Basin	Quaker City	1/24/2018
1066-1-1	Infiltration/Storage Trench	Frankford Ave.	2/27/2018
10-1-1	Tree Trench	Thompson and Columbia	3/6/2018
1-3-1	Tree Trench	Hartranft	3/9/2018
214-1-1	Tree Trench	William Harrity	3/23/2018
277-1-1	Tree Trench	William Cramp	3/23/2018

[1] Reference in this document to any specific commercial product, process, or service, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement, recommendation, or favoring by PWD.

SMP ID	SMP Type	Project Name	Test Date
558-1-1	Rain Garden	Heston Lot	4/17/2018
389-1-1	Infiltration/Storage Trench	St. Monica Manor	4/19/2018
1066-3-1	Infiltration/Storage Trench	Frankford Ave.	4/20/2018
254-2-1	Tree Trench	Mastery Charter School	5/11/2018
281-2-1	Rain Garden	Wakefield	6/18/2018
179-7-1	Tree Trench	Morris Leeds	6/25/2018
179-8-1	Tree Trench	Morris Leeds	6/25/2018

3.3 Permeable Pavement Surface Infiltration Rate Testing

The Water Department uses ASTM Standards (ASTM Committee D18, ASTM C1701/C1701M-09 Standard Test method for Infiltration Rate of In Place Pervious Concrete, 2009) (ASTM Committee C15, 2013), with minor modifications for pervious paving infiltration testing. Development of these procedures was completed in FY13 and refinement of the methods is ongoing. Two 12" diameter sections of Schedule 60 PVC pipe are used as infiltration rings to allow for performing multiple tests simultaneously. Modifications were made to the test calculations to compensate for the different infiltration ring diameter compared to the ring diameter specified in the method. Five SMPs have been selected for surface infiltration rate testing in FY18. Monitoring locations are shown in **Table 3-4** and **Figure 3-2**.

Table 3-4: Permeable Pavement SMPs Selected for Surface Infiltration Rate Testing

SMP ID	Project Name	Surface Type	Number of Test Locations	Number of Tests Performed
192-2-1	Herron Playground Basketball Court	Porous Asphalt	6	1
207-1-3	McMahon St (Waterview Recreation Center)	Pervious Concrete	3	1
240-1-1	Percy St from Catharine St to Christian St	Porous asphalt	3	1
301-1-1	Collins Street	Porous asphalt	3	1
445-1-1	Southwest Treatment Plant Parking Lot	Porous asphalt	4	1
	Southwest Treatment Plant Parking Lot	Permeable Interlocking Concrete Paver (Eagle Bay Aqua Bric)	3	1
	Southwest Treatment Plant Parking Lot	Permeable Articulating Concrete Block/Mat (Pave Drain)	3	1
	Southwest Treatment Plant Parking Lot	Modular Pre-Cast Porous Concrete (Stormcrete)	3	1

SMP ID	Project Name	Surface Type	Number of Test Locations	Number of Tests Performed
	Southwest Treatment Plant Parking Lot	Pervious concrete	3	1
	Southwest Treatment Plant Parking Lot	Pervious stamped concrete	3	1

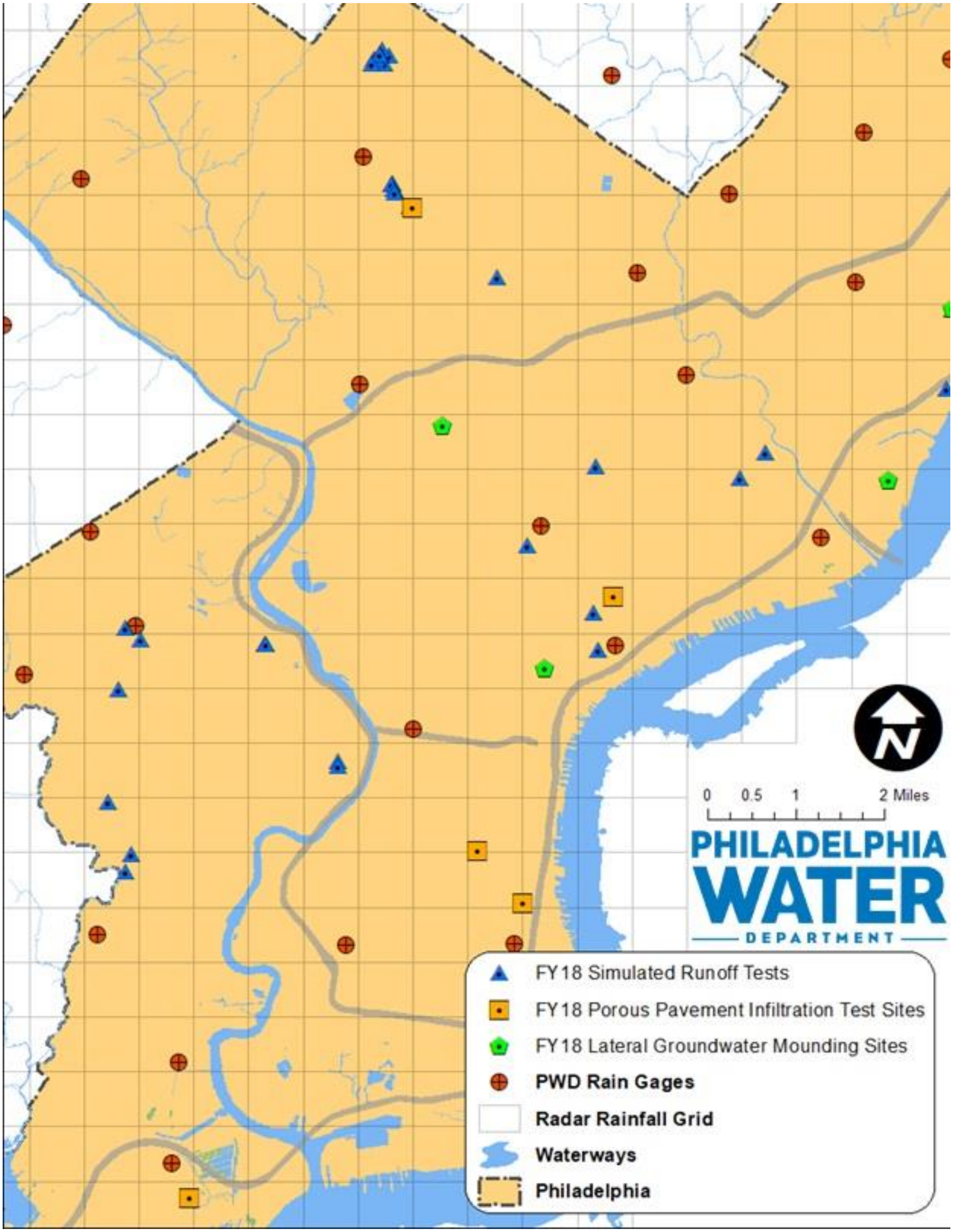


Figure 3-2: Lateral Groundwater Mounding Monitoring, SRT and Surface Infiltration Testing Locations

3.4 Lateral Groundwater Mounding

The Water Department installed groundwater monitoring wells near four SMPs, and control wells near three SMPs to assess the effect of infiltrating SMPs on the water table. Monitoring locations are shown in **Table 3-5** and **Figure 3-2**.

Table 3-5: SMP Attributes for SMPs Selected for Lateral Groundwater Mounding Monitoring

SMP ID	SMP Type	Project Name	Number of wells
12-5-1	Stormwater Tree Trench	Bodine High School	3
271-2-1	Rain Garden	Bridesburg Recreation Center	4
274-4-2	Stormwater Planter	Roosevelt Playground	4
285-1-1	Stormwater Tree Trench	21st and Venango Streets	2

3.5 Sewer System Monitoring

The Water Department continues to perform sewer system monitoring per the methods outlined in the CMP. More information is available in **Appendix B**.

3.6 Meteorological Monitoring

The Water Department continues to perform meteorological monitoring, including operation and maintenance of a rain gauge network, as described in the CMP. More information is available in **Appendix B.**

3.7 Groundwater Level Monitoring

The Water Department is monitoring groundwater levels in the Philadelphia region in partnership with the U.S. Geological Survey. As of July 2018, 25 wells have been established from which water level measurements are made monthly. Results of groundwater monitoring are presented in **Appendix I PWD-USGS Cooperative Groundwater Monitoring Program**. Well PH1043, located in the Germantown section of the City, is equipped with continuous water level recording and telemetry equipment making the data available in near-real time.

4.0 CMP Implementation Successes and Challenges Encountered

During FY18, updated methods were piloted and will be reflected in revisions to in a forthcoming CMP update. The GSI monitoring program has been successful in acquiring the needed equipment, deploying water level sensors to GSI systems, and performing simulated runoff and permeable pavement infiltration tests. During FY18, the number of SRT performed was greatly increased relative to the previous fiscal year. SRT methods have been modified using experiences from Year 5 EAP, FY17 and the revisions will be included in an updated CMP. These methods have been developed to incorporate assessment of impacts that GSI has on the sub-surface and infrastructure proximate to GSI.

The GSI monitoring team has continued providing monitoring assistance to the GSI Implementation program to collect data from systems where challenges have been observed to help interpret cause(s) and verify remediation measures. The performance of these systems is evaluated using methods in the 2014 CMP and additional methods to be detailed in a future update to the CMP.

PWD has provided support to the recipient of the EPA STAR grant since FY13. This has provided PWD with valuable insight and productive academic partnerships. To continue these partnerships PWD has invested resources into developing academic research contracts with Villanova University and Drexel University.

Appendix 5

Green Stormwater Infrastructure Maintenance Manual v2

Green Stormwater Infrastructure

Maintenance Manual

2017

PHILADELPHIA WATER DEPARTMENT

Table of Contents

Introduction

division 1

1.0 Introduction

The City of Philadelphia relies in part on Green Stormwater Infrastructure (GSI) systems—comprised of one or more decentralized stormwater management practices (SMPs) such as rain gardens, stormwater tree trenches, and green roofs—to reduce stormwater volume and pollutants delivered to the City's combined sewer system.

An effective and rigorous maintenance program is crucial for the long-term sustainability and function of GSI systems. Because many GSI systems incorporate vegetation, they can change over time as plant communities grow and establish. In urban environments in particular, GSI may be subject to temperature extremes, pollution, heavy sediment and trash accumulation, and an aggressive weed community—all of which can create a challenging environment for plants. Furthermore, sediment and trash, if allowed to accumulate, can create unsightly conditions and encumber the functionality of the SMP. Proper maintenance can ensure that GSI systems remain effective, beautiful, and safe for many years to come.

This document describes routine maintenance tasks for surface and subsurface features and contains 6 major divisions:

Division 1

Provides background regarding PWD's inspection program for surface and subsurface GSI.

Provides a description of each type of SMP included in Philadelphia's GSI program; tables of recommended routine and reactive maintenance tasks and associated frequencies; an overview of maintenance event procedures; and an overview of general requirements.

Division 2

Provides general procedures, standard operating procedures, equipment, and materials for executing specific tasks for surface maintenace, related to both general care and vegetation management.

Division 3

Provides general procedures, standard operating procedures, equipment, and materials for executing specific tasks for subsurface maintenance.

Division 4

Provides general procedures, standard operating procedure, equipment, and materials for executing specific tasks for pervious pavement maintenance.

Division 5

Consists of appendices which provide supplementary materials including personnel classifications, points of contact, and a sample hydrant operation report.

Division 6

Contains a glossary with definitions for common technical terms used throughout this document.

1.1 Inspections

While the Philadelphia Water Department has prescribed maintenance frequencies for green stormwater infrastructure (GSI), practice and experience has determined that pre-maintenance inspections are the best method to determine the level of maintenance required.

Pre-maintenance surface inspections are completed at each SMP that has surface features. These inspections consist of site visits and are completed visually. The condition of the site at the time of inspection will determine whether or not maintenance is required during the monthly cycle and whether maintenance should be **routine** or **reactive**.

> **Routine surface maintenance** work orders are created for work that is considered routine, such as removal of trash and organic debris, pretreatment device maintenance, erosion repair, concrete repair, painting, hardware care, weeding, mowing, dead and damaged vegetation removal, cutting back vegetation, pest and disease managemnet, and mulching.
>
> ***See Section 1.3. Routine Surface Maintenance.***
>
> **Reactive surface maintenance** work orders are created for surface maintenance tasks that are considered beyond routine. Reactive tasks include construction of energy dissipators, performing void/sinkhole repair, performing restorative cleaning, and other tasks.
>
> ***See Section 1.4 Reactive Surface Maintenance.***

Pre-maintenance subsurface inspections are completed at each SMP with subsurface features once per year. These involve the use of a pus or crawler camera to view the length of pipe. Depending on the conditions within the pipe, subsurface maintenance may or may not be scheduled for the pipe. Regardless of pipe conditions, PWD schedules maintenance annually for green inlets and gray inlets that connect to green.

> **Routine subsurface maintenance** work orders are created to clean subsurface infrastructure.

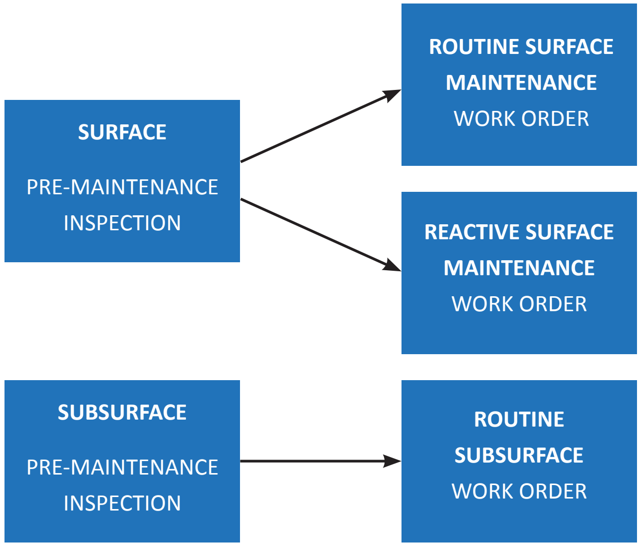


Figure 1-0. Inspections and maintenance work flow.

Stormwater Management Practices

division 1.2

SMPS CURRENTLY IN PRACTICE BY PWD

1.2.1 STORMWATER TREE TRENCH

Description

A stormwater tree trench is a subsurface infiltration/storage trench, typically filled with stone, which is planted with one or more trees. Trees are planted within soil pits throughout the trench to allow the tree roots to access water stored in the system. Stormwater runoff is conveyed to the trench via green inlets and perforated distribution pipes. Green inlets are typically fitted with pretreatment devices to prevent trash and debris from entering the stormwater tree trench. Stormwater infiltrates into the stone trench and is either further infiltrated into the underlying soil and/or slowly released back to the existing sewer system via perforated underdrain pipe conveyance. Trees help reduce the volume of stormwater runoff through evapotranspiration.

Stormwater tree trenches are often constructed beneath sidewalks and adjacent to streets to capture street runoff. Figure 1-1 provides examples of stormwater tree trench SMPs. Figure 1-2 shows typical stormwater tree trench features.

Figure 1-1. Examples of Stormwater Tree Trenches in Philadelphia

Stormwater Tree Trench

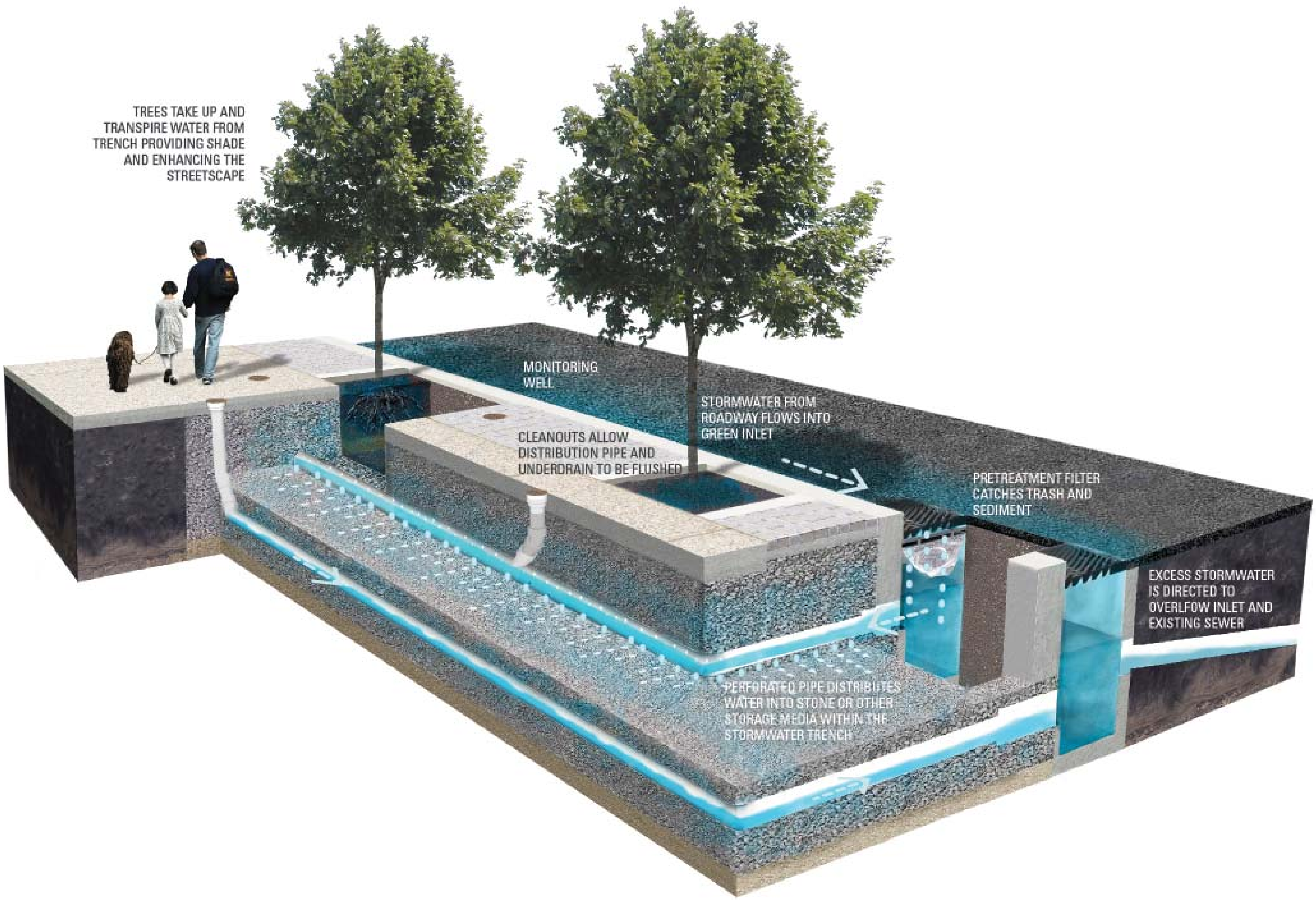


Figure 1-2. Stormwater Tree Trench with Typical Features

1.2.2 RAIN GARDEN AND STORMWATER BASIN

Description

A rain garden or stormwater basin is a vegetated area designed to collect runoff from impervious surfaces such as roofs, walkways, streets and parking lots, allowing water to be evapotranspired by vegetation, infiltrated into the ground and/or slowly released back to the existing sewer system via underdrain pipe conveyance. The bottom soil layer may be constructed over a stone storage area.

Rain gardens are shallow areas that are commonly planted with a variety of native grasses and shrubs and are often integrated into surrounding landscape features. Stormwater basins are often vegetated with mowed grass or a mix of naturalized meadow vegetation. Figure 1-3 provides examples of rain gardens and basins. Figures 1-4 and 1-5 show typical rain garden and stormwater basin features.

Figure 1-3. Examples of Rain Gardens and Stormwater Basins in Philadelphia

Rain Garden

Figure 1-4. Rain Garden with Typical Features

Stormwater Basin

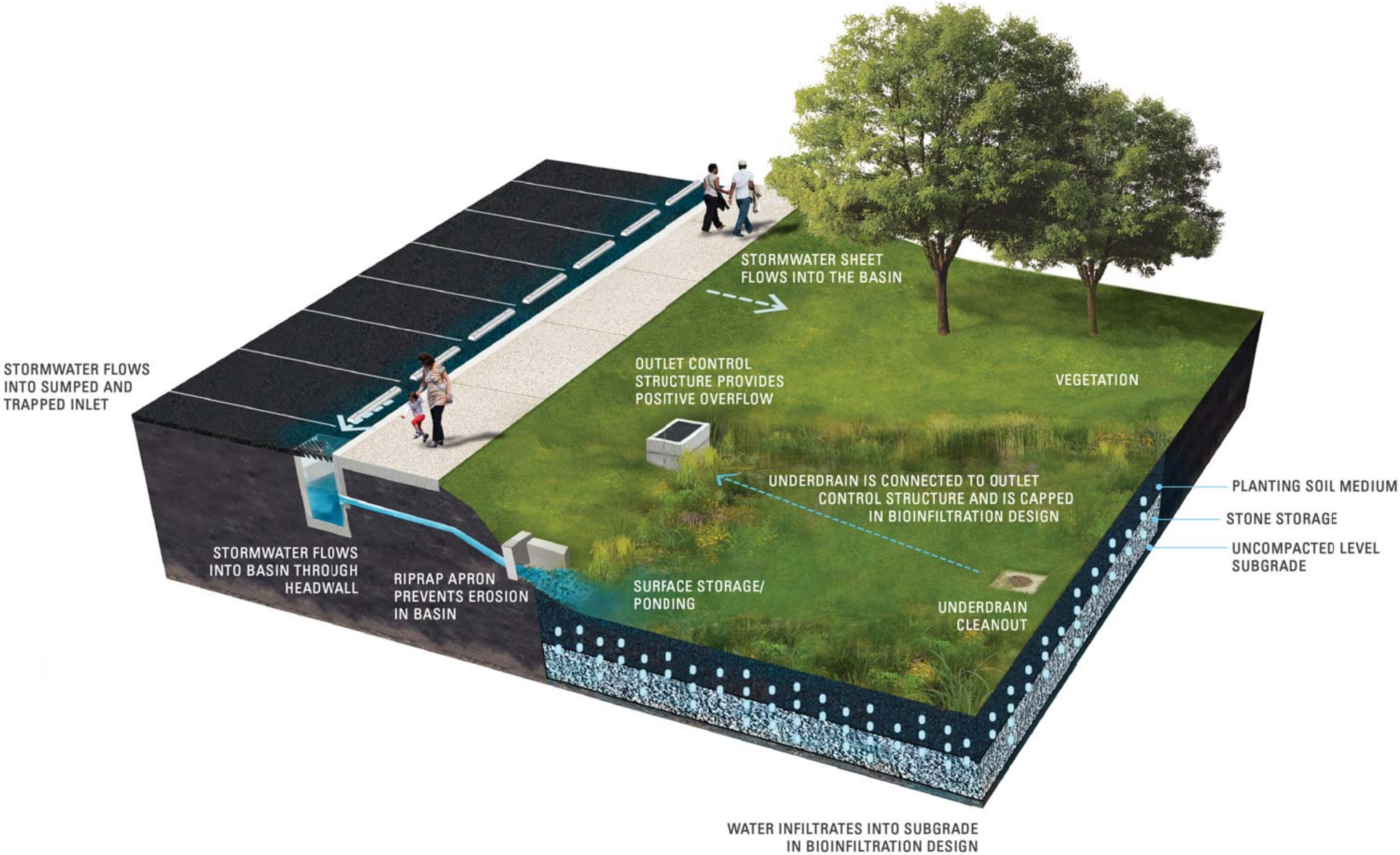


Figure 1-5. Stormwater Basin with Typical Features

1.2.3 STORMWATER BUMP-OUT

Description

A stormwater bump-out is a vegetated curb extension that intercepts gutter flow. A bump-out is composed of a layer of stone that is topped with soil and plants. An inlet or curb-cut directs runoff into the bump-out structure where it can be stored, infiltrated, and taken up by the plants through the evapotranspiration process. Excess runoff is permitted to leave the system and flow to an existing inlet. Aside from managing stormwater, bump-outs can also help with traffic-calming, and when located at crosswalks, they can provide a pedestrian safety benefit by reducing the street crossing distance and by providing a barrier for pedestrians waiting at crosswalks.

Stormwater bump-outs are usually located within the public right-of-way either mid-block or at intersections, and are commonly planted with a variety of grasses and flowering perennials. Figure 1-6 provides examples of stormwater bump-out SMPs. Figures 1-7 and 1-8 show typical stormwater bump-out features.

Figure 1-6. Examples of Stormwater Bump-outs in Philadelphia

Mid-Block Stormwater Bump-out

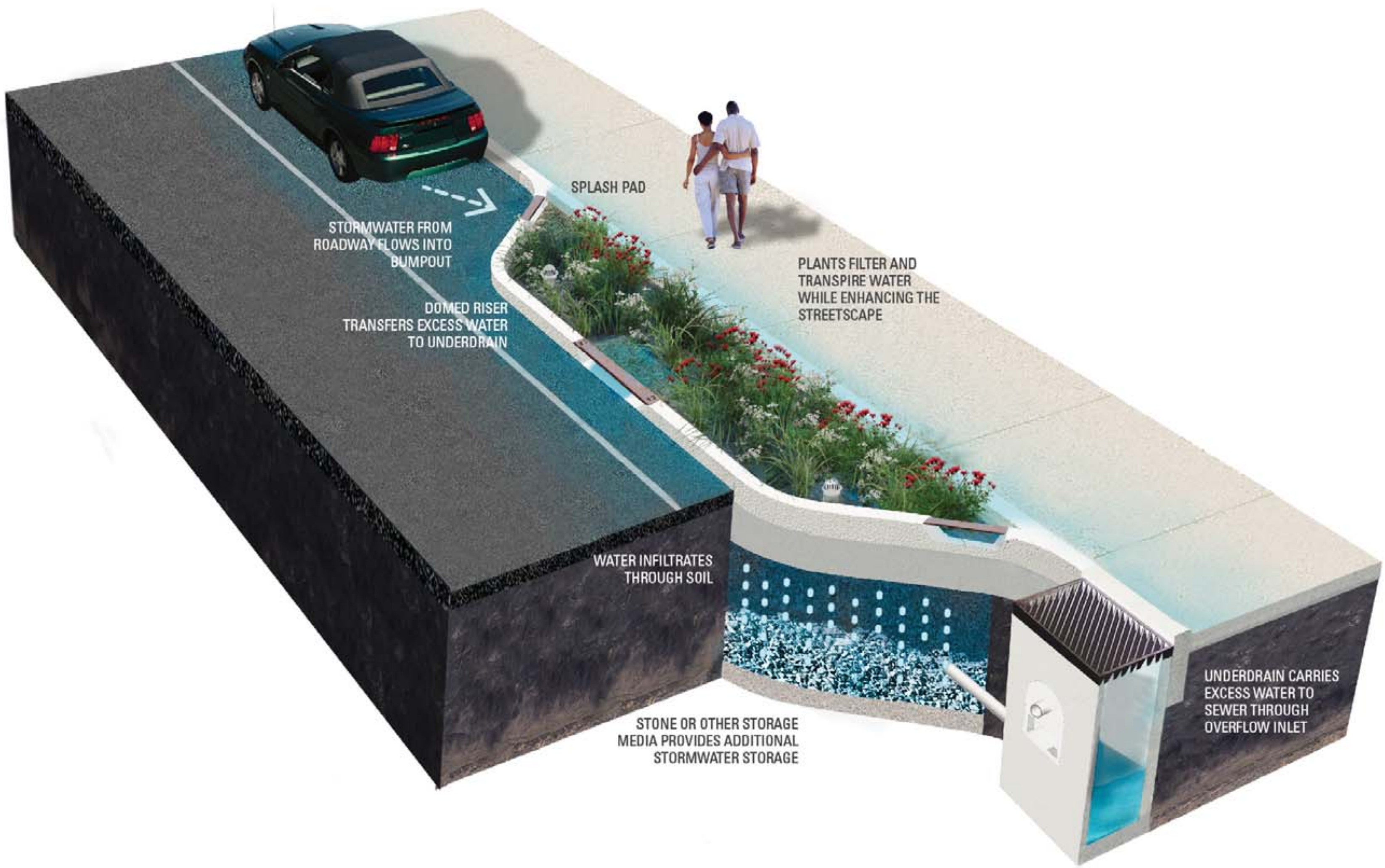


Figure 1-7. Stormwater Bump-out with Typical Features

Corner Stormwater Bump-out

Figure 1-8 Stormwater Bump-out with Typical Features

1.2.4 STORMWATER PLANTER

Description

A stormwater planter is a specialized structure that is typically installed in the sidewalk area and designed to manage street and sidewalk runoff. A stormwater planter often contains curb edging and/or fencing as barrier protection. The stormwater planter is filled with stone, and topped off with soil and plants. The top of the soil in the stormwater planter is lower in elevation than the sidewalk, allowing for runoff to flow into the planter through an inlet or curb cut at street level. These planters manage stormwater by providing storage, infiltration, and evapotranspiration of runoff. Excess runoff is typically directed into an overflow pipe connected to the existing sewer system.

Stormwater planters are often integrated into sidewalks or plazas, and can also be found at building downspouts. They are commonly planted with a variety of native grasses, flowering perennials, and shrubs. Figure 1-9 provides examples of stormwater planter SMPs. Figure 1-10 shows typical stormwater planter features.

Figure 1-9. Examples of Stormwater Planters in Philadelphia

Stormwater Planter

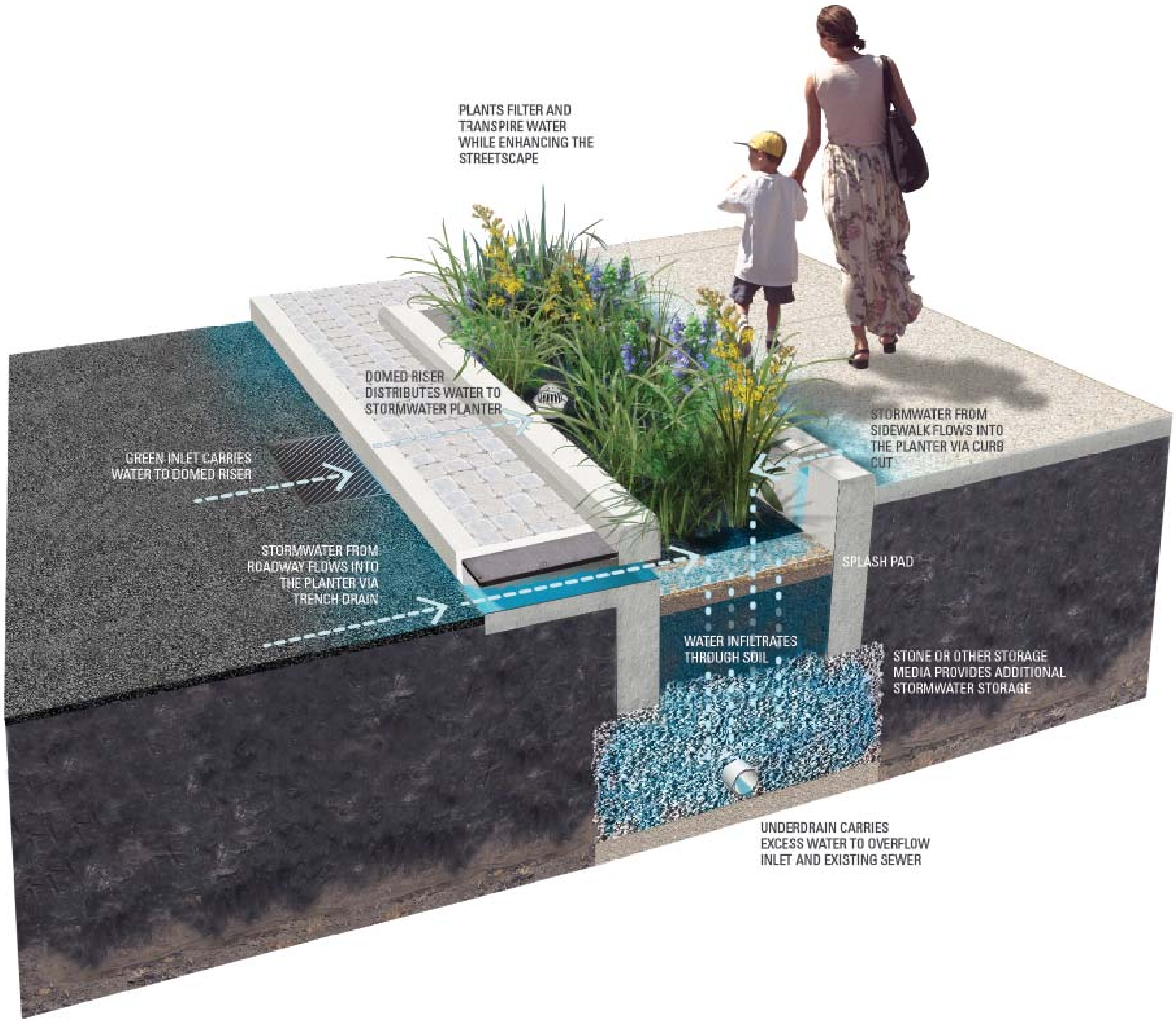


Figure 1-10. Stormwater Planter with Typical Features

1.2.5 INFILTRATION/STORAGE TRENCH

Description

Infiltration/storage trenches are subsurface storage areas filled with stone, plastic crates, or pre-cast modular storage systems designed to either infiltrate stormwater or slow its flow into the sewer system. As water enters the trench (usually through a green inlet or pervious pavement), it fills the voids within the system, seeps to the bottom of the trench, and soaks into the soil beneath. Excess water that does not infiltrate into the soil can be slowly released into the sewer system at a controlled rate.

Infiltration/storage trenches can be located under sidewalks, parking lots, lawns, or other pervious and impervious recreational areas (e.g., basketball courts, athletic fields, etc.) and can be of varying sizes. They can be connected to other SMP types, such as stormwater bump-outs, to receive stormwater overflow from these systems. Some infiltration/storage trenches have very large drainage areas that collect runoff through an intricate series of inlets. Figure 1-11 provides examples of infiltration/storage trench SMPs. Figure 1-12 shows typical infiltration/storage trench features. Figures 1-13 and 1-14 show different varieties of storage systems for infiltration/storage trenches.

Figure 1-11. Examples of Infiltration/Storage Trenches in Philadelphia

Infiltration/Storage Trench

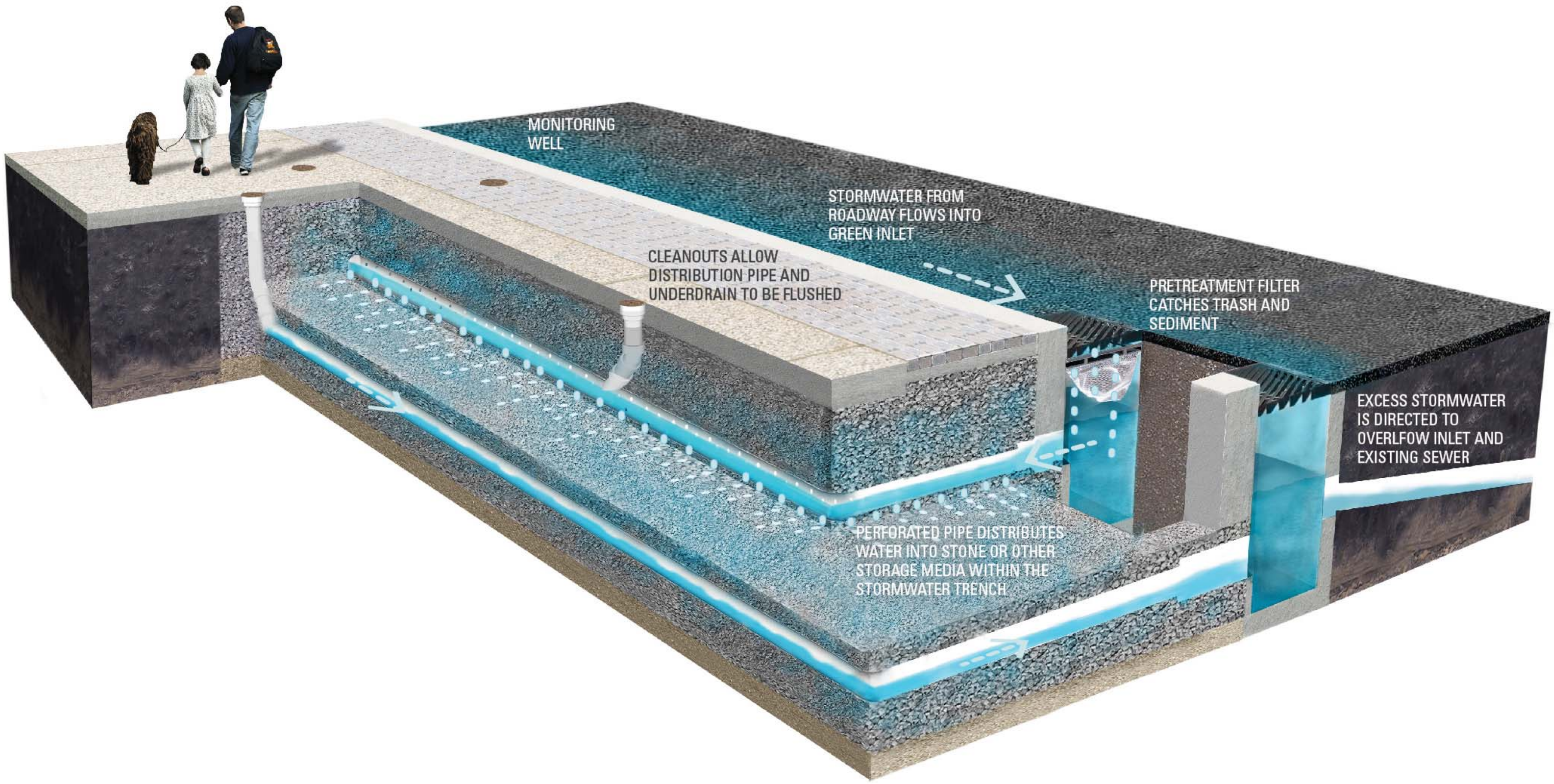
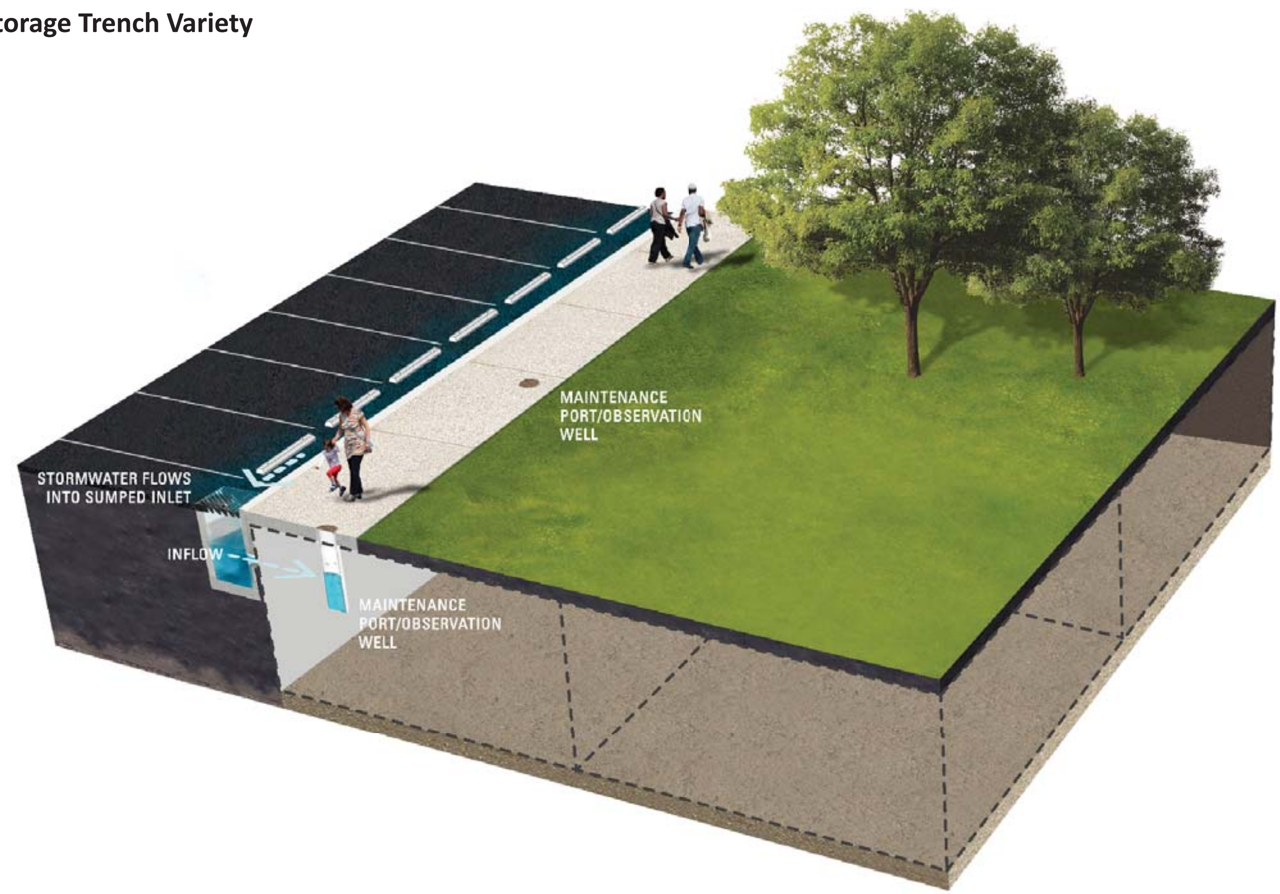


Figure 1-12. Infiltration/Storage Trench with Typical Features

Infiltration/Storage Trench Variety



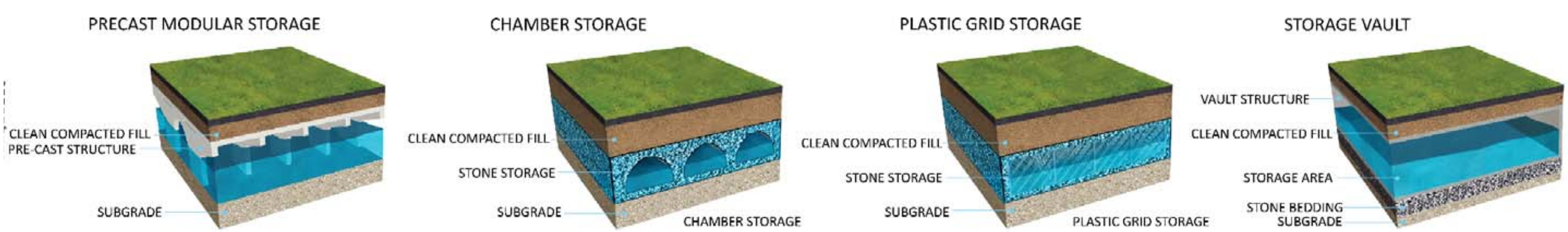


Figure 1-13. Infiltration/Storage Trench with Typical Features

Infiltration/Storage Trench Variety

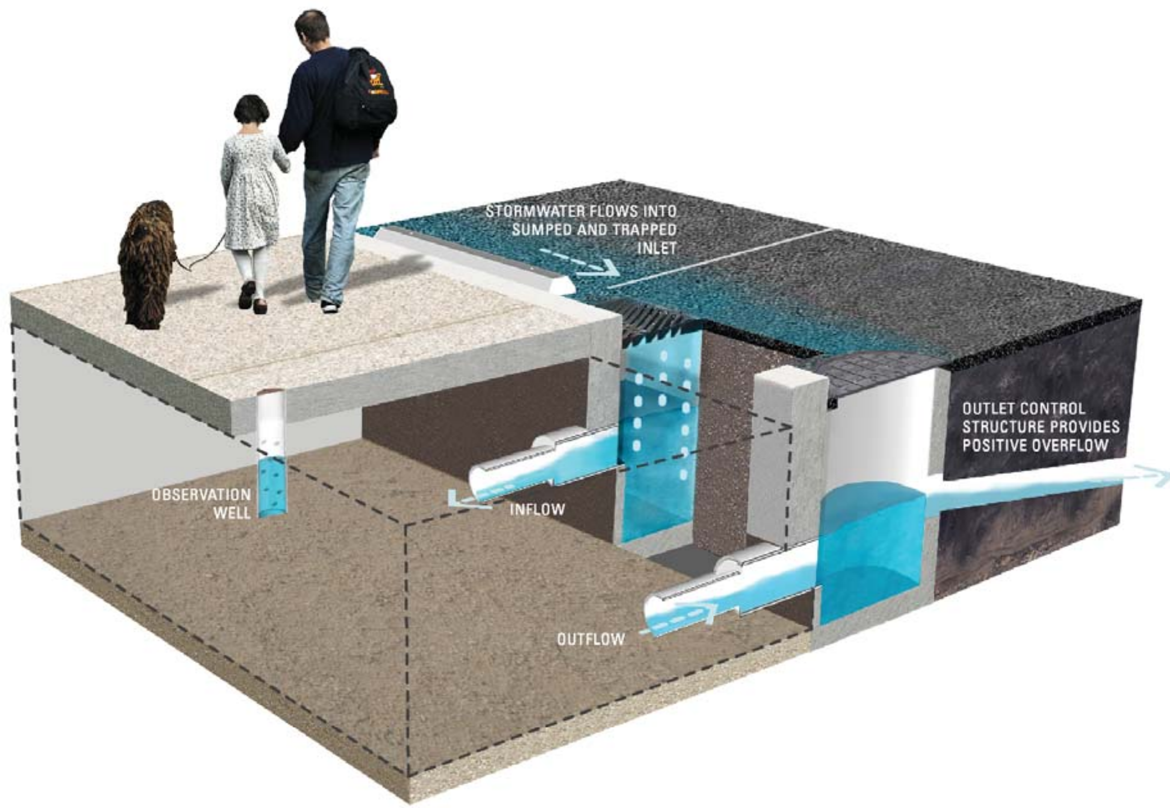


Figure 1-14. Infiltration/Storage Trench with Typical Features

1.2.6 STORMWATER WETLAND

Description

Stormwater wetlands are an effective tool for removing pollutants from stormwater runoff. Stormwater wetlands collect runoff and store it in a permanent, shallow pool and marshland vegetation helps treat the water and allows pollutants to settle to the bottom. Because stormwater wetlands seek to imitate the functions of natural wetlands, these systems can become aesthetic assets to the community and provide habitat for wildlife.

Stormwater wetlands are often constructed in regions originally designated as stormwater basins, within roadside right-of-ways, in areas where native soil conditions do not allow for infiltration, or where the groundwater table is exposed or close to the surface. Stormwater wetlands can also be created in low-lying areas through the use of impermeable liners to induce year-round inundated soil saturation. Wetland vegetation generally consists of a variety of open water, emergent, low/high marsh, and upland plants. Figure 1-15 provides examples of stormwater wetland SMPs. Figure 1-16 shows typical stormwater wetland features.

Figure 1-15. Examples of Stormwater Wetlands in Philadelphia

Stormwater Wetland

Figure 1-16. Stormwater Wetland with Typical Features

1.2.7 STORMWATER SWALE

Description

A stormwater swale is an open vegetated channel designed to convey stormwater runoff. Stormwater swales are typically designed to control stormwater runoff velocity and infiltrate stormwater runoff where feasible. Stormwater swales are often used as pretreatment or conveyance for another downstream SMP such as a rain garden or stormwater basin. Swales are most often planted with turf grass and maintained as lawn areas.

Stormwater swales may be located adjacent to roadways and parking lots, upstream of SMPs, or in areas subject to overland flooding. Figure 1-17 provides examples of stormwater swale SMPs. Figure 1-18 shows typical stormwater swale features.

Figure 1-17. Examples of Stormwater Swales in Philadelphia

Swale

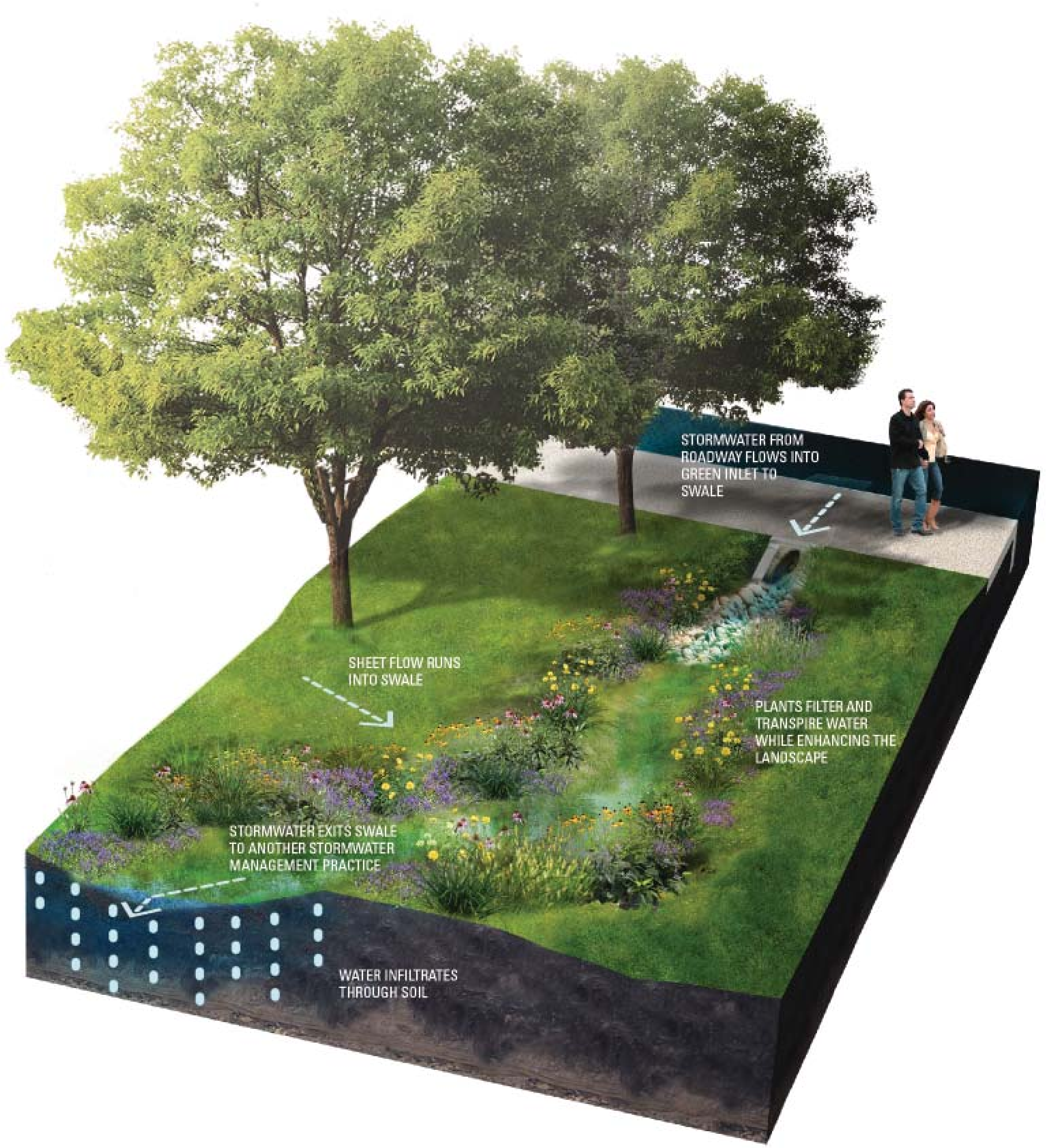


Figure 1-18. Stormwater Swale with Typical Features

1.2.8 STORMWATER TREE

Description

A stormwater tree is a tree planted in a specialized tree pit installed in the sidewalk area. Stormwater runoff is conveyed to a stormwater tree through sheet flow or a grate that is installed along the curb and connected to the tree pit. A stormwater tree design that has the planting media lower than the surrounding elevation requires a protective barrier. Multiple tree pits can be designed in series to maximize the potential for stormwater capture, treatment, and infiltration. Trees help reduce the volume of stormwater runoff through evapotranspiration.

Figure 1-19 provides examples of stormwater tree SMPs. Figure 1-20 shows typical stormwater tree features.

Figure 1-19. Examples of Stormwater Trees in Philadelphia

Stormwater Tree

Figure 1-20. Stormwater Tree with Typical Features

1.2.9 GREEN ROOF

Description

A green roof is a vegetated surface installed over a roof surface. A green roof system is constructed with multiple layers including waterproofing, a drainage layer, and a layer of engineered planting media. Green roofs are planted with specially selected plants that can grow in a thin layer of planting media. A green roof is effective in reducing the volume and velocity of stormwater runoff from roofs by temporarily storing stormwater, slowing excess stormwater release into the sewer system, and promoting evapotranspiration.

Figure 1-21 provides examples of green roofs. Figure 1-22 shows a green roof section with typical elements.

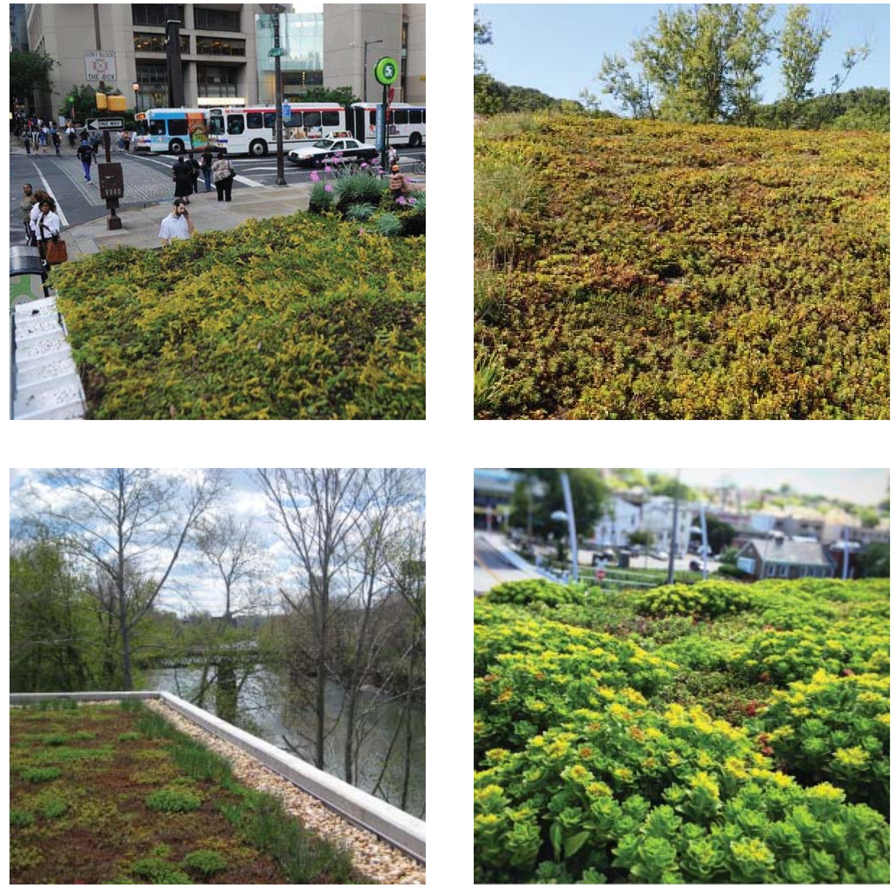


Figure 1-21. Examples of Green Roofs

Green Roof

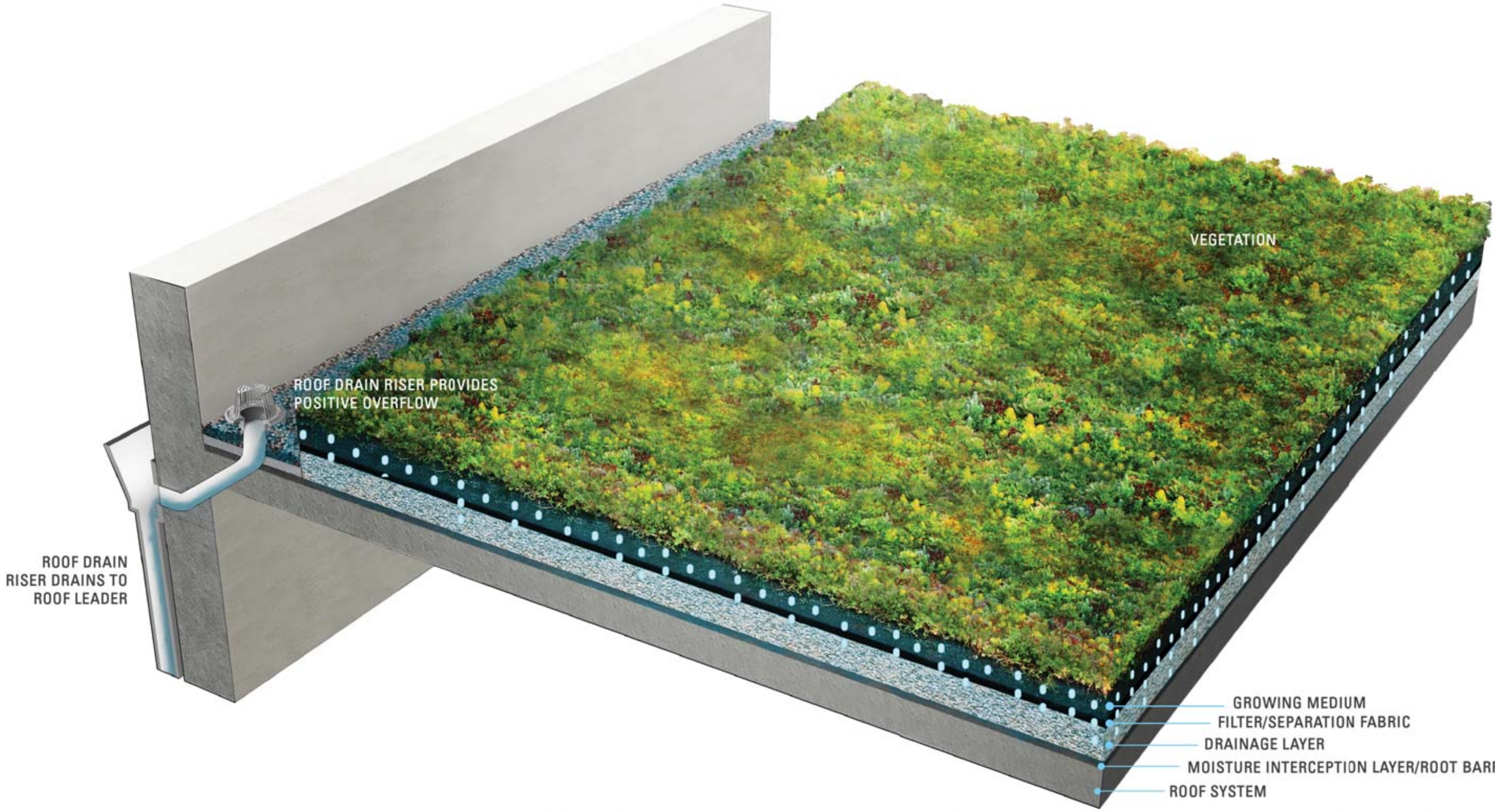


Figure 1-22. Green Roof with Typical Features

1.2.10 PERVIOUS PAVEMENT

Description

Pervious pavement is a permeable hardscape surface that allows water to pass through the surface. Pervious pavement materials can include concrete, asphalt, or pavers. Systems are typically underlain with a stone bed or infiltration/storage trench (see Section 1.2.5) to store stormwater until it is either infiltrated into the underlying soil and/or slowly released back to the existing sewer system via perforated underdrain pipe conveyance. Stormwater runoff is most often conveyed to the system via direct rainfall and/or sheet flow from surrounding impervious surfaces.

Pervious pavement can be found in hardscape areas designed for pedestrian traffic (e.g., sidewalks) and/or low levels of vehicular traffic (e.g., alleyways, parking stalls etc.) as well as in hardscape recreational areas such as basketball courts. Figure 1-23 provides examples of pervious pavement SMPs. Figure 1-24 shows typical pervious pavement features.

Figure 1-23. Examples of Pervious Pavement in Philadelphia

Pervious Pavement

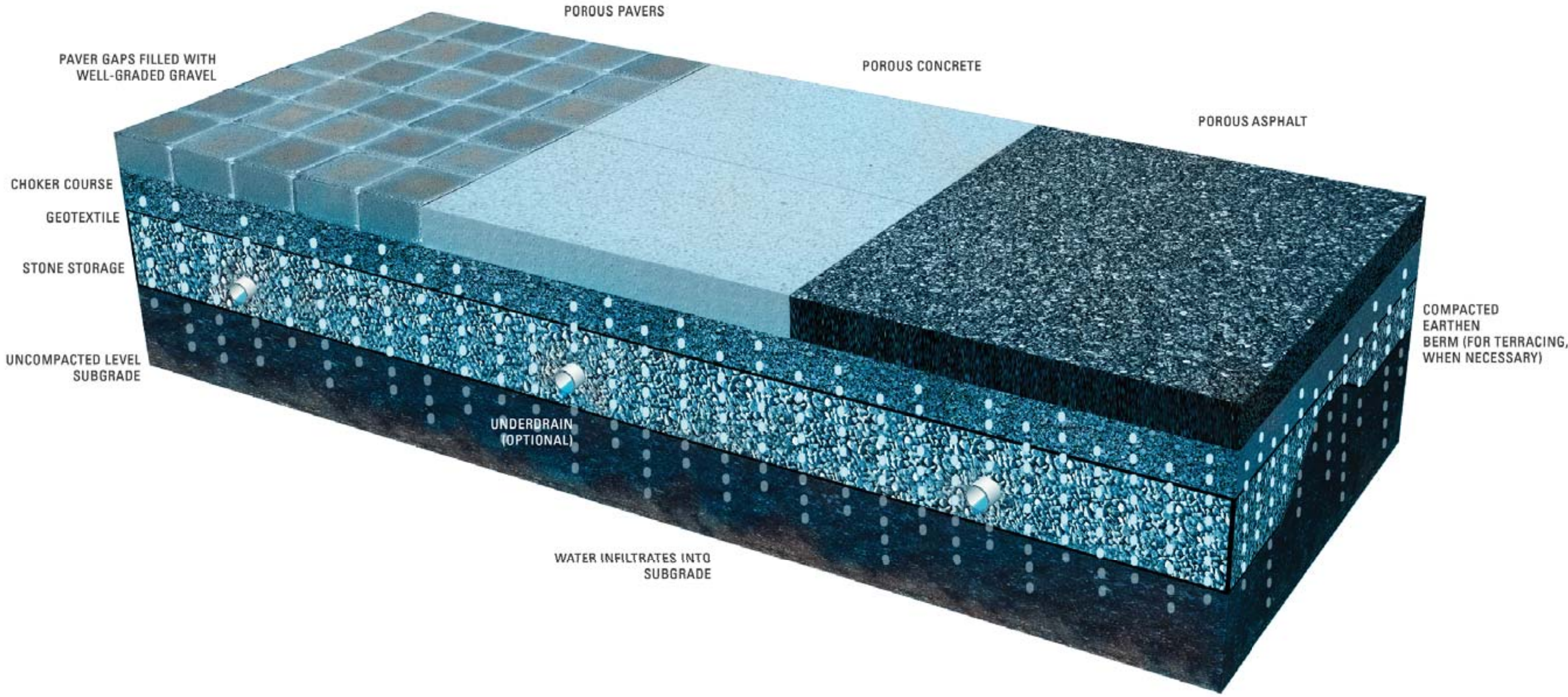


Figure 1-24. Pervious Pavement with Typical Features

1.2.11 GREEN WALL

Description

Green walls, also commonly known as "living walls", are vertical vegetated systems that may be designed to capture stormwater via direct rainfall or via diversions from roof drainage systems. These systems are typically constructed using hanging containers affixed to a structural frame and may include a drip irrigation system. In some cases, green walls may be designed to utilize stormwater collected from roof areas via rainwater cisterns. Plantings may be hydroponic, or planted in a thin layer of media. Green walls typically do not provide significant stormwater storage, but can help to reduce stormwater volume through the evapotranspiration process.

Figure 1-25 provides an example of a green wall SMP and Figure 1-26 shows a green wall elevation with typical features.

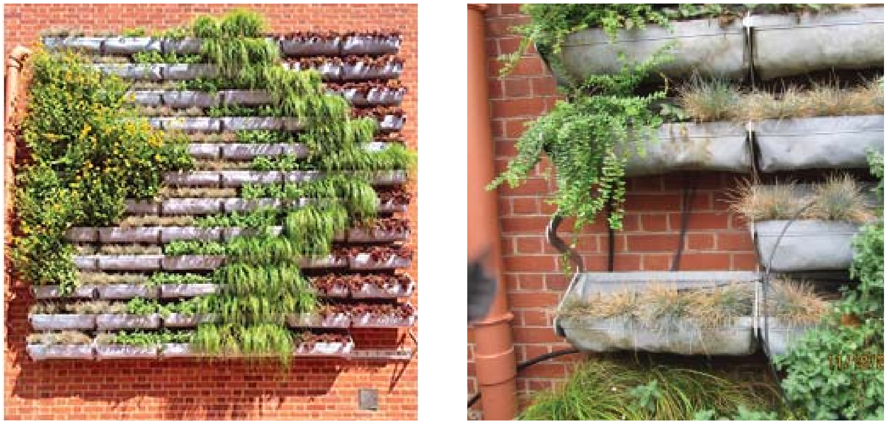


Figure 1-25. Example of Green Wall

Green Wall

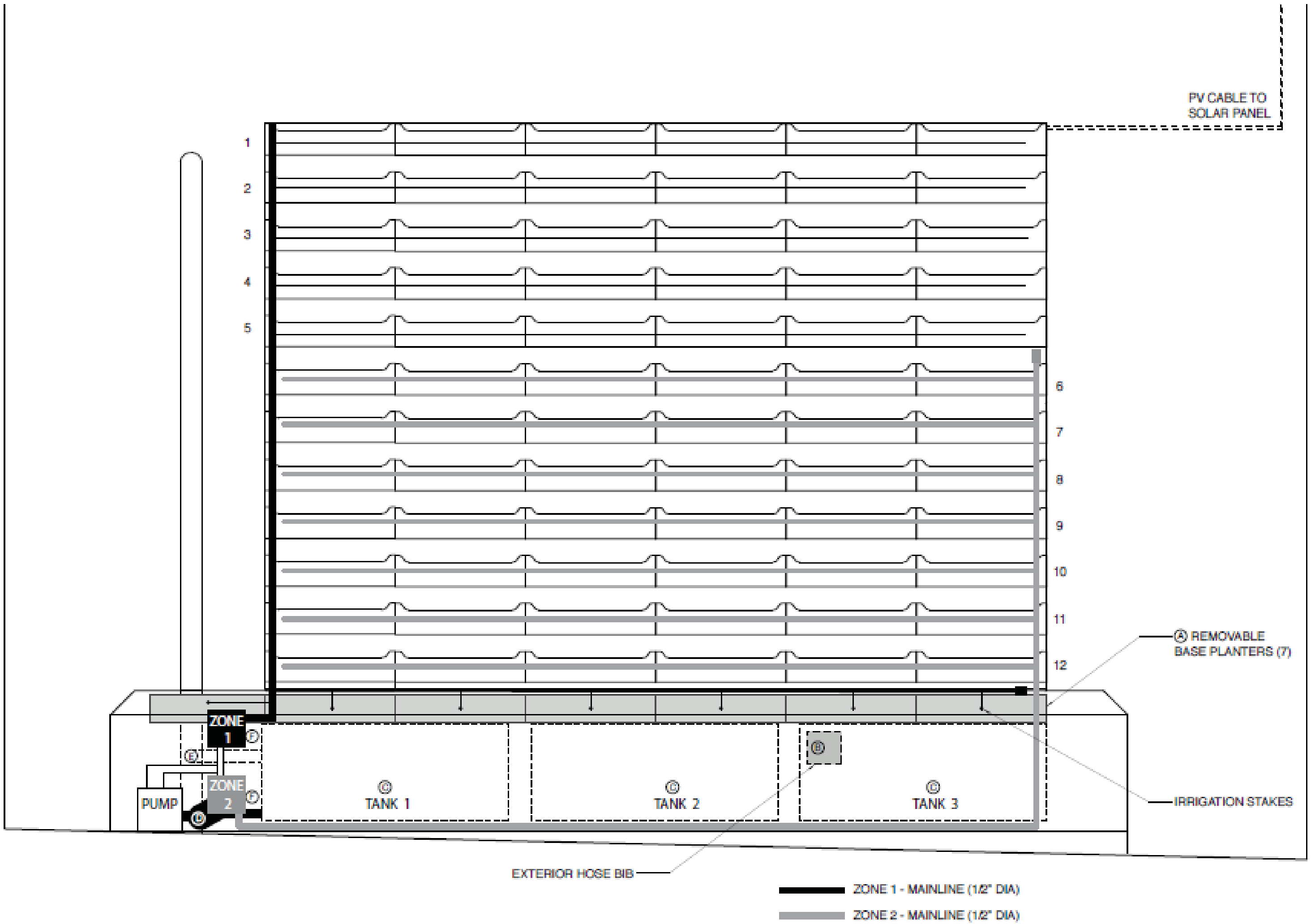


Figure 1-26. Green Wall Elevation with Typical Features

SMPS IN LIMITED PRACTICE OR NOT YET IN PRACTICE BY PWD

1.2.12 CISTERN/RAIN BARREL

Description

Cisterns and rain barrels are tanks or storage receptacles that capture and store stormwater for non-potable, beneficial reuse such as irrigation, toilet flushing, or industrial uses. Stormwater runoff is typically conveyed from roof areas to the rain barrels or cisterns via roof gutters, downspouts, drains, and/or pipes. Screens on gutters and downspouts filter large sediment and debris before it enters the rain barrel or cistern. First flush diverters are used in some systems to capture debris and pollutants within the first few gallons of stormwater runoff during a rain storm. Some systems may be designed to detain and slowly release water back to the existing sewer system via an orifice or valve.

Rain barrels are typically located adjacent to buildings at single downspout locations while cisterns may be located above or below ground and usually receive stormwater runoff from multiple downspouts or conveyance manifold systems. Figure 1-27 provides examples of rain barrel/cistern SMPs. Figure 1-28 shows typical cistern/rain barrel elements.

Figure 1-27. Examples of Cisterns and a Rain Barrel (Image Credits: DarcoInc.com, Septa.org)

Cistern

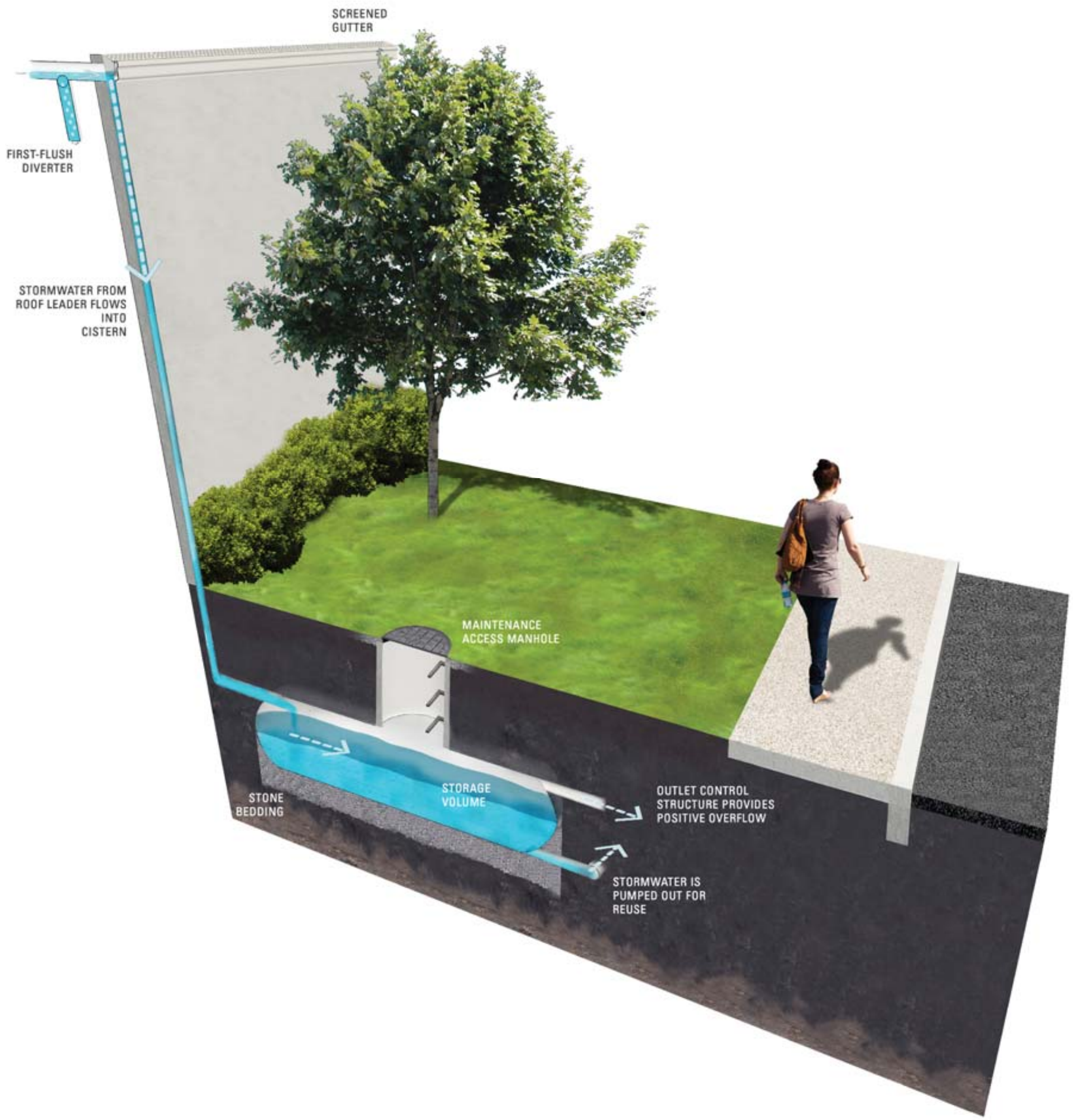


Figure 1-28. Subsurface Cistern with Typical Features

1.2.13 BLUE ROOF

Description

A blue roof is non-vegetated storage system designed into a roof structure such that the roof retains stormwater. It is installed over a sealed roof membrane and typically utilizes check dams, trays, or modified roof drains to capture and temporarily detain or slow stormwater before it reaches building downspouts. Stormwater detained by blue roofs is typically then slow released to the roof drains and/or removed through evaporation to the atmosphere, especially during warm, sunny weather.

Blue roofs are best suited for buildings with relatively flat roofs and other auxiliary structures. Figure 1-29 provides examples of blue roof configurations: retention trays (bottom) and check dams (top). Figure 1-30 shows a blue roof tray with typical elements.

Figure 1-29. Examples of Blue Roofs in New York City (Image credit: Gowanus Canal Watershed, Hazen and Sawyer)

Blue Roof

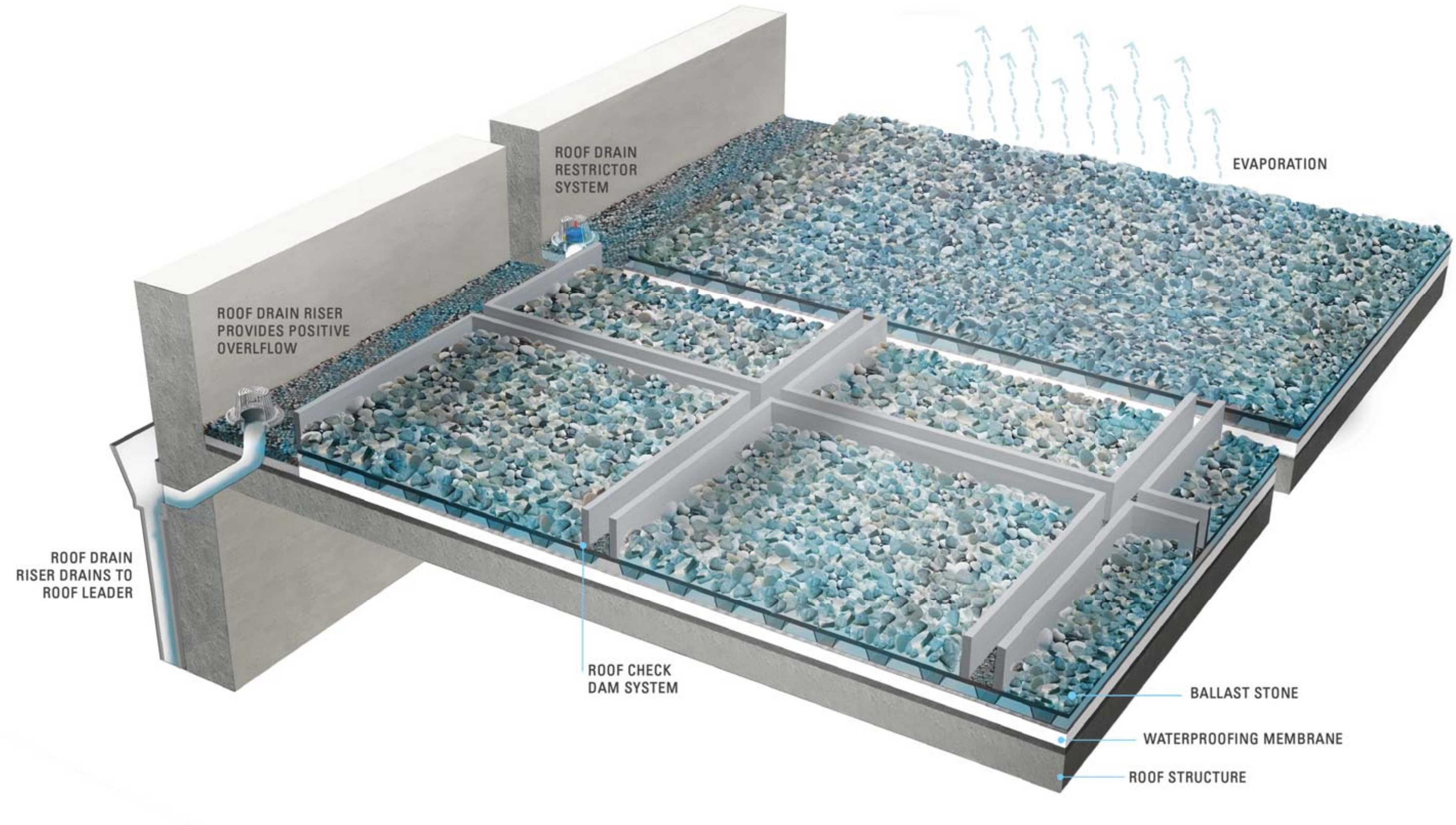


Figure 1-30. Blue Roof with Typical Features

1.2.14 GREEN GUTTER

Description

Green gutters are narrow and shallow landscaped strips along a street's curb line. The top of the planting media in the green gutter is lower than the street's gutter elevation, allowing stormwater runoff from both the street and sidewalk to flow directly into the system. Green gutters may be lined with geotextile (permeable or impermeable) and are commonly planted a variety of grasses and flowering perennials. Stormwater is infiltrated into the underlying soil and/or slowly released back to the existing sewer via a downstream curb cut or other overflow structure. Green gutter vegetation helps reduce the volume of stormwater runoff through evapotranspiration.

Green gutters are typically located within the public right-of-way either mid-block or at intersections. Figure 1-31 provides an example of a green gutter SMP. Figure 1-32 shows typical green gutter features.

Figure 1-31. Example of a Green Gutter in Portland, Oregon (Image credit: PWD Green Streets Design Manual, 2014)

Green Gutter

Figure 1-32. Green Gutter with Typical Features

1.2.15 STORMWATER DRAINAGE WELL

Description

A stormwater drainage well is a manhole structure designed to manage stormwater runoff by receiving stormwater from upstream collection and pretreatment systems and then discharging the stormwater into the surrounding soils through perforations in the manhole. It is designed to infiltrate stormwater.

Stormwater drainage wells can be located under roads, sidewalks, parking lots, lawns, or other pervious and impervious areas. They can also be connected to other SMP types. Figure 1-33 provides an example of a drainage well installation and Figure 1-34 provides a conceptual rendering of a stormwater drainage well with typical features.

Figure 1-33. Example of a Drainage Well Installation (Image Credit: Lake George Association)

Stormwater Drainage Well

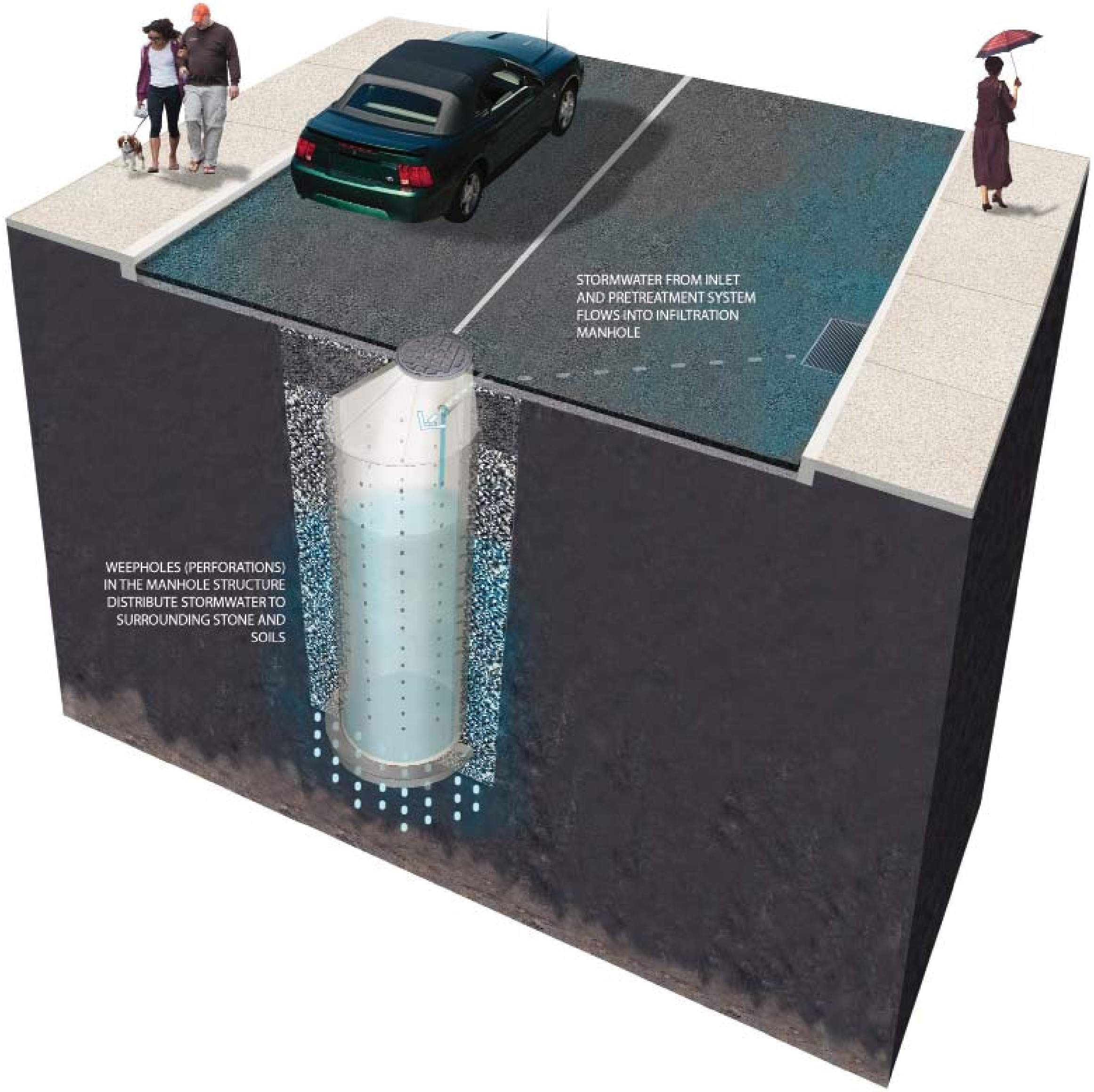


Figure 1-34. Stormwater Drainage Well with Typical Features

Routine Maintenance

division 1.3

1.3 ROUTINE MAINTENANCE TABLES

1.3.1 DESCRIPTION OF ROUTINE MAINTENANCE TABLES

1. Routine Maintenance tasks for the SMP types described in Section 1.2 are listed in Tables 1-1 through 1-7. Not all tasks are applicable to all SMP types.
2. Routine Maintenance tasks must be completed as needed at the frequencies prescribed in Tables 1-1 through 1-7.
3. Other tasks beyond those listed in these Routine Maintenance tables may be required in response to observed issues. These additional tasks are known as Reactive Maintenance, which is described in Section 1.4.

Table 1-1. Monthly Routine Surface Maintenance Tasks

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	APPLICABLE SMP TYPE(S)	PROTOCOL REFERENCE
General Care	Remove trash and/or sediment from SMP surfaces (e.g., sidewalks, gutterlines, tree pits, etc.)	If present within SMP	All SMPs	2.1.1
	Remove organic debris (e.g., leaves, feces, etc.) from SMP surfaces	If present within SMP		
	Remove sediment from basin and forebay areas	If sediment is visible	Rain garden/basin, Bump-out, wetland, swale	
	Remove tags, strings, and expired no-parking signage	Materials present within SMP	All SMPs	
	Wipe down signage	Dust, grime or residue on signs		
	Report dumping to Philly311	If present within SMP		
Pretreatment Device Maintenance	Empty and clean surface inlet pretreatment device	If trash, sediment, and/or organic debris present in pretreatment device	All SMPs	2.1.1
	Install pretreatment device (e.g., frame and bag)	Device not present in surface-accessible inlet		
	Replace ripped or clogged pretreatment device fabric	*Ripped pretreatment device fabric*: Fabric has rip or hole > 3 in. *Clogged pretreatment device fabric*: Fabric has standing water at time of maintenance and inlet is drained down to pipe invert		
Erosion Repair	Fill eroded areas, place erosion fabric, and, if necessary, seed	If minor (<20 ft^2), nonrecurring erosion is present within SMP	All SMPs	2.1.2

Table 1-1. Monthly Routine Surface Maintenance Tasks (cont'd.)

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	APPLICABLE SMP TYPE(S)	PROTOCOL REFERENCE
Concrete Repair	Repair hairline/cosmetic cracks	If present within SMP	All SMPs	2.1.3
	Replace loose, missing or displaced brick, stone or paver	If present within SMP		
Settling	Pack sinkholes or settling with stone, cover with soil and mulch if applicable	If sinkholes of 24 in. deep or less are present within SMP	All SMPs	2.1.4
Graffiti Removal	Remove graffiti from SMP signage, structures, or SMP surfaces	If present within SMP	All SMPs	2.1.5
Painting	Paint appropriate structures (planter box walls, half walls, etc.)	Existing paint on concrete/masonry surfaces is in poor condition	Planters, rain gardens, stormwater trees	2.1.6
Hardware Care	Clean and grease appurtenances; Replace if missing	Each time a component with bolts or locks is opened; As needed	All SMPs	2.1.7
	Install secure bars or grate	Outfall pipes or other openings > 8 in. diameter are not protected with secure bars		
Weeding	Remove weeds (e.g., within tree pits, sidewalk, gutterline, etc.) using approved mechanical or chemical methods	If present within SMP	All vegetated SMPs	2.2.1
Mowing	Mow turf grass	As directed by owner/operator	Rain garden/basin, wetland, swale	2.2.2
	Mow cool season grass meadows to a height of 3-4 in.	If height of vegetation is > 4 in. above ground surface elevation	Rain garden/basin, wetland, swale	2.2.2
Dead & Damaged Vegetation Removal	Remove dead herbaceous vegetation, trees or shrubs from SMP area	If present within SMP	All vegetated SMPs	2.2.3
	Prune trees	If damaged, diseased, and/or dead branches are present; suckers present within the SMP		

Table 1-1. Monthly Routine Surface Maintenance Tasks (cont'd.)

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	APPLICABLE SMP TYPE(S)	PROTOCOL REFERENCE
Cutting Back Vegetation	Cut back dense vegetation	If height of dense vegetation adjacent to walkways or street intersections is > 4 ft. measured from top of curb elevation	All vegetated SMPs	2.2.4
Pest & Disease Management	Treat vegetation to remove, destroy, or minimize pests and disease	If harmful insects (e.g., bag worms, wax scale, caterpillars, aphids, etc.); galls, mildew or fungus are present	All vegetated SMPs	2.2.5
	Remove small animal carcasses	If small animal (e.g., rat, bird, cat, etc.) carcasses are present within the SMP		
	Report large animal carcasses to Philly311	If large animal (e.g., deer, dog, raccoon, etc.) carcasses are present within the SMP		
	Fill animal burrows with stone and compact	If animal burrows are present within the SMP		
	Report animal infestations to SMP owner	If more than 2-3 animal borrows are present or more than 2-3 animals are observed (e.g., rats, mice, moles etc.)		
Mulching	Apply mulch to tree pits	If gap between top of sidewalk and top of mulch is > 1 in.	Tree trench, stormwater tree, green gutter	2.2.6
	Rake mulch away from base of tree trunk or woody-stemmed shrub	If mulch is within 3 in. of trunk	All vegetated SMPs	

Table 1-2. Annual and Semi-Annual Surface Maintenance

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	FREQUENCY AND TIMING OF MAINTENANCE	APPLICABLE SMP TYPE(S)	PROTOCOL REFERENCE
Winterization	Clean and grease appurtenances	None	Annually if needed	All SMPs	2.1.8
	Install traffic bollards	Requested by owner/operator	Annually in November	Bump-out, green gutter	
Pre-emergent Herbicide Application	Apply pre-emergent herbicide	Tree trenches and soft sites within first 2 years of establishment	Spring (April) and summer (June)	All vegetated SMPs	2.2.1
Structural Pruning	Complete selective pruning to improve tree architecture	None	Annually during the period from December to the end of February	All vegetated SMPs	2.2.4
Cutting Back of Vegetation	Cut back herbaceous vegetation from previous growing season	If the height of herbaceous vegetation exceeds 6 in.	Annually in March	All vegetated SMPs	2.2.4
Mulch Care	Remove existing mulch from tree pits and replace with fresh mulch	None	Annually in April	Tree trench, stormwater tree	2.2.6
	Apply mulch to the perimeter of landscaped beds > 2 years old and to entire bed for soft sites < 2 yrs. old	None	Annually in April	Rain garden/ basin, bump-out, green gutter	
Soil Amending	Tree/shrub appears unhealthy, unrelated to drought; soil issues observed	Consult owner/operator	Amend soil	All vegetated SMPs	2.2.7
Planting & Seeding	Bare areas in planted beds > 20 ft^2 during the growing season	Consult landscape architect or horticulturist and owner/ operator for plant selection	Replace plant(s)	All vegetated SMPs	2.2.8
	Bare areas in meadow areas or seeded areas (> 20 ft^2) during the growing season	Consult landscape architect or horticulturist and owner/ operator for plant selection	Perform seeding in spring (March 1 - May 15) or fall (August 15 - October 15)	Rain garden/ basin, wetland, swale, green gutter	2.2.9

Table 1-3. Annual Subsurface Maintenance

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	APPLICABLE SMP TYPE(S)	PROTOCOL REFERENCE
Vacuum Cleaning	Vacuum clean trash/sediment/organic debris from subsurface access and flow control/conveyance structures	If trash/sediment/organic debris present within structures	All SMPs with subsurface features	3.1
Pipe Jetting	Jet (i.e., hydro-clean) conveyance, distribution, and underdrain pipes	If 10% or more of the cross-sectional area of the pipe is blocked by sediment/debris, or as otherwise specified by the owner/operator		
Inlet Pretreatment Device Maintenance	Empty and clean surface pretreatment devices	If trash, sediment, and/or organic debris is present in pretreatment devices		
	Install permanent pretreatment devices	If pretreatment devices are not present		
	Replace ripped pretreatment device fabric	*Ripped pretreatment device fabric*: Pretreatment device fabric has a rip or hole > 3 in.		
Bolt & Lock Care	Clean and grease appurtenances	Each time a component with bolts or locks is opened		2.1.7

Table 1-4. Green Roof, Blue Roof, and Green Wall Maintenance

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	FREQUENCY AND TIMING OF MAINTENANCE	PROTOCOL REFERENCE
General Care	Remove trash and/or sediment from all SMP surfaces (e.g., roof, planted areas, etc.)	If trash and/or sediment is present within the SMP area	3 times per year in April, July, and October	2.1.1
	Wipe down signage	If dust, grime or other residue is present on signage		2.1.1
Graffiti Removal	Remove graffiti from SMP signage, structures, or surfaces	If graffiti present within the SMP area	3 times per year in April, July, and October	2.1.5
Winterization	Clean and grease appurtenances	None	Annually in October	2.1.8
	Implement winterization tasks as defined by or required by manufacturer	As defined by the manufacturer		
	Drain and close internal irrigation pipes, reservoirs, and attachments	None		
Weeding	Remove weeds using one or more of the mechanical or chemical methods	If weeds are present within the SMP area	3 times per year in April, July, and October	2.2.1
Dead & Damaged Vegetation Removal	Remove dead herbaceous vegetation or shrubs from the SMP area	If dead vegetation is present within the SMP area	3 times per year in April, July, and October	2.2.3
Pest & Disease Management	Treat vegetation to remove, destroy, or minimize pests and disease	If harmful insects (e.g., bag worms, wax scale, caterpillars, aphids, etc.); galls, mildew or fungus are present within the SMP area	As Needed	2.2.5
	Remove animal carcasses	If small animal (e.g., rat, bird, cat, etc.) carcasses are present within the SMP area	As Needed	
Manage/ Amend Soil	Amend soil as needed following annual nutrient test performed by the owner/operator	Soil tests report the need for soil amendment; Consult the owner/operator	Depending on soil test results	2.2.7

Table 1-5. Cistern/Rain Barrel Maintenance

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	FREQUENCY AND TIMING OF MAINTENANCE	PROTOCOL REFERENCE
General Care	Remove trash and/or sediment from all SMP surfaces (e.g. gutterlines, screen, diverter etc.)	If trash or sediment is present within the SMP area	3 times per year in April, July, and October	2.1.1
	Wipe down signage	If dust, grime or other residue is present on signage	3 times per year in April, July, and October	
Graffiti Removal	Remove graffiti from SMP signage, structures, or SMP surfaces	If graffiti is present within SMP area	3 times per year in April, July, and October	2.1.5
Winterize	Disinfect cistern/rain barrel storage tank	None	Annually in October	2.1.8
	Close cistern/rain barrel storage tank	If cistern/rain barrel is located above ground or above the frost line for subsurface cisterns		
	Vacuum clean above ground cisterns (e.g., tanks, barrels, etc.)	If trash/sediment/ organic debris is present within the cistern/rain barrel		

Table 1-6. Pervious Pavement Surface Maintenance

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	FREQUENCY AND TIMING OF MAINTENANCE	PROTOCOL REFERENCE
General Care	Remove trash and/or sediment from all SMP surfaces (sidewalks, gutter lines, tree pits, etc.)	If present within SMP area	3 times per year	2.1.1
	Wipe down signage	Dust, grime or residue present	3 times per year	2.1.1
	Report dumping to Philly311	If present within SMP area	As needed	2.1.1
	Vacuum pervious pavement surface	None	3 times per year	4.1
	Perform restorative vacuum cleaning	If infiltration testing performed by the owner/operator indicates decreased infiltration rates	As needed	4.2
	Remove organic debris (e.g., leaves, feces, etc.) from all SMP surfaces	If present within SMP area	3 times per year	2.1.1
Remove Graffiti	Remove graffiti from site signage, structures, or SMP surfaces	If present within SMP area	As needed	2.1.5
Winterize SMP	Clean and grease appurtenances	None	Semi-annually, November and April	2.1.8
Remove Animal Carcasses	Remove and dispose of small animal carcasses	Small animal (e.g., rat, bird, cat, etc.) carcasses present within SMP area	As needed	2.2.5
	Report large animal carcasses to Philly311	Large animal (e.g., deer, dog, raccoon, etc.) carcasses present within SMP area		
Winter Maintenance	Apply de-icer to pervious pavement surface	Snow events > 0.25 in., sleet and freezing rain events, and after any plowing event	Before and after every applicable storm, and after every plowing event	4.3
	Plow snow from surface	Snow event > 2 in.	Every 3 hrs. during storm	

Table 1-7. Establishment Watering Maintenance

TASK	DESCRIPTION	PRECONDITIONS FOR MAINTENANCE	FREQUENCY AND TIMING OF MAINTENANCE	PROTOCOL REFERENCE	APPLICABLE SMP TYPE(S)
Trees	Place water bag(s) on all newly planted tree(s)	If the tree has been planted within the last 24 months	Annually in April, or after planting	2.2.10	All SMPs with trees
	Place water bag(s) on unhealthy tree(s)	If tree leaves appear brown or wilted	Monthly from April to end of October		
	Fill water bag(s)	If there has been period of 7 or more days without rain or watering	Every 7 days from April to end of October		
	Remove water bag(s) from tree(s)	If water bag(s) are present	Annually in November		
Herbaceous Vegetation & Shrubs	Water herbaceous vegetation and shrubs	If there has been a period of 4 or more days without rain or watering and the site has been planted within the last 24 months	Every 4 days from April to end of October		All vegetated SMPs
	Water sedums	If there has been a period of 7 or more days without rain or watering and the site has been planted within the last 12 months	Every 7 days from April to end of October		Green roof, green wall

Reactive Maintenance

division 1.4

1.4 REACTIVE MAINTENANCE TABLES

1.4.1 DESCRIPTION OF REACTIVE MAINTENANCE TABLES

1. Reactive maintenance tasks in Table 1-8 are additional tasks beyond those routine tasks listed in Tables 1-1 through 1-7. Reactive maintenance tasks may be required in response to specific observations (related to site safety, SMP performance, and/or aesthetics) during during pre-maintenance inspection, routine maintenance, or made by the owner/operator. These tasks are typically broader in scope and complexity than routine tasks, and often require additional coordination, review, or investigation by the owner-operator. Reactive tasks may also require consultation with professionals such as engineers, scientists, landscape architects, horticulturalists, or others. **Reactive tasks require approval of the owner/operator before work can be performed.**

1.4.2 OBSERVATIONS

1. Some observations listed in Table 1-8 could present potential safety hazards to the public and to maintenance personnel (e.g., large sinkholes, widespread settling, etc.). When safety issues are observed, maintenance personnel must immediately secure the site and contact the owner/operator. The list of observations in Table 1-8 that require the site be immediately secured is not all inclusive, and maintenance personnel must be diligent in detecting issues.

1.4.3 POSSIBLE RESPONSES TO OBSERVATIONS

1. Table 1-8 lists possible responses. This list is not all-inclusive and other reactive maintenance tasks or investigations not listed in this table or manual may be required in response to observations.
2. Initiation of reactive maintenance tasks in response to observations requires approval from the owner/operator unless pre-approval to initiate response action(s) to specific

Table 1-8. Reactive Maintenance

ISSUE CATEGORY	OBSERVATION	IMMEDIATELY SECURE SITE	POSSIBLE RESPONSE	PROTOCOL REFERENCE	POSSIBLE ADDITIONAL INVESTIGATION
Sedimentation	Sedimentation over an area > 250 ft^2 in size		Perform sediment removal	2.1.1	Consult engineer to determine possible design solutions
Erosion	Recurring erosion located downslope of energy dissipater		Construct or extend energy dissipater	2.1.2	Consult engineer to correctly size energy dissipater for optimal performance
	Recurring erosion not associated with energy dissipaters		Perform erosion repair		Consult engineer to determine possible design solutions
Settling	Sinkholes > 24 in. depth	✓	Perform void/sinkhole repair	2.1.4	Assess area using dye testing or geotechnical investigation to determine root cause of soil loss
Clogging	Standing water within SMP infiltration/storage area more than 72 hrs. after a rain event (except stormwater wetlands)		Perform soil management; debris removal, and/or pipe jetting/vactoring/ dewatering	2.2.7; 3.1	Consult engineer to determine possible design solutions that could affect the outcome of the repair. Geotechnical investigation may also be needed
	Standing water in inflow inlets above the height of the distribution pipe for more than 72 hrs. after a rain event		Perform emergency pipe cleaning	3.1	Perform pipe inspection to assess condition prior to cleaning
	Standing water on pervious pavement, or pavement pores that appear caked with fine sediment or debris		Perform restorative cleaning	4.1	Perform infiltration testing ; if infiltration rate is < 10 in./ hr. pavement may require restorative maintenance

Table 1-8. Reactive Maintenance cont'd.

ISSUE CATEGORY	OBSERVATION	IMMEDIATELY SECURE SITE	POSSIBLE RESPONSE	PROTOCOL REFERENCE	POSSIBLE ADDITIONAL INVESTIGATION
Dead or Missing Vegetation	Large trees or trees in constrained urban areas are dead, have large broken limbs (> 6 in. diameter), or otherwise pose a safety risk	✓	Remove trees/shrubs or dead limbs	2.2.3	Consult arborist for tree removal
	Trees or shrubs that were present at previous maintenance event are missing		Replace trees/shrubs	2.2.8	N/A
Tree Limbs Interfering with Electric Lines	Tree limbs growing in the vicinity of overhead utility wires		Prune tree consistent with utility line clearance standards	N/A	Consult a certified line clearance arborist
Concrete, Pavement, or Masonry Damage	Structural failure or damage (e.g., broken or open structures, exposed subsurface elements, or failure of walls, walkways, or roadways)	✓	Repair/reconstruct structure	N/A	Consult an engineer for possible system re-design, and a construction contractor to perform repairs
	Loose, missing, or displaced brick, stone, or paver areas > 4 ft^2.	✓	Replace and/or reset the missing masonry parts	2.1.3	Perform additional investigate of root cause of missing components
	Pervious or conventional asphalt or concrete is severely degraded or shows significant dents or scars	✓	Replace the degraded area of pavement		Consult an engineer for possible system re-design, and a construction contractor to perform repairs
	Repair large/structural cracks		If large concrete cracks present within the SMP		

Table 1-8. Reactive Maintenance cont'd.

ISSUE CATEGORY	OBSERVATION	IMMEDIATELY SECURE SITE	POSSIBLE RESPONSE	PROTOCOL REFERENCE	POSSIBLE ADDITIONAL INVESTIGATION
Missing Components	Bypass of stormwater observed at inlet or curb cut during storm events; or inlet or curb cut is elevated or offset relative to the intended flow path		Perform inlet drainage modification	2.1.3	
	Missing cleanout covers	✓	Contact the owner/operator about replacements	N/A	
	Public access/safety risk is observed by the owner/ operator		Install permanent fencing		Consult a construction contractor to perform repairs
	The owner/operator indicates that underdrain pipe is needed to address performance problems		Construct underdrain	3.1	Consult an engineer for possible system re-design, and a construction contractor to perform repairs
	The owner/operator indicates that pipe caps require an orifice or that pipes need to be plugged		Drill orifice (sized according to plan sets) or install plug		None
Pests	Mosquito infestation observed in inlets/structures; major mosquito or roach infestations, or wasps/hornets		Report and apply control measures	2.2.5	None
Soil Degradation	Significant salt has accumulated in tree pits, or tree pit soil has become compacted		Remediate salt accumulation and compaction	2.2.7	Investigate possible causes of salt accumulation and compaction; consult an engineer or landscape architect

Maintenance Event Procedures

division 1.5

1.5 MAINTENANCE EVENT PROCEDURES

1.5.1 GENERAL

1. General inspection and maintenance event procedures noted herein shall be followed when executing any and all maintenance activities.
2. **Do not conduct any non-emergency work in saturated soil conditions.**

1.5.2 PRE-MAINTENANCE EVENT

1. Inspection or maintenance personnel shall perform the following general procedures, as applicable, in preparation for maintenance events:
   - Review all route and site access restrictions, site characteristics, and maintenance maps to determine the most appropriate personnel, materials, and equipment.
   - Prepare digital or print copies of all applicable documents (work orders, permits etc.)
   - **Prepare site for maintenance with all necessary warning devices, barricades, and ground personnel required to insure the safety, protection, and warning of persons and vehicular traffic within the area, especially when inlets are open.**
   - If there is a conflict between actual site conditions and the methods specified within protocols, personnel shall coordinate to change methods or to facilitate more effective installation. All modifications must be approved prior to the start of work.
   - Contact the owner/operator if site is inaccessible.

1.5.3 DURING MAINTENANCE EVENT

1. Inspection or maintenance personnel shall adhere to the following general procedures, as applicable, during maintenance events:
   - Personnel must follow any and all applicable PennDOT regulations for highway safety.
   - Minimize disturbance of soils and vegetation, especially that which is most prone to breakage (i.e. woody and broadleaf plants), by taking the following precautions:
     - As much as possible, select equipment that causes minimal disturbance of the ground surface.
     - Practice careful foot placement when working in vegetated areas and avoid stepping on plants.
     - Avoid dragging or driving equipment across vegetated areas.
     - Avoid compaction of SMP infiltration areas by equipment and personnel.
     - Restrict or limit vehicular access over finished grade soils in SMPs.
   - During work, all areas shall be kept neat, clean and free of all trash and debris.
   - Minimize disruption to vehicular traffic on adjacent roadways.
   - Minimize disruption to pedestrian traffic on adjacent sidewalks.
   - Limit use and minimize leaking of water during freezing conditions.

1.5.4 POST-MAINTENANCE EVENT

1. Inspection or maintenance personnel shall perform the following general procedures, as applicable, after maintenance events:
   - Complete all maintenance event documentation.
   - Remove any soil debris or organic debris from hardscape areas.
   - Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks or other hardscape areas.
   - It shall be the responsibility of maintenance personnel to remove and dispose of in a proper and acceptable manner and in accordance with applicable waste disposal requirements, all debris, trash, and materials resulting from maintenance operations.
   - Maintenance personnel may not dump wood chips or any debris, etc. at the Fairmount Park Recycling Center. Dumping of any debris at City dump sites must be authorized and coordinated with City staff.
   - All sites will be inspected by the owner/operator.

General Requirements

division 1.6

1.6 GENERAL REQUIREMENTS

1.6.1 DOCUMENTATION

1. Maintenance personnel may be required to complete work order forms with labor, materials, photographs, and other data fields as requested by the owner/operator.
2. Additional documentation requirements may be listed in Applicability and Requirements or Standard Operating Procedures.
3. All documentation shall be reviewed by the maintenance personnel prior to submission.

1.6.2 HEALTH AND SAFETY

1. Maintenance activities and equipment operation are to be performed in accordance with all applicable laws and regulations including, but not limited to, those of:
   - United States of America;
   - Commonwealth of Pennsylvania;
   - City of Philadelphia;
   - Occupational Safety and Health Administration (OSHA); and
   - The owner/operator’s Health and Safety Plan (HASP).
2. In the event of a conflict between health and safety regulations, maintenance personnel shall follow the most stringent/protective requirements.
3. Personnel shall utilize personal protective equipment such as head, eye, and ear protection, as well as protective gloves, footwear, high-visibility clothing, and all other applicable protective equipment consistent with all OSHA standards. Personnel are responsible for maintaining safe and healthy working conditions as part of their daily activities.
4. **Prior to maintenance events, maintenance personnel must assess sites for safety issues. If safety issues are identified maintenance personnel must report them to the owner/operator immediately. Personnel are responsible for temporarily securing the safety hazard using cones and safety tape.**
5. Combined sewer structures pose health hazards from the hydrogen sulfide gas that accumulates in sewers. No personnel shall for any reason enter a confined subsurface structure (such as a manhole or access port) without valid confined space entry certification. Maintenance personnel are to follow OSHA confined space entry protocols and utilize air quality monitors whenever entering a confined subsurface structure.
6. If any hazardous materials or wastes are encountered, work must be stopped and the owner/operator notified. Hazardous materials shall be handled only by trained personnel.
7. To reduce hazards associated with fire hydrant use, maintenance personnel operating fire hydrants shall adhere to the following conditions:
   - Maintenance personnel must exercise judgment to ensure fire hydrant use does not create a hazardous condition that may compromise public safety. It shall be the responsibility of the user to ensure that the fire hydrant is functioning properly at the conclusion of the workday. When the permit expires, a post use inspection will be performed by the owner/operator. The fire hydrant user shall be held responsible for a malfunctioning fire hydrant if the owner/operator was not notified of any defects.
   - Hoses shall not interfere with any public use of the area.
   - Traffic cones shall be placed surrounding the hose when running across a sidewalk.

- The fire hydrant operation equipment and fire hydrant shall be under close observation by maintenance personnel to prevent tampering or theft.
- When operating a fire hydrant during a time where freezing is a risk, road salt shall be applied to all wet areas on the street or sidewalks surrounding the fire hydrant as well as any areas wet as a result of maintenance.

8. Green and blue roofs may have fall arrest systems and should be used according to manufacturer's instructions in conjunction with training.

1.6.3 ACCESS REQUIREMENTS

1. The owner/operator will provide maintenance personnel with appropriate access permissions to commencement of maintenance events.
2. Prior to commencement, maintenance personnel shall verify the following conditions are sufficient both at the site and along the proposed travel route for all maintenance equipment prior to transporting equipment to the SMP or site:
    - Overhead clearances (e.g., trees, overpasses, overhead utilities, etc.);
    - Weight restrictions (e.g., bridges, sidewalks, etc.);
    - Street and access road/path widths;
    - Physical site barriers (e.g., gates, fences, etc.);
    - Slopes;
    - Soil stability; and
    - Distances from vehicular access.
3. Maintenance personnel shall immediately notify the owner/operator if access to the site is blocked during a maintenance event.
4. Maintenance personnel shall immediately notify the owner/operator if access to inflow inlets is obstructed by vehicles parked in the right-of-way during a maintenance event.
5. For sites where vehicle obstructions are commonplace, the owner/operator may choose to redirect parking using restrictive signage prior to a maintenance event.
6. Blocking of public streets shall not be permitted unless prior arrangements have been made with the City, and coordination with appropriate departments has been established. Traffic control is the responsibility of maintenance personnel and shall be in compliance with state, country, and local highway construction codes.
7. Street and lane closure permitting is described in Section 1.6.4.4.
8. Prior to any excavation using powered equipment, maintenance personnel or the owner/operator must place a PA1CALL (811).

1.6.4 PERMITS AND APPROVALS

1. The owner/operator and/or maintenance personnel shall obtain all required permits and approval prior to commencement of work and have hard copies of document on site during maintenance event.
2. A Philadelphia Parks and Recreation (PPR) requires an Access Permit for maintenance work with or within Philadelphia Parks.

    The School District of Philadelphia requires the following clearances be obtained by maintenance personnel prior to executing maintenance on school district property:

    - Criminal history check.
        - Website: www.epatch.state.pa.us/Home.jsp

- Child abuse clearance.
    - Website: www.webgui.phila.k12.pa.us/uploads/OT/CB/OTCBin1EYlLfhH4ZP_DS1Q/dpwchildabuse.pdf www.phila.k12.pa.us/forms/CY-113.pdf.
- FBI finger printing.
    - Website: www.pa.cogentid.com/index.htm

3. Philadelphia License and Inspections requires a fire hydrant Operation Permit prior to the use of a fire hydrant.
    - Applicant shall indicate to the owner/operator the location of requested fire hydrants, including street intersection and corner (NW, SW, NE, or SE) and show proof of purchase for a backflow preventer.
    - Applicant shall complete a Philadelphia Water Department Hydrant Operation Report (See Division 5 for sample document) each time a fire hydrant is accessed.
4. Philadelphia Streets Department Right-of-Way Unit requires a Street, Lane and/or Sidewalk Closure Permit, if maintenance work requires that a street and/or sidewalk be closed to traffic.
    - Applicants must complete the Utility Work Application for Street Closure, available at http://philadelphiastreets.com/images/uploads/resource_library/Street_Closure_for_Utility_Work.pdf.
    - All applications for a street closure permit must be received by mail or fax by 12 noon at least ten (10) business days in advance of the start date.

1.6.5 PERSONNEL TRAINING, EXPERIENCE, AND IDENTIFICATION

1. All maintenance personnel shall possess the appropriate training and experience as defined by personnel classification listed in Division 5 and as applicable to specific maintenance tasks.
2. Personnel operating all equipment will possess all appropriate and applicable certifications and licenses.
3. Personnel handling regulated materials will possess all appropriate and applicable certifications and licenses.
4. Personnel performing work on public sites shall be clearly identified by clothing, equipment, and information as follows:
    - Personnel shall wear clothing clearly marked with their company or organization's name and/or logo.
    - All vehicles driven in support of field activities shall be clearly marked with their company or organization's name and/or logo. The owner/operator may choose to provide personnel with partner materials such as vehicle magnets and literature/handouts.
    - Personnel shall carry company business cards or program fact sheets as appropriate to provide contact and background information on the work being performed.

1.6.6 EQUIPMENT

1. Surface maintenance equipment is separated into two tables: one for general care (Table 2-1) and one for vegetation maintenance (Table 2-8).
2. Subsurface maintenance and inspection equipment is in Table 3-1.
3. Pervious pavement maintenance equipment is in Table 4-1.
4. Equipment lists are non-exhaustive, and additional or more specific equipment may be required to perform routine tasks as per the best professional judgment of maintenance personnel.

1.6.7 MATERIALS

1. Surface maintenance material for is separated into two

tables: one for general care (Table 2-2) and one for vegetation maintenance (Table 2-9).

2. Subsurface maintenance and inspection material for routine tasks is in Table 3-2.
3. Pervious pavement maintenance material is in Table 4-2.
4. Material lists are non-exhaustive, and additional or more specific materials may be required to perform routine tasks as per the best professional judgment of maintenance personnel.

1.6.8 REFERENCES

Surface Maintenance Content References:

1. American National Standards Institute. Undated document. ANSI A300. This document is available online for download at the following location: http://tcia.org/business/ansi-a300-standards. Accessed October, 2015.
2. American Society for Testing and Materials. 2015. C497 - 13 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile. This document is available online for download at the following location: http://www.astm.org/Standards/C497.htm.
3. Bragg, T. and Sutherland, D. 1989. Establishing Warm-Season Grasses and Forbs Using Herbicides and Mowing. University of Nebraska-Omaha, Publication Code 68182-0040.
4. Honu, Y.A.K., Gibson, D.J. and Middleton, B.A. 2006. Response of Tridens Flavus (L.) A. S. Hitchc. to Soil Nutrients and Disturbance in an Early Successional Old Field. Journal of the Torrey Botanical Society.
5. Pennsylvania State University, College of Agricultural Sciences, Agricultural Research and Cooperative Extension. 2002. Pennsylvania Wildlife (no. 12), Warm-Season Grasses and Wildlife. This document is available online for download at the following location: http://extension.psu.edu/natural-resources/wildlife/landscaping-for-wildlife/warm-season-grasses-and-wildlife/extension_publication_file.
6. Pennsylvania State University, College of Agricultural Sciences, Agricultural Research and Cooperative Extension. 2009. Turfgrass Species for Pennsylvania. Publication Code EC395. This document is available online for download at the following location: http://extension.psu.edu/publications/ec395.
7. Pennsylvania State University, College of Agricultural Sciences. Undated document. Soil Testing Methods. This document is available online for download at the following location: http://agsci.psu.edu/aasl/soil-testing/soil-methods. Accessed October, 2015.

Sources of Additional Information for Surface Maintenance:

1. American Society of Agronomy. Additional information can be found at the following location: https://www.agronomy.org
2. City of Philadelphia Mayor's Office of Transportation and Utilities. 2012. Philadelphia Complete Streets Design Handbook. This document is available online for download at the following location: http://www.philadelphiastreets.com/images/uploads/resource_library/cs-handbook.pdf
3. City of Philadelphia. Contractor Resources. Additional information can be found at the following location: http://www.phila.gov/water/aboutus/buswithpwd/Pages/contractor.aspx
4. Commonwealth of Pennsylvania, Department of Transportation. 2011. Publication 408 Specifications. This document is available online for download at the following location: http://www.dot.state.pa.us/public/PubsForms/Publications/Pub_408/PUB%20 408.pdf
5. Commonwealth of Pennsylvania. 2015. The Pennsylvania Code Chapter 102: Erosion and Sediment Control. This document is

available online for download at the following location: http://www.pacode.com/secure/data/025/chapter102/chap102toc.html

6. National Association of State Departments of Agriculture - Association of Official Seed Analysts. Additional information can be found at the following location: http://www.nasda.org
7. Northeast Organic Farming Association. 2011. Standards for Organic Land Care: Practices for Design and Maintenance of Ecological Landscapes, 5th edition. This document is available online for download at the following location: http://www.organiclandcare.net/sites/default/files/upload/standards2011.pdf
8. Pennsylvania Department of Environmental Protection. 2008. Pennsylvania Stormwater Best Management Practices Manual. This document is available online for download at the following location: http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305
9. Pennsylvania Department of Environmental Protection. 2012. Erosion and Sediment Pollution Control Program Manual: Technical Guidance Number 363-2134-008. This document is available online for download at the following location: http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-88925/363-2134-008.pdf
10. Pennsylvania General Assembly. 2012. Pennsylvania Consolidated Statutes, Title 3, Chapter 21, §§7101-7122. This document is available online for download at the following location: http://www.legis.state.pa.us/cfdocs/legis/LI/consCheck.cfm?txtType=HTM&ttl=3&div=00.&chpt=071.&sctn=001.&subsctn=000.
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13. Soil Science Society of America. 1983. Methods of Soil Analysis, Parts 1, 2, 3 & 4. Additional information can be found at the following location: https://www.soils.org
14. United States Department of Labor. Occupational Safety and Health Administration (OSHA). Additional information can be found at the following location: https://www.osha.gov
15. US Composting Council. Seal of Testing Assurance. Additional information can be found at the following location: http://compostingcouncil.org/seal-of-testing-assurance

Subsurface Maintenance Content References:

1. National Association of Sewer Service Companies. 2015. Pipe Assessment and Certification Program Manual (version 7.0.0).
2. National Association of Sewer Service Companies. 2014. Specification Guideline for Sewer Pipe Cleaning. This document is available for download at the following location: http://www.nassco.org/publications/specs/sewer_cleaning_6Nov2014.pdf.
3. Philadelphia Water Department. 2012. Green City, Clean Waters; Appendix IV: PWD Sewer Assessment Program Cleaning Training Manual. pp. i-v. This publication is available for download at the following location: http://phillywatersheds.org/ltcpu/Green%20Infrastructure%20Maintenance%20Manual%20Development%20Process%20Plan.pdf.

Pervious Pavement Maintenance Content References:

1. American Society for Testing and Materials. 2014. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
2. American Society for Testing and Materials. 2009. ASTM C1701 Standard Test Method for Infiltration Rate of In Place Pervious Concrete.

3. Ballestero, Dr. Thomas, P.E. (University of New Hampshire Stormwater Center). Personal communication, November, 2014.

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Surface Maintenance

division 2

2.1 GENERAL SITE CARE

2.1.1 TRASH, SEDIMENT, AND ORGANIC DEBRIS REMOVAL

1. Description
   - This section sets forth procedures and requirements for trash, sediment, and organic debris removal from pretreatment devices and SMP surfaces.
2. Applicability and Requirements
   - The efficiency of sediment, trash, and organic debris removal operations after winter weather events (e.g., snow or ice storms, etc.) may be significantly reduced to the point where removal requires an impractical level of effort. Based on the best professional judgment of the foreman, such material may be left in place until the next maintenance event where removal is to be attempted again.
   - Removal of debris from the inlets, pipes, and culverts, or other structures that require confined space entry is covered in Division 3: Subsurface Maintenance.
3. Standard Operating Procedure
   - **Remove trash, sediment, and organic debris from pretreatment devices in city inlets, highway inlets and/or domed risers (See Figures 2-1 and 2-2):**
     - If pretreatment device is not present in highway inlet and/or domed riser, install a new pretreatment device.
     - If the pretreatment device is not present in a city inlet, refer to subsurface maintenance installation of city pretreatment device per Section 3.1.
     - Remove the pretreatment device, if not permanently attached, from the structure by hand or with specialized pretreatment device removal tools, if available.
     - If removing device by hand, remove enough material from the device to achieve a liftable weight (based on surface maintenance personnel judgment) prior to lifting.
     - If there is standing water, remove using a pump prior to lifting.
     - Invert and shake or gently tap the device until all material has been removed.
     - A tarp may be used to contain debris for bagging and removal.
     - Clean the fabric using a scrub brush or pressure washer to remove fine sediment from fabric pores, taking care not to tear or damage the material.
   - **When damage or tear/rip to pretreatment devices is greater than 3 in.:**
     - Remove filter fabric from pretreatment device frame.
     - Replace filter fabric.
     - Re-insert pretreatment device into structure and secure.
     - Stockpile damaged pretreatment device filter fabric offsite for repair.
   - **Remove trash, sediment, and debris from SMP surfaces:**
     - Small quantities of trash/sediment/organic/debris can be removed using hand tools.
     - Remove trash, sediment, and organic debris from the

SMP, includes sidewalk/paved areas adjacent to any grates and curb openings with special attention to inflow/outflow areas:

- Remove pieces of trash such as plastic bags or bottles manually or using a trash claw.
- Remove fallen sticks, leaves, and organic material manually or using a leaf rake or blower.
- For trench drains use leaf blower or in some cases covers may have to be removed to fully access the inflow area.
- If trench drain grate is removed, clean and lubricate bolts before re-inserting, being careful not to cross-thread.

◦ If large quantities of sediment/debris, or sediment/debris are present in hard-to-access or permanently wet locations, then mechanized equipment such as a mini excavator or portable vacuum excavator may be used as needed at the discretion of the on-site foreman to promote safe and efficient sediment removal.

◦ Large deposits shall be removed from paved structures or turf-covered storage areas using a mini-excavator or portable vacuum excavator.

◦ Mechanized equipment such as skid-steers, mini loaders, etc. shall not traverse or otherwise be staged on the surface of the storage/infiltration areas to avoid soil compaction.

◦ Adjacent elements such as trees, slopes, and sidewalks shall be protected using fencing and stabilization materials.

◦ Any bare areas within vegetated SMPs that result from sediment/organic debris removal shall be immediately stabilized per Section 2.1.2.

- **Wipe down signage:**
    - Use an all-purpose cleaner and soft rag to remove any dust, grime or other residue.
- **Remove strings or tags from vegetation:**
    - Remove GSI Maintenance expired, temporary, no-parking signage along with string(s) used for attachment.
    - Do not remove intentional tree information labels.
- **Report illegal dumping:**
    - Report activity to the owner/operator.
    - Contact Philly311 for removal.

Figure 2-1. Cleaning of Pretreatment Device for a City Inlet

Figure 2-2. Cleaning of Pretreatment Device for a Highway Grate Inlet

2.1.2 EROSION CONTROL AND REPAIR

1. Description
    - This section sets forth procedures and requirements for the control/repair of minor to moderate erosion. This section also provides guidance for energy dissipater repairs and extensions.
2. Applicability and Requirements
    - Erosion Control Blanket shall be 100% jute fiber (hand-woven into one-inch by one-inch net). Jute netting shall be undyed and unbleached uniform single jute yarn and 100% biodegradable.
    - New energy dissipaters must be sized by the owner/operator.
3. Standard Operating Procedure
    - **To repair areas of erosion (See Figure 2-3):**
        - Fill eroded area, if necessary, with material matching that of the surrounding media profile.
        - Fine grade material with hoe, rake, or other hand tool to match the grade of the surrounding undamaged surface.
        - Install erosion blanket using method described below and consistent with manufacturer's specifications. If specifications below conflict with manufacturer's specifications, choose the specification that is most conservative.
            - Slopes, basins, and channels may each require different installation methods, including the direction of rolling the fabric. Refer to the manufacturer's guidelines prior to installation

to insure sufficient materials are provided to account for overlap, anchor trenches and staple pattern.

- Ensure that the upslope edge of the erosion blanket is securely embedded and anchored into an anchor trench above the entry point of water into the SMP.
- If multiple pieces of erosion blankets are necessary to cover an eroded area, ensure that no bare soil is left exposed by overlapping the fabrics at the seams.
- At the downstream end, anchor the edge of the erosion fabric in an anchor trench at a minimum of 3 ft. downstream of the eroded area to provide sufficient coverage.

◦ At the discretion of the owner/operator, plant or seed the area as per Sections 2.2.8 and 2.2.9.

◦ If erosion repair/control is performed outside the normal seasonal seeding window for the desired species, seed a temporary cover crop.

- **To construct or extend exposed aggregate concrete energy dissipaters:**
    - Excavate area to accommodate design depth of sub-base.
    - Compact soil, add 2A Modified subbase to design depth and compact.
    - Construct forms to design dimensions and elevations.
    - Mix concrete and pour into form.
    - Immediately following pour, set stones/aggregate with the designed exposure.
    - Finish flat surfaces between aggregate.
    - Wash aggregate before concrete sets on stones.
    - Remove forms.
    - Backfill surrounding area to match existing grades.
- **To construct or extend river stone dissipaters (Example: Figure 2-4):**
    - Excavate area to accommodate design depth of sub-base.
    - Compact soil, add 2A Modified subbase to design depth and compact.
    - Mix screenings and Portland cement 50/50 and lay a 0.5-1 in. setting bed.
    - Install river stones with screenings/cement mix filling in voids between stones. Stones must be close but not touching to allow screening mix to surround each stone.
    - Backfill surrounding area to match existing grades.
    - Brush any soil or debris off stones and screenings.
    - Sprinkle with water to activate cement without washing material out from between stones.
- **To construct or extend energy dissipaters with cobblestones/Belgian blocks set in mortar:**
    - Remove any loose or broken pieces and clean surrounding area.

Figure 2-3. Example of Erosion Control

Figure 2-4. Extension of a Velocity Dissipator

  - Confirm that a stable base is in place.
  - Place materials loosely in the area to be repaired to confirm the fit and arrangement before setting in mortar.
  - Adjust material sizes and/or shapes as necessary to achieve the desired aesthetic of the dissipater.
  - Mix mortar and set the stones in place with uniform spacing for joints.
  - Strike joints and clean off loose mortar before it hardens.
  - Backfill surrounding area to match existing grades.

2.1.3 CONCRETE, PAVEMENT, AND MASONRY REPAIR AND MODIFICATION

1. Description
   - This section sets forth procedures and requirements for concrete, pavement, and masonry repair and modification, including regrading of asphalt to modify drainage to inlets.
2. Applicability and Requirements
   - If practicable, schedule concrete work early in the day for final setting to occur during the work day. Protect the newly poured concrete from pedestrian and vehicular traffic using barricades, caution tape or signage. Ensure that personnel are present during the final setting period to prevent vandalism and damage.
   - Maintain protective measures during the 5 to 7 days curing period of concrete.
   - Concrete, pavement, and masonry repairs shall be limited to

days with a temperature range between 40° and 80° F.

- Concrete, pavement, and masonry repairs shall be avoided within a 48 hr. period of forecasted rain.
- Crew shall consist of at minimum one Mason for technical or advanced concrete, pavement, and masonry repair and modification.

3. Standard Operating Procedure

- Guidance from the owner/operator is required if the damaged pavement is greater than 50 ft^2 and more than 10% of the total pavement surface. Block off any areas that are unsafe for pedestrians or vehicular traffic and notify the owner/operator.
- **To repair broken, loose, or compromised concrete or masonry structures:**
  - Place tarp over adjacent areas to protect surfaces, soil, and vegetation from spilled materials.
  - Remove loose debris or material from the repair area.
  - To repair hairline/cosmetic crack in concrete, apply a concrete crack repair product (Sikadur® or approved equal) to the surface per the manufacturer's recommendations.
  - To repair a large/structural crack in concrete, clean out loose debris, fill the cracked area.
  - If the damage is too large to support mortar, saw cut concrete and install concrete forms, as needed.
  - Mix mortar.
  - Fill repair area and smooth joints.
  - Remove excess mortar.
- **To replace and/or reset missing masonry parts such as stones, bricks, or pavers:**
  - Remove stone/brick from an area larger than required repair to provide space to tie in newly constructed masonry work.
  - Place and fine grade subbase according to design documents, if available.
  - If design documents are not available, match depth of the surrounding subbase.
  - If there is existing geotextile in the area of the repair, install geotextile fabric at appropriate depth to match existing elements by excavating soil and keying geotextile into edges of excavated area.
  - Mix mortar or prepare masonry adhesive and plan placement of selected stones/bricks prior to installation.
  - Apply mortar or adhesive according to the designed aesthetic and required structural strength according to manufacturer's specifications.
  - Place stone, brick, or paver material to match existing surfaces.
  - Remove excess mortar or adhesive.
- **To repair small divots in pervious or conventional asphalt, where damage is smaller than 50 ft^2. and comprising less than 10% of the total pavement surface:**
  - Cut the damaged areas with an asphalt cutting blade on a masonry saw, and remove material down to the

base stone course.

- Fill cut hole with conventional asphalt cold patch and pack with a hand tamper.
- Seal patched seams with acrylic sealant consistent with manufacturer's specifications.
- Block repaired area from pedestrian or vehicular traffic.

- **To construct drainage modifications to redirect gutter flow into green inlets offset from curb edges:**
    - Clean the surface where the between the inlet and the curb and allow to dry.
    - Apply cold patch on a downward angle from the curb toward the edge of inlet without interfering with grate approximately 2-2.5 in. thick to direct runoff into the drain.
    - Tamp very firmly with hand tamper and club hammer.
    - Allow cold patch to set per manufacturer's recommendation for current conditions.
    - Seal edges of cold patch with asphalt sealer consistent with manufacturer's specifications.

2.1.4 SETTLING REPAIR

1. Description
    - This section sets forth procedures and requirements for the repair of minor to moderately settled areas.
2. Applicability and Requirements
    - If area is unstable, STOP maintenance and immediately contact the owner/operator.
3. Standard Operating Procedure
    - **If settling has created a visible depression or a sinkhole in the SMP surface:**
        - Remove material over the settled area to access any subsurface voids.
        - Saw cut and jackhammer any settled asphalt or concrete and dispose of this material at an approved off-site location.
        - Remove pavers or stone by hand and set aside.
        - Dig herbaceous plants, shrubs, and small trees less than 3 in. diameter-breast-height (DBH) and set aside, avoiding root damage.
        - Remove turf and associated top soil.
        - Clear around settled area and excavate using hand tools to the bottom of the depression/void space.
        - Fill excavated area with clean fill material (2A Modified subbase or as specified by the owner/operator) and compact with a hand tamper.
        - For softscape areas, cover excavation with top soil or planting soil mix to match existing planting medium and grade.
        - Replace mulching (see Section 2.2.6).
        - Replant or reseed bare areas of soil (see Section 2.2.8 and 2.2.9).
        - For hardscaped areas, replace hardscape subbase and surface over repaired area to match existing grade.
        - Replace any damaged or disturbed pavers, asphalt,

concrete, or stone (see Section 2.1.3).

- **If minor settling extends beneath hardscape areas but has not created a visible depression or sinkhole in the hardscape (e.g., voids beneath sidewalks or walkways) (See FIgure 2-5):**
    - Pack void area with 2A Modified subbase using a shovel, pry bar, or hand tamp as needed.
    - Replace soil using topsoil as needed at the interface of the repair.

Figure 2-5. Example of Settling in a Tree Pit

2.1.5 GRAFFITI REMOVAL

1. Description
    - This section sets forth procedures and requirements for graffiti removal.
2. Standard Operating Procedure
    - **Remove spray paint and similar materials (e.g., permanent makers, polishes, etc.) from concrete and masonry materials and metal surfaces:**
        - Protect all surrounding areas (including plants and soil/mulch) with tarp.
        - Pressure wash surface.
        - Apply chemical graffiti removal solvent as per manufacturer specifications.
        - Scrub surface with metal or plastic brush.
        - Wipe away graffiti removal solvent with rags.
        - Pressure wash or rinse surface clean.
        - Repeat as needed until graffiti is removed.
        - If applicable, repaint surface as per the owner/operator’s specifications (see Section 2.1.6).
    - **Remove sticker-based graffiti from metal or other smooth surfaces:**
        - Remove sticker from surface by holding utility knife at a low angle relative to the surface to prevent scratching of the surface.

2.1.6 PAINTING

1. Description
   - This section sets forth procedures and requirements for painting.
2. Applicability and Requirements
   - Follow product manufacturers' instructions and recommendations for paint application. Most paint requires temperatures to be above 50° F.
   - Do not paint if precipitation is forecasted for within 48 hr. of effort.
3. Standard Operating Procedure
   - Drape all surrounding areas (including plants and soil/mulch) with tarp or paint cloth.
   - Remove existing loose paint, corrosion, and/or deposits from painting surface.
   - Tape all non-soil edges.
   - Without disturbing vegetation, dig soil away from painting surface to maximize paintable area and minimize visible non-painted areas.
   - Apply primer per manufacturing recommendations.
   - Apply paint, paint color should match existing color unless otherwise specified by the owner/operator.
   - Install wet paint signs and temporary barriers.
   - Remove wet paint signs and temporary barriers after manufacturer-specified drying time.

2.1.7 HARDWARE CARE

1. Description
   - This section sets forth procedures and requirements for general care of hardware:
     - Clean and lubricate bolts.
     - Extract and replace broken bolts.
     - Replace missing or damaged appurtenances.
     - Replace missing or damaged safety bars for concrete end walls and outfalls larger than 8 in. diameter.
2. Standard Operating Procedure
   - **Cleaning and lubricating of nuts and bolts:**
     - Remove nuts and bolts from the associated structure.
     - Wipe any grit or other debris and clean threading.
     - Carefully and accurately spray nuts and bolts with material-appropriate lubricant.
     - Replace nuts and bolts, careful to not cross thread, within the associated structure.
       - See broken or seized bolt extraction.
   - **Cleaning and lubricating of locks:**
     - Wipe any grit or other debris and clean shackle.
     - Carefully and accurately spray locking mechanism.
   - **Broken or seized bolt extraction:**
     - Drill out bolt completely with a hardened alloy bit (same diameter as bolt shaft).

  - Rethread bolt hole with tap and die set.
  - Grease new bolt and insert, careful to not cross-thread.
  - Avoid mixing metals (e.g., stainless steel, iron, or aluminum) as this can lead to corrosion and binding.
- **Replace missing or damaged appurtenances:**
  - Replace rods, washers, bolts, caps and gaskets with equivalent hardware.
- **Replace missing or damaged safety bars:**
    - Remove debris from unsecured endwall and outfall openings consistent with procedures set forth in Section 2.1.1.
  - **To install hinged metal grate over headwall and endwall openings where pipe diameter is greater than 8 in.:**
    - Measure and mark off hinge fastener locations on concrete headwalls or endwalls. Hinge fasteners must be located on one side of the grate to allow the structure to open outward away from the structure. Lock attachment fittings must be located opposite the hinges or according to manufacturer's specifications.
    - Using a hammer drill and concrete drill bit of appropriate size, pre-drill holes for fasteners in the concrete.
    - Use the shop vacuum with small crevice tool to blow the dust out of holes.
    - If necessary, paint the grate and allow to dry.
    - Fasten the grate hinges and lock attachment fittings to the wall using the concrete bolts and pre-drilled holes or threaded stock and adhesive with washers and nuts.
    - Close and lock grate.
  - **To install unhinged metal grate using steel flat stock to endwall openings where pipe diameter is greater than 8 in.:**
    - Measure, mark and cut steel bars to appropriate lengths.
    - Drill holes in steel bars at ends and at points of intersection to match the diameters of fasteners to be used.
    - Mark locations of end holes onto the concrete endwall.
    - Use appropriate size masonry bits and hammer drill to create holes in endwall.
    - Use the shop vacuum with small crevice tool to blow the dust out of holes.
    - Insert adhesive and threaded stock into holes and allow to set.
    - Install bolts and nuts as required to secure bars at points of intersection.
    - Use washers as needed to close gaps under outer bars at points of attachment to threaded stock.
    - Use washers, thread locker and nuts to secure assembled grate to the concrete endwall.

2.1.8 WINTERIZATION

1. Description

- This section sets forth procedures and requirements for winterization, including:
    - Clean and lubricate bolts and locks.
    - Drain, clean, and close cisterns and irrigation systems.
    - Place traffic bollards.
    - Drain irrigation system.

2. Standard Operating Procedure

- **Clean and lubricate bolts consistent with procedures in Section 2.1.7.**
- **Drain, clean, and seal any surface cisterns, tanks, and rain barrels or any subsurface storage systems that are located above the frost line in the fall:**
    - Remove standing water using approved vacuum cleaning (see Section 3.1) and decanting and waste disposal protocols (see Section 3.2 and 3.3).
    - Disinfect and rinse storage areas using approved non-toxic disinfectant, and dispose of waste material using approved decanting and waste disposal protocols (see Section 3.2 and 3.3).
    - Close inflow valves as needed to maintain dry conditions within the cistern or rain barrel.
- **For stormwater bump-outs and other structures that include detachable traffic delineators, install bollard elements in the fall:**
    - Wipe any grit or other debris and clean threading in bollard base.
    - Spray base carefully and accurately with material-appropriate lubricant.
    - Place bollard within the associated base.
- **Drain and seal any irrigation systems that are located above the frost line:**
    - Remove any attachments, stakes, and removable watering heads and store in a dry place.
    - Close inflow valves, including surface-accessible downspout attachments, and drain standing water from inflow pipes as applicable.
    - Clean any filters and screens.
    - Using an air compressor, force any remaining water from the irrigation pipes for approximately 5 minutes.

Table 2-1. Recommended Equipment for Surface General Maintenance

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Angle grinder with cutting wheels and grinding wheels			•				•	
Axe	•							
Backflow preventer(s) and associated appurtenances		•	•		•	•		
Backhoe	•							
Bolt cutters			•				•	•
Buckets or tub		•	•		•	•		
Chainsaw	•							
Chipper trailer type, either disc or drum. Minimum 12 knives.	•							
Chisel		•	•				•	•
Club hammer			•					
Concrete cut-off saw			•	•				
Concrete mixing tray		•	•					
Cordless drills and batteries							•	
Crowbar			•	•			•	•
Digging bar	•							

Table 2-1. Recommended Equipment for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Drill bits (assorted concrete)							•	
Dust pan and brush	•							
Electric jackhammer				•				
Extension cord(s)				•				
Fire hydrant center compression lock		•	•		•	•		
Fire hydrant wrench		•	•		•	•		
Float		•	•					
Generator				•			•	
Graffiti remover applicator					•			
Hammer		•						
Hand tamper		•	•	•				
High-pressure sprayer/hose	•				•			
Hoe		•						
Hose spray nozzles and appurtenances		•	•		•	•		
Ladder					•	•		

Table 2-1. Recommended Equipment for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Laser level, standard level(s) (Torpedo, 2 foot, 4 foot);				•				
Leaf blower	•	•						
Line level		•	•					
Mallet		•					•	•
Manhole hooks	•						•	•
Mason line			•					
Masonry chisel set and stone hammer		•	•					
Masonry tools for mixing and finishing concrete and mortar		•	•					
Masonry trowel			•					
Metal or plastic brush	•				•		•	•
Mini excavator	•							
Paint brushes and/or paint roller						•		
Paint scraper, sander, or stripper			•		•	•		
Pick mattock	•							
Pliers, adjustable wrenches, vice grips, and pipe wrenches	•						•	•

Table 2-1. Recommended Equipment for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Pump (handheld)	•							
Push broom with firm bristles	•							
Rakes (assorted)	•	•		•			•	
Rotary/hammer drill (high speed)							•	
Saw to cut lumber for forms		•						
Screwdrivers, phillips and standard	•						•	•
Scrub brush with fine bristles	•							
Shovels (assorted)	•	•		•			•	
Socket wrenches, sets of metric and standard	•						•	•
Spade	•	•		•				
Stakes		•	•					
Tap and die set with clamp							•	
Tarp or other receptacle	•	•	•	•	•			
Trash claw	•						•	
Utility blade		•	•	•	•	•	•	

Table 2-1. Recommended Equipment for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Water hose of sufficient strength to withstand kinking and abrasion		•	•		•	•		
Water tank (250 gal. minimum), hose with appropriate nozzles, and truck of sufficient capacity to support a water tank		•	•		•	•		
Wheelbarrow or push cart	•	•	•	•				

Table 2-2. Recommended Materials for Surface General Maintenance

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
1,000 lb. test rope	•							
50 gal. plastic contractor bags	•	•	•	•	•	•	•	•
Acrylic crack sealant			•					
All-purpose cleaner	•		•		•	•	•	
All-purpose rags	•		•		•	•	•	•
Appropriate replacement appurtenances (e.g., bolts, screws, caps, etc.). Ask Owner/Operator or manufacturer specifications							•	
Asphalt cold patch			•					
Assorted concrete anchors/bolts or threaded studs							•	
Assorted washers and nuts to fit threaded stock							•	
Bagged concrete mix		•	•					
Bagged Portland cement		•	•					
Biodegradable degreasing agent							•	
Biodegradable erosion blanket (North American Green® NAG-C125BN or SC-150BN or equivalent)		•						

Table 2-2. Recommended Materials for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Clean sand with a high clay content				•				
Concrete cold patch			•					
Disinfectant (e.g., bleach, pine oil, or other householder disinfectant liquids).								•
Flat black exterior spray paint for steel							•	
Graffiti remover solvent for different surface types					•			
High strength masonry adhesive (epoxy)		•	•				•	
Hinged metal grate or rack with openings between 6-8 in.							•	
KBI Flexi®-Pave			•					
Landscape edging or edge barrier with a subsurface depth of 1-2 ft. made of rust-resistant metal or plastic				•				
Large paper bags, 30 gal.								•
Lock attachment fittings							•	
Lumber, stakes and nails to make concrete forms		•	•					

Table 2-2. Recommended Materials for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Maintenance Map	•	•	•	•	•	•	•	•
Material Safety Data Sheets (MSDS) as applicable	•		•		•	•	•	•
Mulch material; Licorice bark mulch if available, shredded hardwood bark mulch (see Section 2.2.4)	•			•				
Nonwoven geotextile fabric and staples		•	•					
Paint and primer as per owner/ operator specifications					•	•		
Painting tape					•	•		
Permits and access permissions	•	•	•	•	•	•	•	•
Porous asphalt			•					
Porous concrete			•					
Potable municipal or well water and/or harvested rainwater sufficient for watering and cleaning activities, as required			•		•			
Re-sealable plastic bags – 1 or 2 gal.								•
Sand		•	•					

Table 2-2. Recommended Materials for Surface General Maintenance (cont'd)

	TRASH, SEDIMENT, & ORGANIC DEBRIS REMOVAL	EROSION CONTROL/ REPAIR	CONCRETE PAVEMENT, MASONRY REPAIR & MODIFICATION	SETTLING REPAIR	GRAFFITI REMOVAL	PAINTING	HARDWARE CARE	WINTERIZATION
	2.1.1	2.1.2	2.1.3	2.1.4	2.1.5	2.1.6	2.1.7	2.1.8
Sandpaper, various grades			•					
Sikadur® hairline crack sealant or equivalent			•					
Stone dust/screenings		•						
Stone, various sizes (including clean fill 2A modified)		•	•	•				
Thread locker							•	
Top soil	•	•		•				
Various pavers		•	•	•				
Water (potable or non-potable)	•	•	•					
Waterproof lock							•	
White lithium grease or equivalent metal-to-metal lubricant and rust protector							•	•
Woven geotextile		•	•	•				

Vegetation Maintenance

division 2.2

2.2 VEGETATION MAINTENANCE TASKS

2.2.1 WEED CONTROL

1. Description
   - This section describes the procedures and requirements of weed control using mechanical and chemical methods:
     - Mechanical:
       - Hand pulling herbaceous and woody weeds
     - Chemical including:
       - Cut stem treatments
       - Foliar treatments
       - Basal bark treatments
       - Pre-emergent treatments
   - For the purpose of this section weeds are defined as:
     - Plants listed on the Pennsylvania Department of Conservation and Natural Resources Invasive Plant List
     - Plants listed by the United States Department of Agriculture as a Federal Noxious Weed
     - Volunteer species that do not fit within the aesthetic of the SMP, as defined by the owner/operator

2. Applicability and Requirements
   - Chemical vegetation control shall be performed during periods of dry weather (not within 24 hrs. of a prior or expected rain event) with little or no wind.
   - Foliar treatments shall not be performed in temperatures below 60°F and periods of high wind.
   - Cut stem and basal bark treatments shall not be performed in temperatures below freezing (32°F).
   - For herbicide application, submit the following information to the owner/operator within 24 hrs.:
     - Date of application, and for herbicides specifying a reentry period, the hour of completion
     - Name and address of the application site (commercial applicators must also record the name and address of the customer if it differs from the application site)
     - The brand name, Environmental Protection Agency (EPA) registration number, amount, and rate or dosage of each herbicide used
     - Size and identification of the area treated
     - Names and certification numbers of all persons involved with the application
     - Application records must also include restricted reentry interval and vegetation treated
   - All herbicides shall be applied per label-specific safety instructions and manufacturer's directions.
   - Personnel shall comply with directions on all herbicide label sheets, Material Safety Data Sheets (MSDS) sheets, other applicable sources, and all applicable codes and regulations.
   - Notify anyone listed on the Pennsylvania Pesticide Hypersensitivity Registry whose location is within 500 ft. of an herbicide application site not more than 12 hrs. in advance, but less than 72 hrs. prior to application. Notification must be made via email, a telephone answering device, or by contact with an adult by dialing any of the listed telephone numbers.
   - Include the following in the hypersensitivity notification

information: date, time, location of application, EPA registration number, brand name, common name of active ingredients of herbicide(s) that may be used, business name, business phone number, and a copy of the label if requested.

- Personnel performing chemical weed control shall include at a minimum:
    - A Pennsylvania Certified Pesticide Applicator or Registered Technician who is under the supervision of a Pennsylvania Certified Pesticide Applicator that can be on site within 5 hrs. if necessary.
    - A Noncertified Applicator under the direct supervision of a Pennsylvania Certified Pesticide Applicator who is physically present and within sight of the application.
- Chemical control in aquatic environments must be conducted with a permit from the PA Fish and Boat commission.

3. Standard Operating Procedure

- **Select appropriate method weed control (See Table 2-3 for species-specific best practices for weed control).**
- **Hand pulling of mature annual and tap-rooted herbaceous plants and tree seedlings:**
    - If necessary, use a shovel or spade to loosen the soil surrounding plant root mass.
    - Remove entire plant including root mass to prevent re-sprouting.
    - Shake soil of plant roots.
    - Using a shovel or rake, smooth the surrounding soil to fill in the remaining hole and cover with shredded hardwood or root mulch consistent with procedures in Section 2.2.6.
    - Properly bag and dispose of the plant material in approved location off site. Ensure that no plant pieces remain on site.
- **Hand pulling of aquatic weeds:**
    - In areas of intentional continuous ponding, remove aquatic weeds using an aquatic weed rake.
    - Properly bag dispose of the plant material in an approved location off site. Ensure that no plant pieces remain on site.
- **General chemical control procedure:**
    - Provide the necessary notifications, as applicable (See Applicability and Requirements):
    - Prepare herbicide solution as per manufacturer's specifications prior to arriving on site.
    - Apply the herbicide according to manufacturer's instructions and recommended safety procedures:
        - To minimize risk of herbicide spillage, open containers are not to be used on the site during the application process.
        - In the event that herbicide is spilled, follow appropriate safety protocols for cleanup and notification of appropriate parties (See Pesticide Safety Fact Sheet: How to Handle Chemical Spills, Penn State College of Agricultural Sciences Document UO229).
        - Use caution to keep herbicide agents from spreading to other areas.
        - Follow manufacturer and safety specifications for pesticide clean-up and disposal.

- **Procedures for specific chemical treatments:**
    - **Cut stem treatments:**
        - Horizontally cut stems at or near ground level.
        - All cuts shall be level, smooth, and free of debris.
        - Immediately apply appropriate translocated herbicide (see Table 2-4) to the outer 20% (cambial area) of the stump.
    - **Foliar treatments:**
        - Apply appropriate translocated or contact herbicide (see Table 2-4) using a low pressure (20-50 psi) backpack sprayer at rates of one gallon or less per minute, equipped with a flat spray tip or adjustable cone nozzle.
        - Apply herbicide to leaves and stems of target plants using a consistent back and forth motion to ensure that herbicide has fully covered foliage, but not to the point of run-off.
        - Allow herbicide treatments to dry for at least 3 hrs. at an air temperature above 60° F to ensure adequate absorption and translocation.
        - In areas that receive significant public use, it may be necessary to close off the treatment area until the herbicide has completely dried. Need for area closures shall be determined prior to application and reviewed/approved by the owner/operator.
    - **Basal bark treatments:**
        - Apply herbicide with a backpack sprayer using low pressure (20-40 psi) with a straight stream or flat fan tip.
        - To control vegetation with a basal stem diameter of less than 3 in. apply a translocated herbicide-oil mixture on one side of the basal stem to a height of 6 in. from the base; within an hour the mixture must almost encircle the stem.
        - For stems greater than 3 in. basal diameter or with thick bark, treat both sides of the stem to a basal height of 12-24 in.
    - **Pre-emergent treatments:**
        - Apply pre-emergent herbicide early spring, late summer or early fall; or immediately following cultivation.
        - Thoroughly remove weed residues, prunings and debris prior to treatment.
        - Apply pre-emergent herbicide in granular form using a small handheld spreader, or in liquid form using a hand-held or backpack sprayer.
        - Apply evenly to bare soil, avoiding any areas seeded with non-weed species.
        - Following application of granular herbicide, apply approximately 1/4 in. or more of water evenly across treatment area (manual watering or rainfall is acceptable).
        - Do not apply more than 600 lbs. per acre within a 12-month period.

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Norway maple	*Acer platanoides*	Tree	Hand pulling of seedlings; Cutting of saplings	Monthly	Saplings can be cut multiple times to weaken and kill plant.
Tree of Heaven	*Ailanthus altissima*	Tree	Hand pulling of seedlings; Digging & removal of saplings	Monthly	Control with glyphosate or triclopyr for larger trees or major invasions. (Foliar, basal bark or cut stump applications, depending on time of year).
Akebia	*Akebia quinata*	Vine	Hand pulling of seedlings; Cutting & herbicide application to stumps	Monthly	
Mimosa	*Albizia julibrissin*	Tree	Hand pulling of seedlings; Cutting & herbicide application to sapling stumps	Monthly	Remove before flowering for optimal effectiveness.
Garlic mustard	*Alliaria petiolata*	Herbaceous	Hand pulling	Monthly	Biannual; conduct manual and mechanical removal over 5 years effective for eradication. Removal more effective before flowering.
Foxtail (meadow)	*Alopecurus pratensis*	Grass	Hand pulling	Monthly	Hand pull in early spring to prevent seed set.
Porcelainberry	*Ampelopsis brevipedunculata*	Vine	Hand pulling	Monthly	Hand pull before flower and fruit set.
			Cutting and herbicide application to stumps	Monthly, Sept- Oct.	Glyphosate can be applied to cut stumps in the fall for eradication
Japanese barberry	*Berberis thunbergii*	Shrub	Hand pulling of seedlings	Monthly	Pull before flower and fruit set

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Paper mulberry	*Broussonetia papyrifera*	Tree	Hand pulling of seedlings	Monthly	Glyphosate or triclopyr can be used on cut stumps for complete eradication.
			Cutting and herbicide application to stumps		
Fanwort	*Cabonba caroliniana*	Submerged aquatic	Chemical control with approved aquatic herbicide	Monthly	
Marijuana**	*Cannabis sativa*	Herbaceous	Hand pulling for light infestation	Monthly, May –Sept.	Glyphosate can be use in nonselective locations.
			Foliar herbicide application for larger infestation		2,4-D can be used when target grassy species are present.
Musk thistle**	*Cardus nutans*	Herbaceous	Hand pulling for light infestation	Monthly	Bag and dispose of plants, especially flower sand seed heads.
			Foliar herbicide application for severe infestation	Monthly, Apr - Oct	Apply foliar treatment at rosette stage prior to flowering. Glyphosate can be used. Large infestations of musk thistle require selective herbicides, but 2,4-D is only minimally effective by itself. Clopyralid or a blend of clopyralid and 2,4-D is typically more effective.
Oriental bittersweet	*Celastrus orbiculata*	Vine	Hand pulling of seedlings	Monthly	Glyphosate or triclopyr can be used on cut stumps for complete eradication.
			Cutting and herbicide application to stumps		
Chara	*Chara spp.*	Algae	Hand pulling and raking	Monthly	Remove and dispose all parts of plant off-site to prevent re-establishment.

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Canadian thistle**	*Cirsium arvense*	Herbaceous	Mechanical removal for light infestation	Monthly, May - June	Mow down before flowering.
			Foliar herbicide application for severe infestation	June and Sept.	2, 4-D can be used as post emergent herbicide application after basal rosette stage in spring; glyphosate or aminopyralid can be used in fall to kill plant.
Bull thistle**	*Cirsium vulgare*	Herbaceous	Mechanical removal for light infestation	Monthly	Sever root below the crown with a shovel or spade because plant is a tapped rooted species
			Foliar application for severe infestation	Monthly, June-Sept.	Apply foliar treatment at rosette stage prior to flowering. Glyphosate can be used.
Blue green algae	*Cyanobacteria*	Algae	Manual removal by surface skimming	Monthly	Physical control can be implemented by increasing aeration by the owner/operator. Chemical control must be conducted with care as massive algae kill can release large quantities of toxins into water.
Nutsedge	*Cyperus spp.*	Grass	Hand pulling or mowing	Monthly	Pro Sedge® specifically targets nutsedge.
			Foliar herbicide application for severe infestation		
Jimsonweed**	*Datura stramonium*	Herbaceous	Hand pulling	Monthly, June-Sept.	Wear protective clothing; sap is toxic.
			Foliar herbicide spot application for larger plants		Glyphosate can be used in non-selective situations. 2,4-D can be used where desirable target grasses are present.

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Diymo	*Didymosphenia geminata*	Algae	Manual removal with net	Monthly	Check equipment for contamination; bag refuse and dispose in approved location. Clean non-absorbent items with a 2% solution of bleach and let soak for 20 min. Clean absorbent items by soaking in 113°F plus hot water for 40 min. or freeze solid.
Crabgrass	*Digitaria sanguinalis*	Grass	Hand pulling or mowing	Monthly	Remove before seed set.
			Pre-emergent herbicide	Monthly, Mar. Apr.	Timing and correct rate of pre-emergent chemical are important for effectiveness; refer to manufacturer's instructions.
Russian olive	*Elaeagnus angustifolia*	Shrub	Hand pulling of seedlings	Monthly	
Autumn olive	*Elaeagnus umbellata*	Shrub	Hand pulling of seedlings	Monthly	
Burning bush	*Euonymous alatus*	Shrub	Hand pulling of seedlings	Monthly	
Goatsrue**	*Galega officinalis*	Herbaceous	Hand puling of seedlings	Monthly	Hand pulling is only effective for seedlings.
			Foliar herbicide application	June - Oct.	Apply glyphosate at non-selective situations. 2,4-D can be used where desirable grasses are present. Chemical control must be conducted over 2 successive years for complete eradication.
English ivy	*Hedera helix*	Vine	Hand pulling of seedlings	Monthly	

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Giant hogweed**	*Hercleum mantegazzianum*	Herbaceous	Mechanical removal by digging out entire plant	Monthly	Wear protective clothing when handling as plant exudes sap which sensitizes skin to UV radiation.
			Foliar herbicide application for severe infestation	Monthly, June - July	Glyphosate or a combination of triclopyr and clopyralid can be used as a post emergent herbicide.
Water stargrass	*Heteranthera dubia*	Submerged aquatic	Mechanical control by raking or seining	Monthly	Remove all plant fragments and dispose off-site to prevent re-establishment.
Japanese hops	*Humulus japonicus*	Vine	Hand pulling	Monthly	
Hydrilla	*Hydrilla verticillata*	Submerged aquatic	Seasonal water drawdown and manual removal of tubers in the fall prior to regrowth in the spring for limited application.	Sept- Oct.	Chemical treatment is preferred for long-term management. Fluridone is used for large scale control.
Morning glory	*Ipomoea spp.*	Vine	Hand pulling	Monthly	
Privet (Chinese, Common, Japanese)	*Ligustrum spp.*	Shrub	Hand pulling of seedlings	Monthly	
Honeysuckle (Amur, Bell's, Japanese)	*Lonicera spp.*	Shrub	Hand pulling of seedlings	Monthly	
Floating primrose –willow	*Ludwigia peploides*	Emergent aquatic	Manual removal	Monthly	Remove and dispose of all plant parts at approved offsite location to prevent reintroduction by vegetative reproduction of remaining plant parts.

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Purple loosestrife**	*Lythrum salicaria*	Herbaceous	Hand pulling	Monthly	Remove entire plant at seedling stage; dispose off site at approved location.
			Spot foliar application with aquatic approved herbicide	Monthly, June – Sept.	Triclopyr is preferred in situations where desirable target grassy species are present.
White mulberry	*Morus alba*	Tree	Hand pulling of seedlings	Monthly	
Parrot feather*	*Myriophyllum aquaticum*	Submerged aquatic	Aquatic Herbicide	Monthly	Species spread vegetatively. Do not use manual or mechanical removal as it may spread plant parts. Consult a licensed aquatic herbicide applicator.
Eurasian watermilfoil*	*Myriophyllum spicatum*	Submerged aquatic	Manual control by raking in small scale infestations; all plant fragments must be removed.	Monthly, Apr –Sept.	Monitoring and prevention of are important because it is difficult to control once established. Fluridone is an effective chemical treatment.
Yellow floating heart	*Nymphoides peltata*	Floating aquatic	Hand raking	Monthly	Rake and remove of all plant parts because plant can reproduce from stem and root parts.
Princess tree	*Paulownia tomentosa*	Tree	Hand pulling of seedling	Monthly	
Bristled knotweed	*Persicaria longiset*	Herbaceous	Cut down	Monthly	Do not pull as it can lead to erosion.
Common reed	*Phragmites australis*	Grass	Hand pulling or mowing	Late July	
			Foliar herbicide application for severe infestations	Sept.	Use glyphosate herbicide to eradicate large areas of infestation.

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Mile-a-minute**	*Polygonum perfoliatum*	Vine	Hand pulling	Monthly, Apr- Sept.	Wear protective clothing to guard against spines.
			Pre and post emergence herbicide application	Feb.-Mar; Jun-July	Pendimethalin can be used for effective for pre-emergent application; Glyphosate or triclopyr can be used for post-emergent application.
Curly-leaf pondweed*	*Potamogeton crispus*	Submerged aquatic	Mechanical removal	Monthly	Cut, rake and remove all plant parts.
Kudzu**	*Pueraria montana*	Vine	Foliar herbicide application for severe infestations	Monthly, June –Oct.	Clopyralid can be used for effective post emergent control.
Lesser celandine	*Ranunculus ficaria*	Herbaceous	Hand pulling or mechanical removal by digging with a trowel for small infestation.	Monthly	Take care to prevent leaving large bare spots if removing mechanically near riparian areas to prevent soil erosion. Remove all tubers to prevent re-establishment.
			Foliar herbicide application	Monthly, March-May	Use aquatic safe herbicide near riparian areas.
Poison ivy	*Rhus toxicodendron*	Vine	Hand pulling of seedlings Cutting of large plants	Monthly	Wear protective clothing to guard against toxic urisols. Never burn plants.
Multiflora rose**	*Rosa multiflora*	Shrub	Hand pulling of seedlings Foliar herbicide application	Monthly	Use triclopyr for selective removal where desirable grass species are present.
Foxtail	*Setaria spp.*	Grass	Hand pulling	Monthly	Conduct manual removal in early spring to prevent seed set.

Table 2-3. Weed Management for Noxious and Invasive Plants of Pennsylvania (cont'd)

COMMON NAME	SCIENTIFIC NAME	PLANT TYPE	PREFERRED TREATMENT	SCHEDULE	COMMENTS
Shattercane**	*Sorghum bicolor*	Grass	Hand pulling for light infestation	June	Glyphosate is effective chemical control, may require several years of application to completely eradicate.
			Foliar herbicide application for severe infestation	Monthly	
Johnsongrass**	*Sorghum halepense*	Grass	Hand pulling for light infestation	June	Glyphosate is effective chemical control, may require several years of application to completely eradicate.
			Foliar herbicide application for severe infestation	Monthly	
Water chestnut*	*Trapa natans*	Floating aquatic	For small scale infestation, manual removal is preferred before plants go into flower and set seed.	Monthly, June – Sept.	Chemical control is no longer widely used but the herbicide 2,4- D has been shown to be effective.
Cattail	*Typha spp.*	Grass	Mechanical removal by cutting	Monthly	Cut below water line.
Filamentous algae	*Various filamentous spp.*	Algae	Manual removal	Monthly	Rake or sein with aquatic rake.
			Organic chemical control		Barley straw effective as organic control if added prior to growing season to prevent establishment.
Wild grape	*Vitis spp.*	Vine	Hand pull seedling	Monthly	

* Aggressive, invasive species

** Pennsylvania Noxious Weed

Table 2-4. Selection of Applicable Chemical Vegetation Control Methods

TREATMENT METHOD	COMMONLY USED HERBICIDE	SPECIES TREATED	TIMING
Basal bark treatment	Systemic chemical herbicides such as glyphosate (e.g., brand name Round-up PRODry®)	Small stands of woody species, including vines, with main stem diameter < 6-8 in. (e.g., Norway Maple [*Acer platanoides*] and Tree of Heaven [*Ailanthus altissima*])	Year round, when temperatures are between 32-80° F
Foliar treatment, non-selective	Systemic chemical herbicides such as glyphosate (e.g., brand name Round-up PRODry®)	Perennial, biennial, and annual herbaceous species, and woody species < 8 ft. tall (e.g., Japanese Knotweed [*Polygonum cuspidatum*], Common Reed [*Phragmites australis*])	After full leaf-out and before fall colors appear
	Contact herbicides such as perlargonic acid (e.g., brand name Scythe®), acetic acid, or clove oi (e.g., brand name Matran II®)	Biennial and annual herbaceous species, or perennial seedlings during the first year of growth (e.g., Ragweed [*Ambrosia artemisiifolia*], Lambsquarters [*Chenopodiumalbum*], Chickweed [*Stellariamedia*])	After full leaf-out and before fall colors appear
Foliar treatment, selective	2,4-D dicamba, mecoprop, carfentrazone, sulfentrazone	Broadleaf herbaceous species (e.g., Mugwort [*Artemisia* sp.], Plantain [*Plantago* sp.], Thisle [*Cirsium* sp and *Carduus* sp.])	Spring or fall, when air temperature is between 65 and 85° F
Cut stem treatment	Systemic chemical herbicides such as glyphosate (e.g., brand name Round-up PRODry®)	Large woody species with main stem diameter > 6-8 in. .(e.g., Norway Maple [*Acer platanoides*] and Tree of Heaven [*Ailanthus altissima*])	Late summer or fall
Pre-emergent treatment	Isoxaben, trifluralin, dinitroaniline (e.g., brand name Snapshot®)	Annual broadleaf and grass species, and perennials spread by seed (e.g., Foxtail (*Alopecurus* sp.), Japanese Stilt Grass (*Microstegium vimineum*)	Early spring prior to seed germination; late summer or early fall; or immediately following cultivation

2.2.2 MOWING AND STRING TRIMMING

1. Description

    - This section describes the procedures and requirements for mowing and string trimming including: warm season/ wildflower meadows, cool season meadows, and turf.

2. Applicability and Requirements

    - Where mowing cannot be performed due to slope or terrain issues use a string-trimmer instead.
    - If mowing or string trimming of vegetation occurs during the spring and summer, special care should be taken to reduce potential impact to ground-nesting birds where applicable (in other words, prior to or after nesting season: April 15 – July 31).

3. Standard Operating Procedure

    - Refer to Tables 2.5-2.6 for species-specific mowing protocols for warm season and cool season grasses. For all other warm and cool weather species refer to the following protocols:
    - **Mowing warm season grasses:**
        - Mow established warm season/wildflower meadows to a height of 6-8 in. to discourage the establishment of woody species and to encourage the new growth of target grasses and forbs.
        - Use a flail-type mower or equivalent if possible to prevent burying of seedlings with mowed material.
        - When using a flail mower, mow perpendicular to the slope (up and down) and never parallel (along the contours) to any slope that is greater than 15 degrees.
        - Clippings are very finely chopped by a flail-type mower and so can be left in place without damaging plants.
        - If a flail-type mower cannot be used, a conventional tractor, hand held, or walk-behind mower may be used.
        - Walk-behind mowers, riding mowers, or tractors with brush hogs shall not be used on any slope greater than 15 degrees.
        - Rake and remove excess clippings and properly dispose of the plant material in an approved location off-site.
        - To avoid accidental damage, do not mow within 1 ft. of any tree or shrub. Instead, cut or remove plants by hand within the 1 ft. offset zone.
    - **Mowing cool season grass meadows:**
        - Mow cool season meadows to a height of 3-4 in. to discourage the growth of woody species and maintain height/aesthetic conditions as preferred by the owner/operator.
        - Use a handheld, tractor, or walk-behind mower.
        - Mow uniformly to the prescribed height without scalping or tearing the grasses.
        - To avoid accidental damage, do not mow within 1 ft. of any tree or shrub. Instead, cut or remove plants by hand within the 1 ft. offset zone.
        - Rake and remove excess clippings and dispose of the plant material in an approved location off-site.

- **String trimming:**
    - String trim herbaceous vegetation to approximately 4-6 in. above the ground surface.
    - To avoid accidental damage, do not string-trim within 1 ft. of any tree or shrub. Instead, cut vegetation with garden scissors or remove plants by hand within the 1 ft. offset zone.
    - Maintain an even level of string-trimmed vegetation to create a neat and tidy appearance.
    - Rake and properly dispose of the plant material in an approved location off site.

Table 2-5. Mowing Protocols for Cool Season Grasses

COMMON NAME	SCIENTIFIC NAME	MOWING REGIME	MOWING SCHEDULE	COMMENTS
Kentucky Bluegrass	*Poa pratensis*	Mow to 1 ½ to 2 ½ in. height. Mow to above 2 in. in warmer weather above 85°F.	Monthly from May to October	Sensitive to low mowing height. Perform best when grown in well-drained soils, in an open, sunny condition.
Rough Bentgrass	*Poa trivalis*	Mow to height of 1 ½ to 2 ½ in.	Monthly from May to October	Shade-tolerant, prefers moist soils.
Perennial Ryegrass	*Lolium perenne*	Mow to height of 1 ½ to 2 ½ in.	Monthly from May to October	Wear and heat tolerant.
Fine Fescues spp.	*Festuca spp.*	Mow to height of 2 ½ in. or higher.	Bimonthly from May to October	Tolerates low soil fertility, low pH, drought and shady.
Tall Fescue	*Festuca arundiancae*	Mow to height of 2-3 in.	Monthly from May to October	Drought and heat tolerant.
Bentgrasses	*Argrostis spp.*	Mow to 3/16 to ¾ in.	Monthly from May to October	Cold and heat tolerant, but moderately wear and drought tolerant.

Table 2-6. Mowing Protocols for Warm Season Grasses

COMMON NAME	SCIENTIFIC NAME	MOWING REGIME	MOWING SCHEDULE	COMMENTS
Big Bluestem	*Andropogon gerardii*	Remove no more than the top 1/3 of growth	Annually in early spring	Tolerates hot weather and drought; grows best in moist, well-drained soils.
Little Bluestem	*Schizachyrium scoparium*	Remove no more than the top 1/3 of growth	Annually in early spring	Drought tolerant, prefers soil pH of 5.5 to 6.5.
Indiangrass	*Sorghastrum nutans*	Remove no more than the top 1/3 of growth	Annually in early spring	Moderately drought tolerant.
Sideoats Grama	*Bouteloua cutipendula*	Remove no more than the top 1/3 of growth	Annually in early spring	Moderately drought tolerant.
Purple Lovegrass	*Eragrostis spectablis*	Remove no more than the top 1/3 of growth	Annually in early spring	Highly drought tolerant. Can be left unmown in extremely dry situations.
Purpletop	*Tridens flavus*	Remove no more than the top 1/3 of growth	Annually in early spring	Does not tolerate accumulation of old leaf litter. Moderately shade tolerant. Adaptable to moist and dry-mesic conditions.
Prairie Dropseed	*Sporobolus heterolepis*	Remove no more than the top 1/3 of growth	Annually in early spring	Drought and heat tolerant.
Switchgrass	*Panicum virgatum*	Remove no more than the top 1/3 of growth	Annually in early spring	Drought and heat tolerant; adaptable to a wide variety of soil conditions.

2.2.3 DEAD AND DAMAGED VEGETATION REMOVAL

1. Description

- Procedures and requirements for the following types of vegetation removal are described in this section:
    - Removal of shrubs measuring over 5 ft. to the top of the crown
    - Removal of trees in unconstrained settings
    - Removal of herbaceous vegetation or shrubs

2. Applicability and Requirements

- If site constraints are such that the tree cannot be safely removed by maintenance personnel, a specialty tree removal service may be needed. Inform the owner/operator. Specialty tree removal is not included in this manual.
- Work must be performed consistent with the following standards:
    - International Society of Arboriculture (ISA)—All applicable standards
    - ANSI A300 (Part 9) – 2011 Tree Risk Assessment
    - OSHA Standard 1901.266: Logging Operations

3. Standard Operating Procedure

- **Large shrub removal:**
    - Use a handsaw or small chainsaw to cut through thick branches.
    - Using a digging spade and a digging fork, dig around the perimeter of the root zone to loosen and cut roots.
    - Cut through roots at the base of the stump with a garden mattock.
    - Use a digging spade and digging fork to dislodge the stump from ground. If a stump puller is available, securely clamp the stump in the puller's vice. Rock the stump puller back and forth until the stump loosens and can be pulled away from the earth completely.
    - Backfill excavated hole with surrounding soil and finish with mulch per Section 2.2.6.
- **Tree removal:**
    - Identify the expected fall line by observing the natural growth pattern and angle of the tree, check for and remove, if possible, obstacles within the escape routes and erect temporary barriers to warn pedestrians and vehicular traffic.
    - Remove all dead snags prior to felling, if practicable.
    - Select appropriate saw. Typically a hand saw may be used for cutting trees less than 4 in. DBH, but a small chain saw may be used in some cases to increase efficiency.
    - Select appropriate 1-cut or 2-cut (undercut) method to fell the tree, depending on size of crown and constraints in the surrounding area. The 2-cut method allows greater control of where the tree falls, but is difficult to implement on small trunks.
        - **One-cut method:**
            - Cut directly through the trunk with a single horizontal cut.
        - **Two-cut method (undercut) method:**

            - First, establish an undercut: Cut a 90-degree V-shaped notch into the side of the tree in the direction of intended fall. The undercut must be approximately one-third of the branch diameter in depth. The face of the notch must be equal to the depth of the notch. A rope may be used to secure the upper trunk to ensure that the tree falls in the right direction.
            - Second, establish a backcut: Cut approximately 2 in. higher than the deepest part of undercut and on the opposite side of the trunk. Never make the backcut lower than the undercut. Never cut through the undercut.
        - Cut the trunk and branches into pieces than can be easily carried, and remove and dispose of material at an approved off-site location.
    - Roots may be removed or left in the ground at the discretion of the owner/operator.
        - If roots are to be left in the ground:
            - Cut stump to an elevation flush with the ground surface.
        - If roots are to be removed:
            - Use a shovel, pick mattock and digging bar to reveal the roots around the stump. Cut roots with an axe or loppers.
            - Push the trunk to expose more roots; continue cutting and pushing until the trunk is uprooted.
            - Remove roots from the site.
    - Backfill with soil and cover with mulch and replant as needed (see Section 2.2.8 and 2.2.9).
- **Herbaceous Vegetation and Small Shrub Removal:**
    - Cut base of vegetation using a hand saw or pruners.
    - Dig out roots using a shovel, taking care not to disturb nearby plants.
    - Backfill area with top soil.
    - Apply mulch to match existing condition, consistent with Section 2.2.6.

2.2.4 PRUNING, THINNING, AND CUTTING BACK VEGETATION

1. Description

- This section sets forth procedures and requirements for trimming, pruning, and thinning woody and herbaceous plants to maintain health, including the following:
    - Non-structural pruning of trees and shrubs
    - Structural pruning of trees and shrubs
    - Cutting back of herbaceous species

2. Applicability and Requirements

- Trimming, pruning, and thinning shall be performed consistent with the latest revision of the ANSI A3OO (Part 1) -2008, “Tree, Shrub and other Woody Plant Maintenance-Standard Practices,” and ANSI Z-133.1-2006.
- All equipment to be used and all work to be performed must be in full compliance with the most current revision of the ANSI A-300 [Part 1] – 2008 and ANSI Z-133.1-2006 standards for tree care operations.
- Structural tree pruning work must be performed under the direction and on-site supervision of a Certified Arborist.
- The owner/operator shall make arrangements with the utility company for removal of any limbs or branches in conflict with of electrical distribution lines. Tree pruning near or within electrical wires shall only be conducted by a qualified line-clearance arborist. **Electric Utilities warn to keep 10 ft. from all Primary/Distribution Power Lines.** (See Figure 2-6).
- All pruning efforts should intend to protect clear sight lines, insure that branches and limbs are not impeding with street traffic, pedestrian traffic, or structures. Ideal clearances many not be practical in all cases, particularly for young trees.

3. Standard Operating Procedure

- **Pruning of shrubs and trees:**
    - **Non-structural pruning:**
        - Remove all dead, damaged, diseased, or dying branches.
        - Remove broken or cut branches back to the branch collar.
        - Remove low limbs as needed to maintain safe overhead and line of sight clearances for pedestrians and vehicles (Figures 2-7 and 2-8).
        - Use sharp, sterilized pruning tools.
        - Make clean even cut using proper tool for size of branch.
        - Carefully cut as close to the branch collar without cutting the branch collar. Preserve the branch collar for proper healing.
    - **Structural pruning:**
        - Structural pruning promotes proper growth habit and train the growth of young trees to achieve target clearances.
        - Do not remove more than 25% annually of total tree foliage or foliage of any single branch or limb when it is cut back to a lateral.
        - Elevate lower limbs:
            - The extent of elevation depends on the size, species, and location of tree.
            - Laterally prune (to a lateral large enough

to assume terminal role) only those limbs that are directly interfering with objects such as street lights, wires, buildings, utility poles, etc. or lines of sight.

- Remove all rubbing and crossing limbs.
- Perform structural pruning not more than once per year during winter dormancy if needed.
- Remove competing leaders, if tree is single-stemmed species.
- Use sharp sterilized pruning tools
- Make clean even cut using proper tool for size of branch.
- Carefully cut as close to the branch collar without cutting the branch collar. Preserve the branch collar for proper healing.
- For branches larger than 1.5 inches in diameter use the 3-cut method (Figure 2-9) or method approved of by Certified Arborist on site.
- Cut branches into pieces than can be easily carried, and remove and dispose of material at an approved off-site location.

- **Cutting back of herbaceous species:**
  - Trim plants, as needed, to maintain safe lines of sight for pedestrians, especially at intersections. A general rule at traffic triangles or other SMPs located at intersections is to keep the height of herbaceous vegetation no more than 4 ft from top of curb to top of vegetation.
  - Cut back dormant herbaceous species annually.
  - Use sharp sterilized pruning tools.
  - Make clean even cut using the proper tool.
  - Cut back herbaceous to a height of 3-5” above ground once in the spring.
  - Remove and dispose of material at an approved off-site location.

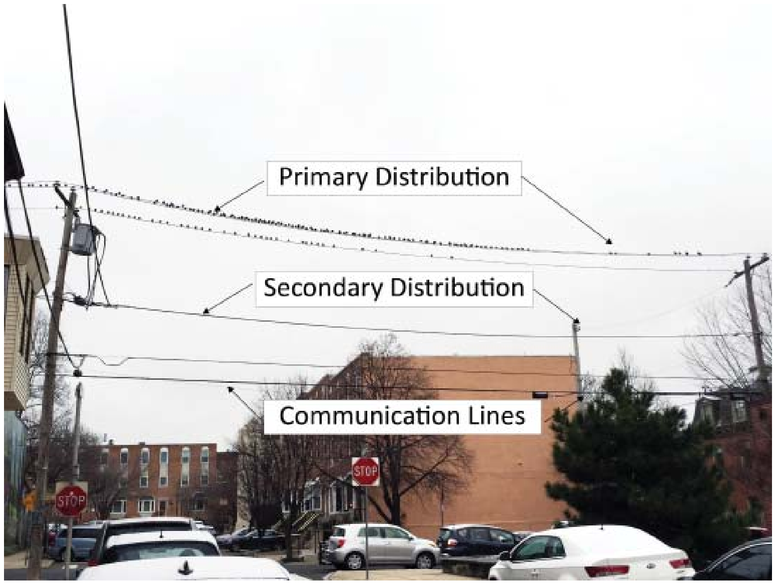


Figure 2-6. Common Electric Distribution Lines

Figure 2-7. Shrubs Pruned to Preserve Sight Lines.

Figure 2-8. Tree with Elevated Lower Limbs to Preserve Sight Lines.

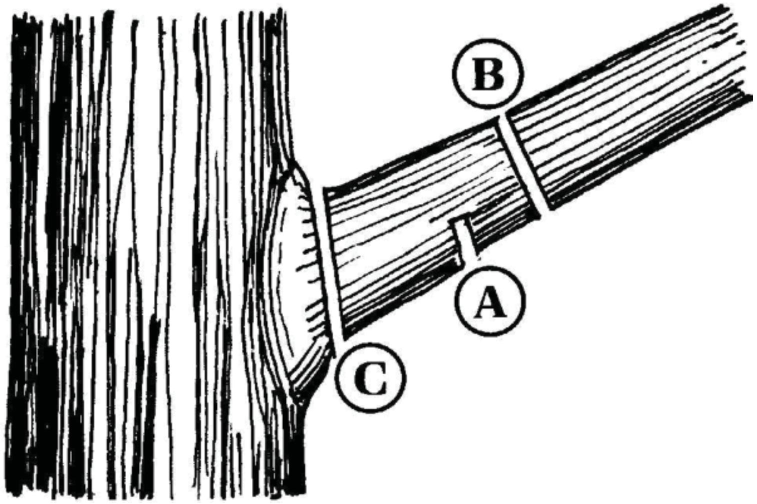


Figure 2-9. 3-Cut Method for Pruning.

Image Credit: Roswell Arborist.

2.2.5 PEST AND DISEASE MANAGEMENT

1. Description

- This section sets forth procedures and requirements for cultural, mechanical, biological, and/or natural chemical controls to manage pests and diseases, including:
    - Pest mammals
    - Pest insects and fungi

2. Applicability and Requirements

- Chemical pest control shall be performed during periods of dry weather (not more than 24 hrs. before or after a rain event) with little or no wind.
- Temperature restrictions may apply but vary by pesticide type (see Table 2-7).
- For pesticide application, submit the following information to the owner/operator within 24 hrs.:
    - Date of application, and for herbicides specifying a reentry period, the hour of completion;
    - Name and address of the application site (commercial applicators must also record the name and address of the customer if it differs from the application site);
    - The brand name, EPA registration number, amount, and rate or dosage of each pesticide used;
    - Size and identification of the area treated;
    - Names and certification numbers of all persons involved with the application; and
    - Application records must also include restricted reentry interval.
- All pesticides shall be applied per label-specific safety instructions and manufacturer's directions.
- Personnel shall comply with directions on all pesticide label sheets, Material Safety Data Sheets (MSDS) sheets, and other applicable sources, as well as all applicable codes and regulations.
- Notify anyone listed on the Pennsylvania Pesticide Hypersensitivity Registry whose location is within 500 ft. of a pesticide application site not less than 12 hrs. in advance, but not more than 72 hrs. prior to application. Notification must be made via e-mail, a telephone answering device, or by giving information to an adult contacted by dialing any of the listed telephone numbers.
- Include the following in the hypersensitivity notification information: date, time, location of application, EPA registration number, brand name, common name of active ingredients of the pesticide(s) that may be used, business name, BU number, business phone number, and a copy of the label if requested.
- Personnel performing pest and disease management shall include at a minimum:
    - A Pennsylvania Certified Pesticide Applicator or Registered Technician who is under the supervision of a Pennsylvania Certified Pesticide Applicator that can be on site within 5 hrs. if necessary; and
    - A Noncertified Applicator under the direct supervision of a Pennsylvania Certified Pesticide Applicator who is physically present and within sight of the application being made.

3. Standard Operating Procedure

- Determine the extent of infestation and damage, and select the most specific control for the pest to avoid harming beneficial organisms. Start with the least-toxic measures. See Table 2-7 for common pest and disease control methods.
- **Large animal carcass removal:**
  - Report the presence of large animal carcass to the owner/ operator.
  - Report large animal carcass to Philly311 or to the Philadelphia Streets Department (if located in a public street) for prompt removal.
- **Small animal carcass removal:**
  - Wear disposable gloves.
  - Use shovel(s) and rake(s) to collect and place the animal carcass in the trash bag.
  - Seal and dispose of the bag Clean tools with disinfectant solution (bleach, pine oil, or other householder disinfectant liquids).
  - If potable water is available, apply disinfectant solution to the tools and hose down.
- **Repair of animal burrows:**
  - Fill animal burrows with 2A modified stone, pack with hand tamp
  - Replace mulch as applicable(see Section 2.2.6);
- **Pest insects or fungi:**
  - Remove infected leaves, twigs, branches, needles, and cones around the base of trees and shrubs to remove disease reservoirs (see Section 2.2.4).
  - Apply appropriate pesticide (see Table 2-5):
  - Prepare pesticide solution as per manufacturer’s specifications prior to arriving on site.
  - Apply the pesticide according to manufacturer’s instructions and recommended safety procedures.
  - To minimize risk of pesticide spillage, do not use open containers on the site during the application process. In the event that the pesticide is spilled, follow appropriate safety protocols for cleanup and notification of appropriate parties.
  - Avoid introducing pesticide onto unaffected vegetation or areas of the plant that will not respond to treatment.
  - Follow manufacturer and safety specifications for pesticide clean-up and disposal.
  - For mosquito issues within inlets or catch basins, use Mosquito Dunks ® or the equivalent to treat areas of standing water.
  - Report wasp/hornet nests, roach, or animal infestations to the owner/operator and Philadelphia Health Department’s Vector Control Services (See Appendix) Table 2-5. Common Pest and Disease Control Methods.

Table 2-7. Common Pest and Disease Control Methods

PEST/DISEASE	TREATMENT	APPLICATION NOTES
Mites, aphids, whiteflies, and other soft-bodied insects as well as the softer nymph stages of some hard-bodied insects.	Insecticidal soap	Spray only on pests. Avoid hitting beneficial insects with the spray. Insecticidal soap must come in contact with the insects while it's still liquid. It has no effect after it dries on the plants. Caution: Insecticidal soap can burn some plant leaves. Test each type of plant before spraying entire plant.
	Narrow-range, or superior, horticultural spray oils (petroleum derivative), e.g., JMS Stylet Oil, Saf-T-Side Spray Oil, Sunspray Ultra-Fine Spray Oil; Plant-based oils, including those derived from garlic, neem, jojoba, cottonseed, and thyme.	Use "dormant" oils to kill insect pest eggs and disease spores on bare branches of trees and shrubs during the dormant season. To treat growing plants, use a lighter-weight horticultural oil. Lighter oils evaporate more quickly than dormant oils and are less likely to damage plants. Avoid use of oils at temperatures below freezing or above 90°F.
	Beneficial organisms	Application methods and timing vary by species and intended target.
Slugs	Slug baits with ferric (iron) phosphate as the active ingredient; Diatomaceous earth	Caution: Protection is needed against breathing diatomaceous dust.
Wasp/hornet nests; severe mosquito/ roach infestations	Report to owner/operator and to Philadelphia Vector Control Services: 215-685-9000	N/A
Minor mosquito infestations in inlets/structures	Mosquito Dunks® or equivalent	N/A
Powdery mildew	Horticultural oil, e.g. JMS Stylet Oil, Saf-T-Side Spray Oil, Sunspray Ultra-Fine Spray Oil; Plant-based oils, e.g. neem oil (Powdery Mildew Killer), jojoba oil (E-rase).	Do not apply an oil spray within 2 weeks of a sulfur spray, or it may injure plants. Do not apply oils when temperatures are above 90°F or to water-stressed plants.
	Wettable sulfurs that are specially formulated with surfactants , e.g., Safer Garden Fungicide	Do not apply within 2 weeks of an oil spray.
	Biological fungicides, e.g., Serenade	Helps prevent the powdery mildew from infecting the plant.
Mammals	Liquid repellent, e.g. Critter Ridder	Groundhogs will eat all parts of a plant, especially woody parts. Spray directly on plants susceptible to damage.
	Granular repellent, e.g., fox urine granules	Sprinkle granular repellent on the ground around problem areas (burrows, areas of herbivory).
	Removal of borrows	Fill burrows with crushed stone.

2.2.6 MULCHING

1. Description

    - This section sets forth procedures and requirements for mulch application and maintenance.

2. Standard Operating Procedure

    - **Mulch removal:**
        - Remove mulch from tree pit or SMP using rakes and shovels, taking care not to disturb vegetation. Mulch shall be disposed of at an off-site location.
    - **Mulch application:**
        - For newly planted landscaped beds, apply mulch throughout. For established landscaped beds aged 2 years or older, apply mulch to perimeter of landscaped beds. Do not apply mulch to SMPs where mulch may clog pretreatment devices, such as planters or bump-outs.
        - Apply a 2-3 in. thick layer of mulch extending from the edge of the tree pit or other SMP to a radius of 3 in. from the woody stem of each plant.
        - Add mulch until the mulched area is flush with the edge of pavement unless tree pit is covered by a grate or has fencing around the pit.
    - **Mulch maintenance:**
        - Rake mulch away from trunks and woody stems of shrubs to a distance of 3 in. using a rake taking care not to disturb vegetation.

2.2.7 SOIL MANAGEMENT

1. Description

    - This section sets forth procedures and requirements to maintain soil health and function, including:
        - Soil amendment
        - Decompaction of tree pit soil
        - Remediation of accumulated salt

2. Applicability and Requirements

    - Inorganic fertilizer is intentionally excluded from this section and shall not be used, unless specifically approved by the owner/operator for special circumstances.
    - Soil must meet the owner/operator’s requirements – fertile, natural soil, free from large stones, roots, sticks, clods, plants, peat, sod, pockets of course sand, pavement and building debris, glass, noxious weeds, invasive species, undesirable organisms and disease causing pathogens.
    - Soil shall be amended as required according to soil analysis, which may be completed or requested by the owner/ operator.

3. Standard Operating Procedure

    - **Application of soil amendments:**
        - Remove weeds and complete tree and shrub pruning before spreading soil amendments.
        - Spread soil amendments evenly over the target area, avoiding clumping or piling of material, and taking care not to injure target vegetation.
        - When applying amendments to vegetated areas,

spread by hand.

  - For turf areas, till soil amendments into existing soil with a mechanical tiller to a depth of 4 in.
  - Reseed disturbed area as needed (see Section 2.2.9).

- **Decompaction of tree pit soil:**
  - Use the proper hand tools or an air spade to break up soil compaction in tree pits. Do not use a conventional rototiller, which will damage roots near the surface.
  - Top dress with 3 in. of compost over roots.
- **Remediation of accumulated salt:**
  - Flush or leach excess salt from the soil by irrigating with water. After flushing, the owner/operator may request a follow-up soil analysis.
  - Apply amendments. Typical amendments for correcting saline soil include gypsum, calcium chloride, sulfur, and iron sulfate.

2.2.8 PLANTING AND TRANSPLANTING

1. Description
   - This section sets forth procedures and requirements for planting and transplanting of trees, shrubs, containerized herbaceous plants, and herbaceous plugs within SMPs. Work includes, but is not limited to the following:
     - Delivery, storage, and handling of plants;
     - Appropriate planting seasons, site preparation and planting list;
     - Installation of trees, plants, and shrubs (containers and seedlings); and
     - Protection of new plantings.
2. Applicability and Restrictions
   - **Plant delivery, storage and handling:**
     - Plants and trees must meet the owner/operator’s requirements for genus, species, variety, size, and quality. Plants must be clearly labeled with scientific and common names when delivered to site.
     - Substandard plants or trees for caliper size and condition of root ball and root systems, insects, injuries and latent defects or defective material may be rejected by the owner/operator at any time during progress of work.
     - Do not store vegetation in direct sunlight and roots should be kept moist.
     - Protect bark, roots and branches from handling; do not use trunk as lever; do not lift or carry a plant by the trunk or branches.

- **Appropriate planting seasons:**
    - Deciduous trees and shrubs: Early spring and late fall when plants are dormant (typically March 15 to May 30 and September 15 to October 31).
    - Tree selection and digging operations shall be scheduled so as to comply with nursery industry standards for 'Spring Dig Only' or 'Fall Hazard' plant materials. If Red maple (*Acer rubrum*), American hornbeam (*Carpinus caroliniana*), Tulip poplar (*Liriodendron tulipifera*), hickories (*Carya* sp.), Sassafras (*Sassafras* sp.) or Black gum (*Nyssa sylvatica*) are to be planted, they must be planted in early spring when trees are dormant (have not leafed out yet).
    - Evergreen trees and shrubs: Early spring and late summer/early fall (typically April 15 to May 30 and September 15 to October 31). Fall-planted conifers must have enough time to establish fine root systems and be well watered so as not to be at risk of desiccation during winter months. Soil temperatures for fall planting must not be less than 60◦F.
    - Ground cover, herbaceous perennials and plugs: In spring after danger of frost is past (typically April 15-May 30) or late summer/early fall at least 30 days before first frost (typically September 15 to October 31).
    - Bulbs: September 15 to October 31 planting (soil temperature less than 55◦F, but before soil freezes).
- **Site preparation and plant lists:**
    - No planting pits shall be left open at the end of day.
    - The owner/operator will inform where to install plants.
    - Installed plant list – A complete list of installed plants shall be submitted to the owner/operator after completion of the plantings.
        - The list shall include botanical and common names, variety, size (container or caliper), quantity, location within SMP, and source of plant materials.

3. Standard Operating Procedure

- **Installation in erosion control blanket:**
    - An incision shall be cut in the erosion blank and a hole shall be dug for each plug or plant that is the same depth as the soil of the plug or potted plant.
    - For plugs, a 'dibble bar' with the same diameter as the plug can be used to create the hole, when punched through the erosion blanket.
    - For container plants, the stapled erosion control blanket shall be cut in a circular shape to match the diameter of the container.
    - No erosion control blanket is to rest directly against any tree or plant stem.
- **Installation of trees and shrubs (See Figures 2-10 and 2-11):**
    - All planting pits shall be dug so the walls of pits are vertical or angled outward from the bottom up. Scarify the walls of the pit after digging.
    - Excavate the planting pit to at least 1-½ times the width of the root mass of the plant to be installed.
    - The planting pit shall be deep enough to allow the

bottom of the root flare to be flush with the final grade.

- Remove all debris from the pit and tamp loose soil in the bottom of the pit by foot.
- Do not handle plant by the branches, leaves or stem (or trunk).
- Remove plant from container and place straight in the center of the planting pit, carrying the plant by the root mass. Do not lift or carry a plant by the trunk or branches.
- If a tree or shrub is balled and burlapped, carefully remove root ball packing (½ of cage and as much burlap as possible) while disturbing the tree as little as possible after tree is set in pit.
- Cut and remove all ropes around the burlapped ball.
- Remove as much burlap from the ball as possible.
- Remove at least ½ of the wire basket.
- Remove all nails.
- Remove bamboo staking adjacent to root ball and trunk prior to planting, if present.
- Backfill planting pit with soil and tamp firmly to fill all voids and air pockets. Do not over compact soil. Make sure the plant remains straight during backfilling/ tamping procedure.
- The top of the root mass of the trees/shrubs shall be flush with, or slightly elevated (no more than ¼ in. height) above the final grade. Root flare must be visible. Do not cover woody stem with soil.
- Water plants thoroughly immediately after planting to saturate backfill. See Section 2.2.10.
- Install mulch as specified in Section 2.2.6.
- Install stakes on all trees. Use Hardwood stakes and ArborTie®, or equivalent approved by owner/operator.
- If space allows place stake at curb side and the second stake opposite.
- Remove all strings and wire from the plant materials with the exception of plant name tags which must be left until owner/operator inspection.

- **Installation of herbaceous containers and plugs:**
  - Dig the planting pit to at least 1 ½ times the width of the root ball.
  - Remove the plants and soil from the pots or plug trays and position in the holes so that the soil level of each plant is flush with the surrounding finished grade soil surface.
  - After planting, fill soil in around the plant completely, firming the soil and ensuring there are no air pockets as plants are installed.
  - Water plants thoroughly immediately after planting to saturate backfill. See Section 2.2.10.
- **Protection of new plantings:**
  - Install silt socks over trench drain and curb cut openings to minimize scour, inundation, and sediment delivery impacts of stormwater during early establishment of new plants (silt socks must be removed after a full growing season has elapsed).


Figure 2-10. A Tree After Planting, Before Mulching


Figure 2-11. A Tree Being Planted

2.2.9 SEEDING

4. Description
   - This Section sets forth procedures and requirements for seeding. Work includes, but is not limited to the following:
     - Seeding seasons and seeding plan
     - Seedbed preparation
     - Seeding - manual and hydroseeding
     - Protecting newly seeded areas
5. Applicability and Requirements
   - Appropriate seeding seasons:
     - Spring (March 1 - May 15)
     - Fall (August 15 - November 15)
   - Seed plan:
     - Owner/operator will inform where to install seed mix.
     - Seed species list – a complete composition list for each area that was seeded.
       - Include scientific and common names and percentages of each species within the mix.
       - Label each list by the site and corresponding feature ID.
       - Any change from the originally specified mix must be fully documented.
6. Standard Operating Procedure
   - **Seedbed preparation:**

- No seeding shall be performed on frozen ground or when the temperature is 32 °F/0 °C or lower, unless specifically instructed by owner/operator.
- If herbicide is necessary, apply well in advance (several days to weeks) of site preparation.
    - Apply all approved herbicides under supervision of a Certified Pesticide Applicator licensed for commercial application by the Commonwealth of Pennsylvania (see Section 2.2.1).
- All areas to be seeded shall be well-graded and free of all weeds, trash, debris, brush, clods, loose stones, construction debris, and other foreign materials that would interfere with seeding.
- Scarify seedbed prior to seeding using a harrow/rake.
- If area to be seeded is in within the vicinity of trees and shrubs or a woodland opening, take care to avoid damage to existing trunks and roots by using a hand rake or small rototiller to prepare the site.
- Avoid critical root zone areas.

- **Seeding – general:**
    - Seeding is to be performed only after all other work in an area is complete.
    - No fertilizer or lime shall be applied to any seeded areas, unless explicitly approved.
- **Seeding – hand broadcast:**
    - Uniformly distribute seed throughout the target area.
    - Applied seed in two different directions.
    - Harrow or rake site following seeding.
    - Maximize the seed/soil contact by firming soil around the seed with a Cultipacker, other similar equipment. Do not cover seed with more than ¼ in. of soil.
    - Immediately after initial seeding, water seeded areas evenly and thoroughly – see Section 2.2.10.
    - Straw mulch all seeded areas within 12 hrs. Place straw uniformly, in a continuous blanket, in approximately ¾ in. loose layers, anchor straw mulch with tackifier, if necessary.
- **Seeding – hydroseeding:**
    - All seeding equipment shall be calibrated before application so that the materials are applied accurately and evenly to avoid misses and overlaps.
    - Seed shall be installed by equipment capable of placing seed at a specified rate.
    - Apply seed uniformly and evenly across the entire disturbed area.
    - Apply seed-water mixture within the hydroseeder tank no later than 1 hr. after the seed is added to the tank.
    - Comply with equipment manufacturer's installation instructions and recommendations. Use approved spraying equipment with fan-type nozzle.
    - Hydroseed shall be applied using a two-step process to ensure good seed to soil contact:
        - Step 1: Apply the first coat evenly and uniformly from opposing directions to the soil surface to cover the entire area. The mix

shall contain only the specified seed mixtures at specified rates, hydroseed mixture at 500 lb. per acre (for visual metering only) and tackifier at manufacturer recommended rates.

- Step 2: Apply the second coat evenly and uniformly on top of the first coat, covering the entire seeded area with an erosion resistant coating of mulch. This mix shall contain water, hydro-seed mixture at 1,500 lb. per acre and tackifier at manufacturer recommended rates.

◦ After hydro-seed application, thoroughly flush the tank, pumps and hoses to remove all material. Wash all material from the exterior of the machine and remove any slurry spills.

- **Protecting newly seeded areas:**
  - Do not allow seeded areas to be trafficked. A temporary fence may be necessary.

2.2.10 WATERING

1. Description
   - This task outlines the procedures and requirements for watering vegetation.
2. Applicability and Requirements
   - Do not perform overhead watering during sunny days to prevent leaf scorch.
3. Standard Operating Procedure
   - **Fire hydrant operation:**
     - Operate permitted fire hydrants using-approved center compression lock keys or a hydrant wrench if the center compression lock bonnet has been removed.
     - Follow fire hydrant operation procedure guidelines to open, operate, and close all permitted fire hydrants, using approved backflow preventer assemblies.
   - **Watering tank operation:**
     - If direct onsite access to a rain-harvested or fire hydrant is not available, personnel shall use a watering tank as the source of water.
   - **Watering of herbaceous plants, shrubs, and seeded areas:**
     - Direct water towards base of plants.
     - Allow the water to soak into the ground within each area of vegetation, moving slowly through each section.
     - Each 100 ft^2 section of the vegetated SMP shall be evenly and thoroughly watered for 5 min. before

moving on to the next section.

- Use appropriate hose sprinkler attachments, taking care to avoid directing concentrated flows at planted or seeded areas.

- **Watering of trees:**
  - Water bag installation, filling, and removal:
    - Install and fill 15-20 gal. watering bags such as TreeGator® or equivalent (See Figure 2-12), per the manufacturer's recommendations, on any trees that:
      - Have been in the ground for less than 24 months, during April through October
      - Between April and October, have more than 25% dead, wilted, or discolored foliage
      - Allow the first 15-20 gal. to seep into the ground, then refill the watering bag
      - In October, remove watering bags from trees, wash, and store in a dry environment
  - Watering using manual methods:
    - Water each tree for a 5 min. or until the soil is thoroughly saturated.
    - Using a hose and gentle stream of water, apply water to the base of the tree.
    - Allow the water to soak into the ground. Replace any mulch that has been disturbed during the watering process.

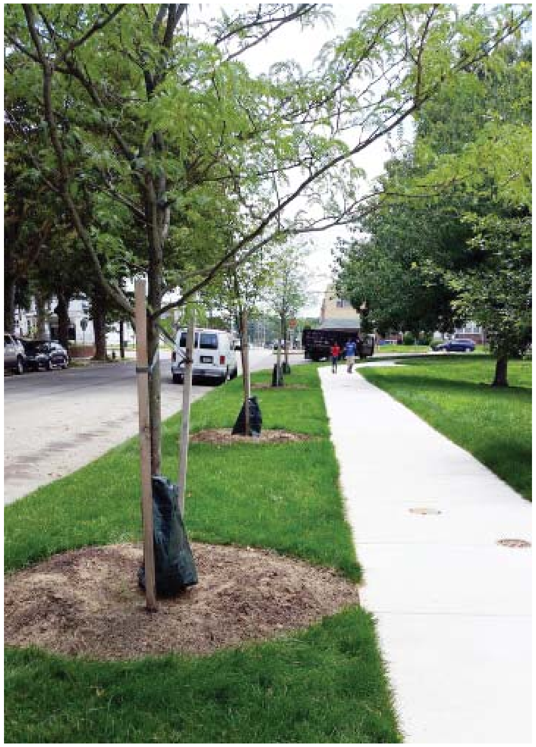


Figure 2-12 Gator bags installed on trees

Table 2-8. Recommended Equipment for Surface Vegetation Maintenance

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Aerial lift truck with dump box				•						
Air spade to decompact and aerate soil							•			
Air tiller	•									
Aquatic weed cutter	•									
Aquatic weed rake	•									
Axe	•	•	•							
Backflow preventer(s) and associated appurtenances										•
Chainsaw	•			•						
Chipper trailer type, either disc or drum. Minimum 12 knives.				•						
Club hammer	•									
Cultipacker	•								•	
Dibble bar								•		•
Digging bar		•								

Table 2-8. Recommended Equipment for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Dust pan and brush			•							
Fire hydrant center compression lock										•
Fire hydrant wrench										•
Flail mower – adjustable cutting height with sharpened blades, minimum cutting width of 4 ft., with offset for mowing around trees and shrubs	•									
Garden scissors	•									
Hammer								•		
Hand held power mower unit with sharpened blades										
Hand trowel								•		
Harrow									•	
Hoe	•									
Hose with spray nozzle								•		•

Table 2-8. Recommended Equipment for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Hydroseed tank, hoses, nozzles and related appurtenances									•	
Ladder of appropriate height				•						
Landscape edger (manual) – corrosion resistant, step on model						•				
Landscape edger (mechanical) – gas-powered, caster steering, pneumatic tires, carbide-tipped cutting blades, adjustable cutting depth, curb hop option and appropriate safety guards						•				
Leaf blower				•						
Mallet	•							•		
Manual tiller	•									
Pesticide applicators and injectors					•					

Table 2-8. Recommended Equipment for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Pick mattock		•	•							
Pruning shears, clippers, and loppers – sharpened and sterilized	•	•	•	•	•					
Push broom with firm bristles				•						
Rake	•			•	•	•	•		•	
Rototiller	•			•					•	
Safety lines/ropes, saddles, lowering lines				•						
Shovel	•	•	•	•	•	•	•	•		
Soil test kit							•			
Spade	•	•	•							
Spreader									•	
Stakes								•		
Staple gun								•		
Sterilized hand saw, pruning pole saws, and pole clips		•	•	•	•					

Table 2-8. Recommended Equipment for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Storage containers for herbicides, as specified in manufacturer's instructions	•									
Storage containers for pesticides, as specified in manufacturer's instructions					•					
String trimmer	•			•		•				
Stump puller		•	•							
Tarp						•	•			
Tractor and brush hog or finish mower–3-point hitch, sharpened rotary blades, minimum cutting width of 4 ft	•									
Trash bags (various sizes)										
Trash claw										

Table 2-8. Recommended Equipment for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Walk-behind mower –commercial-grade, with sharpened blades with minimum cutting width of 30 in.	•					•				
Water hose of sufficient strength to withstand kinking and abrasion									•	•
Water tank (250 gal. minimum), hose with appropriate nozzles, and truck of sufficient capacity to support a water tank										•
Watering bags such as TreeGator										•
Weed-pulling tool, e.g., Root Talon, Weed Wrench	•									
Wheelbarrow or push cart							•			

Table 2-9. Recommended Materials for Surface Vegetation Maintenance

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK VEG.	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
50 gal. plastic contractor bags	•	•	•	•	•	•	•	•	•	•
Biostimulants (various)							•			
Bonded fiber matrix (BFM), wood cellulose, or equivalent approved by owner/operator (for hydroseeding applications)									•	
Burlap								•		
Clean straw mulch free of noxious weeds with tackifier added									•	
Compost							•			
Deer repellant (e.g., Repellex)					•					
Disinfectant (e.g., bleach, pine oil, or other householder disinfectant liquids)				•						
Erosion blanket (biodegradable NAG-C125BN or SC-150BN or equivalent)								•	•	

Table 2-9. Recommended Materials for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK VEG.	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Grass clippings							•			
Hardwood stakes shall be 2 in. x 2 in. square wood, 6 ft. length, and chiseled on one end	•							•		
Herbaceous containers and plugs								•		
Herbicide (various)	•								•	
Horticultural spray oils (petroleum derivatives)	•				•					
Insecticidal soap					•					
Maintenance map	•	•	•	•	•	•	•	•	•	•
Material Safety Data Sheets (MSDS) as applicable	•				•					
Mosquito dunks					•					
Mulch material; Licorice bark mulch if available, shredded hardwood bark mulch	•		•		•	•			•	
Mycorrhizal fungal inoculant							•			

Table 2-9. Recommended Materials for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK VEG.	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Organic fertilizers							•			
Paper bags, 30 gal.	•									
Permits and access permissions	•				•					
Pesticides (various)					•					
Pine straw mulch							•			
Potable municipal or well water and/or harvested rainwater sufficient for watering and cleaning activities, as required	•				•		•	•	•	•
Sand							•			
Seed and establishment dressings									•	
Shredded leaf mold							•			
Shredded leaves							•			
Silt sock filled with straw or hay								•		
Staking ribbon shall be ArborTie®, or equivalent								•		

Table 2-9. Recommended Materials for Surface Vegetation Maintenance (cont'd)

	WEED CONTROL	MOWING, STRING TRIMMING	DEAD VEG. REMOVAL	PRUNING, CUTTING BACK VEG.	PEST & DISEASE MGMT	MULCHING	SOIL MGMT	PLANTING	SEEDING	WATERING
	2.2.1	2.2.2	2.2.3	2.2.4	2.2.5	2.2.6	2.2.7	2.2.8	2.2.9	2.2.10
Stone, various sizes					•					
Top soil			•				•			
Trees and container shrubs								•		

Subsurface Maintenance

division 3

3.1 JETTING/VACTORING/INSPECTION

1. Description

   - This section describes the protocols for subsurface inspection, jet-rodding, and vacuum cleaning. The task includes:
     - Subsurface inspection and maintenance of SMPs with a stone bed and distribution and/or underdrain piping
     - Inspection and maintenance of proprietary subsurface storage chambers with maintenance port(s)
     - Inspection and maintenance of proprietary subsurface storage chambers with an access manifold
     - Pretreatment device installation
     - Troubleshooting

2. Applicability and Requirements

   - Subsurface inspection, jet-rodding, and vacuum cleaning shall not be performed within 48 hrs. of a significant (greater than 1.0 in.) rainfall event unless approved by the owner/operator.
   - Determination of appropriate equipment for inspection and maintenance shall be made prior to inspection and maintenance of each structure (e.g. cleanout, domed riser, inlet. See Figures 3-9 through 3-11.) so that appropriate equipment is transported to the site.
   - Structural loading constraints must be considered for each site. Staging area for vactor truck must support weights in excess of 35,000 lb.
   - For maintenance occurring in SMPs directly connected to the Municipal Separate Storm Sewer System (MS4) or to a water body, the following conditions must be met:
     - Water used in all subsurface maintenance activities must be dechlorinated prior to use (75 mL of calcium thiosulfate dechlorination liquid must be added to every 1,500 gal. of water) to avoid discharge of chlorinated water into the MS4 or water body. Approval by the owner/operator must be given prior to use of alternative dechlorination liquids.
     - Prior to performing any maintenance, all downstream pipes connecting to the MS4 or discharging directly into a nearby water body must be plugged.
   - In access structures that have more than one pipe connection, pipes (other than the one being maintained) must be plugged if there is concern of debris migrating to another portion of the system.
   - For SMPs where backflow conditions may allow non-treated surface water or sewage to enter SMP piping, the installation of an inline check valve (or other backflow assembly) may be requested by the owner-operator.
   - Confirm that the vacuum/jetter equipment waste storage tank is free of debris from another site or project. If required by owner/operator, take a time stamped photograph of empty storage tanks.
   - When hydraulically-propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the pipe line are used, precautions shall be taken to ensure that the water head pressure does not damage or cause flooding to nearby public or private property.
   - When hydraulically-propelled cleaning tools are used, all access structures that are not used as entry points shall be closed, secured by screws, screw caps, or weighted bags

(minimum 40 lbs.).

3. Standard Operating Procedure

- **Subsurface inspection and maintenance of SMPs with a stonebed and distribution and/or underdrain piping:**
    - Position jet/vactor truck so that the reel is adjacent to the structure (e.g., inlet, manhole, control structure, riser, or cleanout, etc.). Utilize an inlet, manhole, or control structure as the primary maintenance access point, if possible.
    - If SMPs include extensive sewer networks such as "daisy-chained" inlets, junction boxes, manholes, or other access structures, then maintenance must be performed first on upstream components before continuing to downstream components.
    - If the structure has a grate, sweep or vacuum the grate. If the structure has a grate and is in the right-of-way, sweep or vacuum the surrounding area, collecting trash/sediment/organic debris at least 4 ft. from the structure on all sides.
    - Open structure.
    - If pretreatment device(s) is present:
        - Perform a visual condition inspection and report tears, clogged fabric or missing components to the owner/operator.
        - Remove trash, sediment, and organic debris from the pretreatment device(s).
            - If not permanently attached to the structure, remove the pretreatment device.
            - If removing by hand, remove enough material from the device to achieve a liftable weight (based on subsurface maintenance personnel judgment). Once removed, invert and shake or gently tap the device and pressure-wash device with water or hand-clean using wire brush or stiff nylon brush until clean.
            - If performed prior to vacuum cleaning structure, trash/sediment/organic debris from the pretreatment device may be emptied into the structure.
            - If pretreatment device is permanently attached (e.g., pretreatment screen), clean using wire brush or stiff nylon brush.
    - Perform a visual condition inspection of the structure. Look for underdrain end cap and any plugs.
        - If distribution plugs are present:
            - PVC or wingnut/plumber's plugs are installed in distribution components during construction or to keep a site offline. These plugs must should generally be removed during maintenance, but confirm with the owner/operator.
        - Underdrain end cap:
            - Most underdrain pipes are designed and constructed to include a PVC end cap at the connection to an access structure. If a cap is missing or was not properly installed, contact the owner/operator.
            - If owner/operator determines a solid end

cap is required, install the end cap without drilling an orifice.

- If owner/operator determines that an orifice is required, orifice must be drilled into center of the underdrain end cap using a cordless drill and the appropriate drill bit based on the orifice size listed in the design plans.
- If the underdrain is exposed, a PVC adapter sleeve may be required for the installation of the end cap. Concrete patching of the inlet wall may be required to create a seal around the pipe.

- Loosen compacted sediment on structure with high-velocity water gun or air lance while vacuuming, removing all trash/sediment/organic debris down to the sump.
- During maintenance of structure but prior to maintenance of pipes, complete a pre-maintenance inspection of any pipes connected to the structure.
  - The type of closed-circuit television (CCTV) camera required will depend on pipe size, length, and presence of bends in the pipe network. Refer to Figure 3-1 for guidance on camera selection and Figures 3-2 and 3-3 for photographs of camera types.
  - Position CCTV camera in center of pipe at access point. If possible, attempt access through a cleanout or riser before attempting access through other structures such as an inlet, control structure, or manhole.
  - Ensure the lighting is adequate enough to illuminate the pipe. Avoid excessive lighting as it can result in the flaring of the image or misrepresent defects.
  - Ensure color and video display correctly reflects the true colors of the pipe. Camera settings must follow manufacturer's recommendations to ensure proper identification and documentation.
  - Move camera at a steady pace not to exceed 30 ft. per minute from entry point to the intended end point by pushing manually or remotely steering.
  - Stop the camera if structural or construction defects are observed. Re-position camera to better view the defect(s) and capture still shots if possible.
  - At the completion of the inspection, retract the camera to the entry point, recording the CCTV data.
  - Remove the camera from the pipe.
  - Close and secure any access points that were used for pre-maintenance inspection that will not be used for jetting. Clean and grease the bolts.
  - Code defects observed in CCTV camera inspections using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program Manual (PACP) (Version 7.0 or later) and PACP partner software.

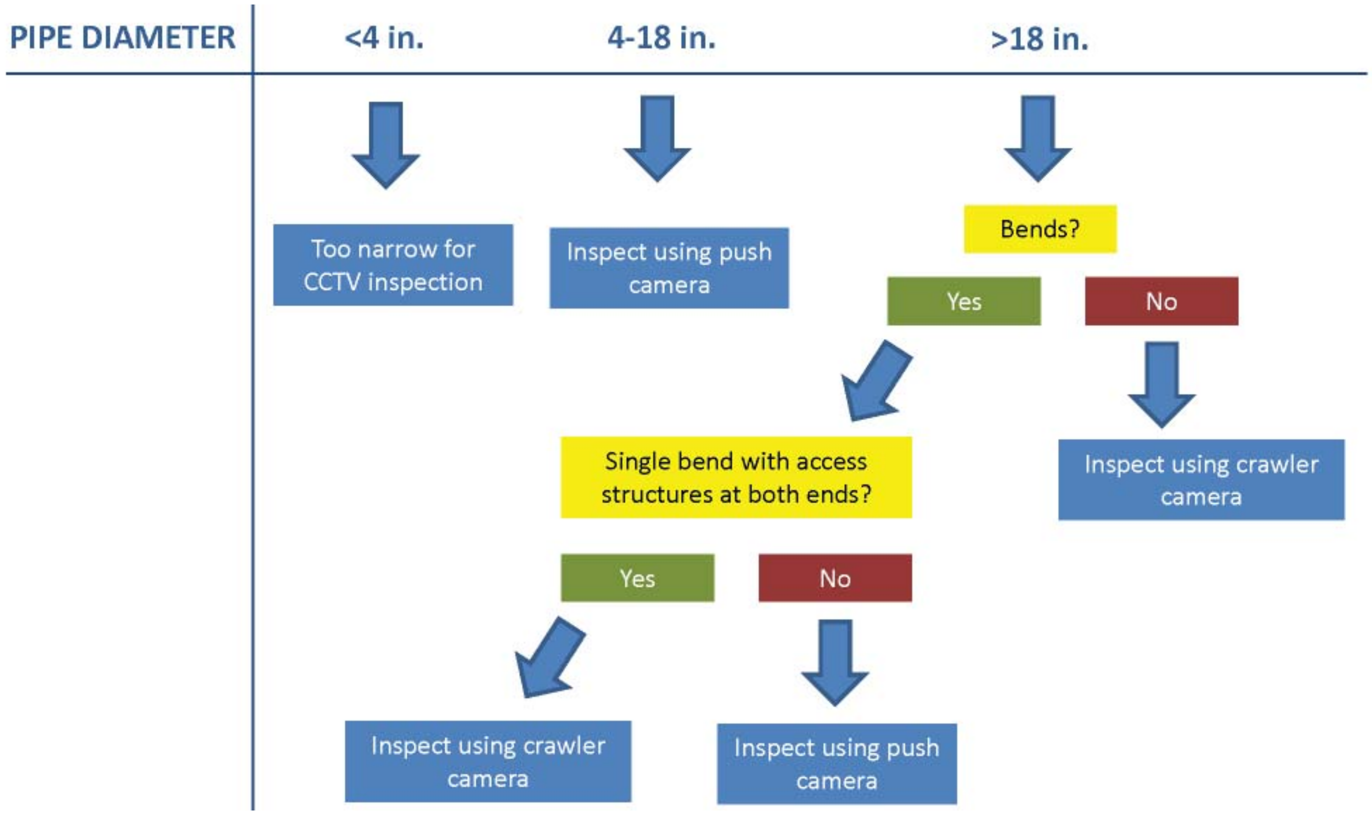


Figure 3-1. CCTV Camera Selection Flow Chart

CCTV CAMERAS

Figure 3-2. Crawler Camera

Figure 3-3. Push Camera

- Refer to Figures 3-12 to 3-25 for examples of commonly observed pipe defects.

- If any pipes connected to the structure require maintenance, select appropriate nozzle. (See Figures 3-4 to 3-8 for examples of jetting nozzles).
    - There are 3 types of nozzles that can be used:
        - Rotating nozzles can have forward- and/or rear-facing jets. A component of these nozzles rotates, providing lateral cleaning. These nozzles are effective at removing roots as well as debris from pipe walls.
        - Pentrating nozzles have both forward and rear-facing jets. The forward-facing jets helps loosen large blockages.
        - Flushing nozzles have rear-facing jets and are used to clean lines that do not have large blockages.
    - Before installing nozzle, always run water through the hose for a short period of time until the water runs clear.
    - If material to be cleaned is known, select appropriate nozzle; if not, initially use a penetrating type nozzle until material is determined.

- Jet-rod pipe(s) requiring maintenance through primary access structure:

- Insert vacuum tube into the structure from which conveyance pipe will be accessed, and vacuum waste material throughout jet-rodding procedure.
    - Insert jetter hose into the pipe through the flexible hose guard.
    - Insert flexible hose guard in the pipe to guide the jetter hose and prevent wear from friction.

◦ Start high-pressure pump after ensuring the nozzle is fully inserted in the pipe.

◦ Jet-rod conveyance pipe structures moving trash/sediment/organic debris toward the access point for vacuuming and performing as many passes as necessary to clean the structure.

- During cleaning, keep the nozzle moving and the water pump operating to prevent damage to pipe.
- Stop maintenance immediately if indications of structural damage or failure are observed (e.g., infiltration bed stone, soil, or pieces of pipe are removed during jet-rodding, etc.) Report observation to owner/operator immediately.

◦ Jet-rod conveyance pipe until jet-rodding water is clear.

- If pipe cannot be cleaned successfully using initial equipment and techniques, attempt cleaning with different equipment set ups (e.g., other combinations of jetter hose diameter, nozzles, and/or pressure, etc.) or from alternative access points.

◦ Complete post-maintenance inspection of pipe(s) using pre-maintenance inspection protocol.

◦ If water remains in the pipe, obstructing the post-maintenance inspection, reference “Troubleshooting.”

◦ For structures that connect to the combined sewer, fill inlet with water up to the top of the trap opening after all pipes have been cleaned as needed.

◦ Inspect structure to ensure all traps are closed and pretreatment devices/screens are latched and/or correctly installed prior to closing access points.

◦ Follow guidelines for Decanting and Waste Disposal (Section 3.2 and 3.3) when removing sediment/trash/organic debris from the vactor truck.

JETTING NOZZLES

Figure 3-4. Large Penetrating Nozzle with 1 Front-Facing and 5-Rear Facing Jets

Figure 3-5. Most Commonly Used Nozzle. Rotating Nozzle with 3 Rear-facing Jets and Rotating Center

Figure 3-6: Small Rotating, Root Cutting Nozzle

Figure 3-7. Small Penetrating Nozzle with 1 Front-facing and 6 Rear-facing Jets

JETTING NOZZLES (CONT'D)

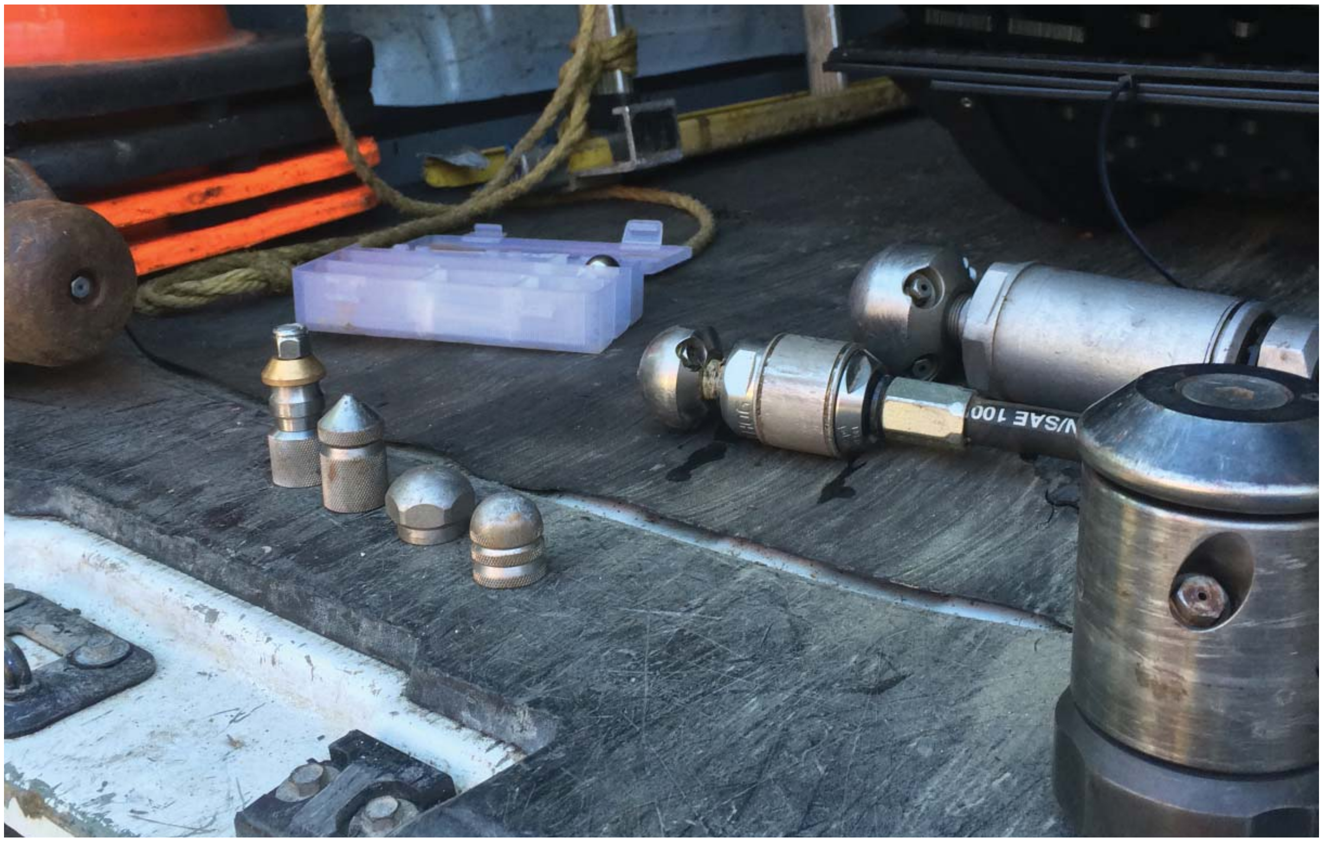


Figure 3-8. Various Types of Penetrating, Rotating, and Flushing Nozzles

TYPICAL PROCEDURES FOR JETTING AND VACUUMING

Cleanout

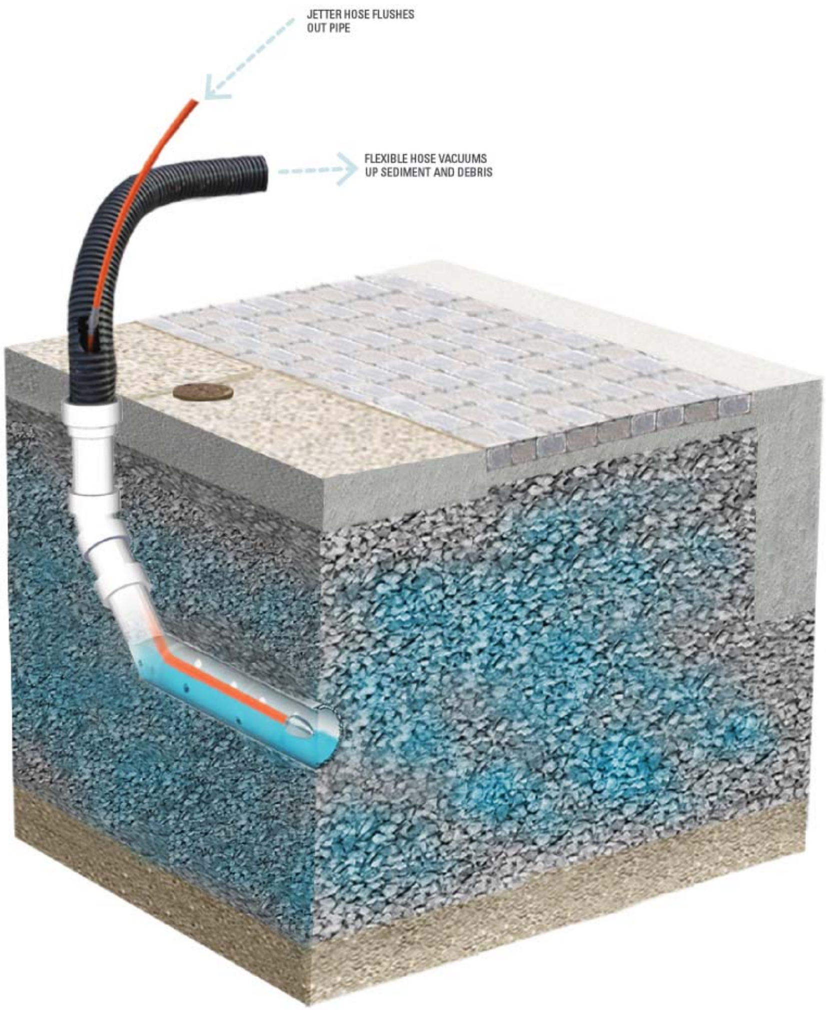


Figure 3-9. Typical Procedure for Vacuuming and Jetting form a Cleanout Access Structure

Domed Riser

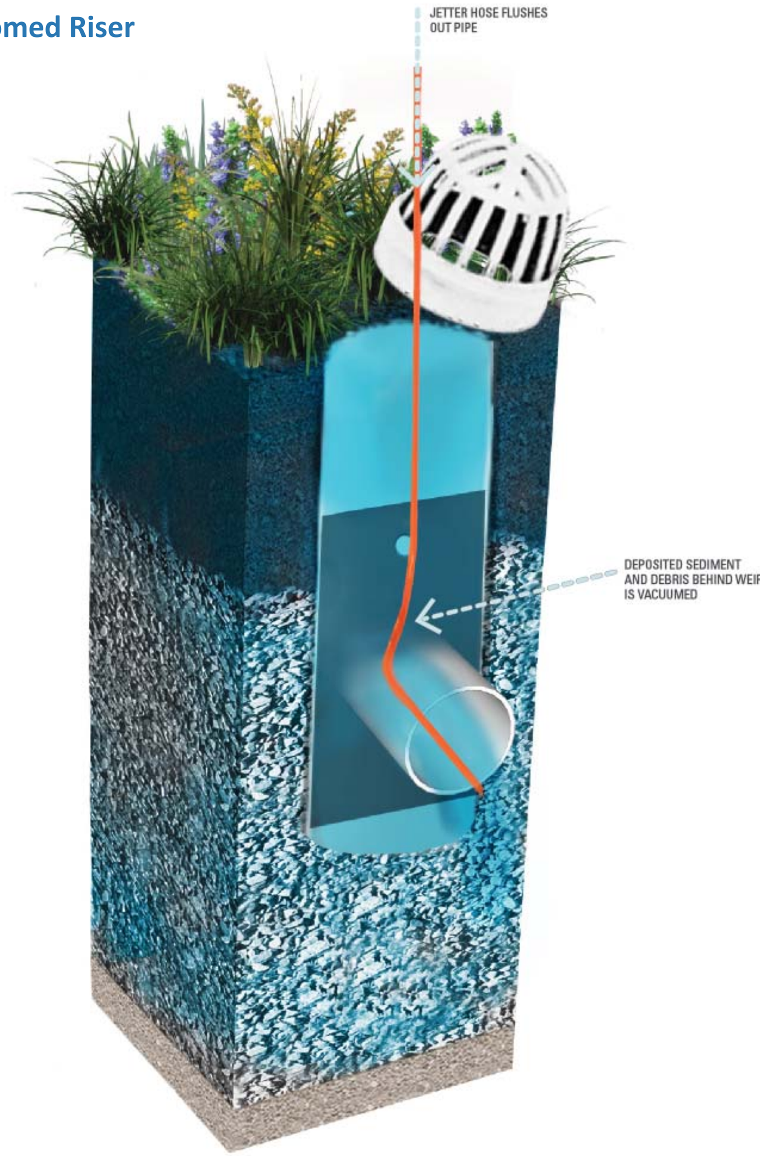


Figure 3-10. Typical Procedure for Jetting from a Domed Riser with a Weir

Inlet

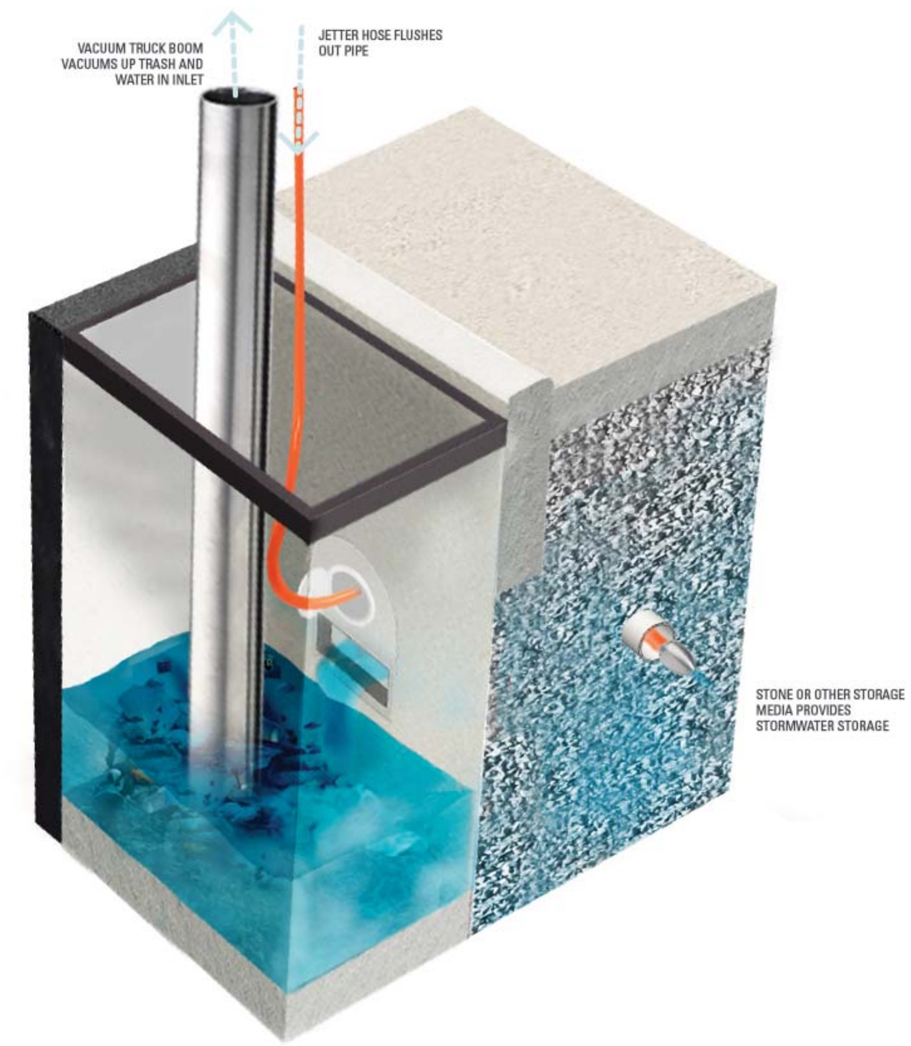


Figure 3-11. Typical Procedure for Jetting and Vacuuming from an Inlet

- **Inspection and maintenance of proprietary subsurface storage chambers with maintenance port(s):**
    - Subsurface storage chambers with maintenance port(s) may also include distribution and underdrain piping, inlets, control structures, weirs, sumps, and similar components, which must be inspected and maintained.
    - Open maintenance port or manhole.
    - Use flashlight to detect sediment deposits.
    - If sediment is present, measure depth to sediment with a tape measure.
    - Close all maintenance ports or manholes.
    - Repeat steps above for all available maintenance ports or manholes.
    - See manufacturer's guidelines to determine if maintenance is required. If maintenance is required:
        - Plug the outlet control structure to contain waste water within storage chamber.
        - Insert vacuum tube into the outlet control structure, if applicable, or the most downstream access point.
        - Open maintenance port.
        - To suspend any sediment or debris, pump water (at a high flow rate using a fire hydrant or jetter hose) through maintenance port until water level in the system is at least 1 in., or as specified by manufacturer's guidelines.
        - Close maintenance port.
        - Repeat for all available maintenance ports.
        - Remove plug from outlet control structure.
        - Vacuum all waste water from outlet control structure or most downstream maintenance port.
        - Re-inspect the area to verify that subsurface storage unit is free of trash/sediment/organic debris.
        - If subsurface storage unit is not free of trash/sediment/organic debris, then repeat flushing procedures.
    - Inspect structure to ensure all traps are closed and pretreatment/screens are latched and/or correctly installed prior to closing access points.
    - Follow guidelines for Decanting and Waste Disposal (Sections 3.2 and 3.3) when removing sediment/trash/organic debris from the site.
- **Inspection and maintenance of proprietary subsurface storage chambers with an access manifold:**
    - Subsurface storage chambers with an access manifold utilizing pre-cast modular arches or chambers (typically concrete) may also include distribution and underdrain piping, inlets, control structures, weirs, sumps, and similar components which must be inspected and maintained.
    - Open and visually inspect chamber manifold and arch rows.
    - Measure sediment depth of manifold and/or arch rows. Refer to the manufacturer's guidelines to

determine if maintenance is required.

- ◦ Maintenance of subsurface storage chambers allowing full access for a maintenance worker can be maintained as follows:
  - Any non-porous surface can be maintained using standard vacuum cleaning techniques.
  - Any porous surface or surface with loose material must be maintained as specified by the manufacturer.
- ◦ Inspect structure to ensure all traps are closed and pretreatment/screens are latched and/or correctly installed prior to closing access points.
- ◦ Follow guidelines for Decanting and Waste Disposal (Sections 3.2 and 3.3) when removing sediment/trash/organic debris from the site.

- **Pretreatment device installation:**
  - ◦ For 4 ft. distribution city inlets, installation of pretreatment filter bags also requires installation of brackets. Since personnel must enter flow control/conveyance structure to install brackets, confined space equipment protocols must be followed (see Section 1.6.2.5 and Table 3-1).
  - ◦ For 4 ft. distribution highway grate inlets, installation of pretreatment device does not require personnel to enter flow control/conveyance structure.
  - ◦ Green-grey inlets (those with underdrain connections that receive surface runoff bypassing distribution inlets) do not require pretreatment devices.
  - ◦ For non-standard or irregular inlets (e.g., 6 ft. city inlets, dual trap inlets, etc.) contact owner/operator as customized pretreatment device may be required.

- **Troubleshooting:**
  - ◦ **If the jetter hose gest stuck or cannot maneuver pipe bends:**
    - Decrease pressure and/or reduce jetter hose diameter to maneuver jetter through sharp bends or bends in close proximity (i.e., less than 5 ft. apart).
    - If the nozzle becomes trapped in the pipe, shut off water supply and attempt to pull it back with the hose reel. If this does not work, turn on the water supply, send the nozzle to the upstream manhole for removal, and then pull back the jetter hose with the hose reel.
  - ◦ **If pipes cannot be accessed via larger structures, cleanouts may be used to access pipes. The following steps and considerations may be necessary:**
    - Attempt to jet the pipe through the cleanout.
    - Insert a flexible vacuum hose, with a diameter only slightly smaller than access structure, into cleanout, sealing the area around the hose to maximize suction power.
    - Cut a small window into the side of the vacuum hose and insert the jetter hose into the opening.
    - Jet and vacuum the pipe.
  - ◦ **If jet-rodding through the cleanout does not successfully clean the pipe, flush the pipe.**

        - Flush conveyance pipe using a jetter hose and no nozzle to loosen and push deposits and large debris to the downstream access point.
    - **Large quantities of debris:**
        - If pipe has large quantities of debris, is long (e.g., over 200 ft.) and/or must be jetted from an upstream access point, perform multiple short passes that remove trash/sediment/organic debris in sections starting closest to the access point.
    - **Significant blockages:**
        - Select an appropriate penetrating nozzle.
        - If nozzle will not move forward, pull back a few feet and let go to sling-shot against the blockage. This pulsating action on nozzle must be used only for extremely heavy blockages.
        - Once the blockage has been removed, shut down the pressure, wait until flow subsides, and then make a couple of passes to ensure the pipe is free of blockages.
        - Change the nozzle as needed, and re-clean the pipe where blockage was first identified.
        - Verify that conveyance pipe is free of trash/sediment/organic debris by repeating inspection procedures.
        - If conveyance pipe is not free of trash/sediment/organic debris, then repeat jet-rodding procedures.
    - **Roots:**
        - If significant roots are present within the pipe, utilize a rotating nozzle.
        - Exercise caution to avoid entangling the nozzle in roots. When removing the nozzle, pull slowly and gently on the hose. Do not yank or jerk the hose if nozzle does become entangled, as this could compromise the structural integrity of the pipe.
            - Attempt to move the nozzle slowly and carefully through the section of pipe that has roots.
    - **If a significant amount of water remains in the pipe after maintenance:**
        - Insert the vacuum hose at the most downstream access point, if possible.
        - Seal other access points to maximize suction.
        - Vacuum conveyance pipe until it is dewatered.
- **Illegal Dumping:**
    - Report activity to owner/operator.
    - Contact Philly311 for removal.

3.2 DECANTING

1. Description
   - This section describes the protocol for the disposal of water generated or collected during the performance of subsurface maintenance activities.
2. Applicability and Restrictions
   - Sediment-laden and/or chlorinated water must not be discharged into the MS4 or to a structure directly connected to a water body. Decanting can only occur in Combined Sewer areas.
3. Standard Operating Procedures
   - Collect the material removed during the maintenance operation in the truck holding tank, and allow it to settle.
   - Check the collected water for any unusual color or odor that might indicate the presence of oil or other chemicals. If any unusual color or odor is found, notify the owner/operator immediately.
   - Transport the water to the approved decanting inlet or manhole.
   - Decant or filter the water prior to discharging it into an inlet or as directed by the owner/operator. This may require the insertion of inlet filters. Ensure that no sediments are discharged to the inlet. The solids, in slurry form, must be transported to an approved disposal site.

3.3 WASTE DISPOSAL

1. Description
   - This section describes the protocol for the disposal of non-hazardous waste materials generated or collected during the performance of subsurface maintenance activities. The task includes proper containment, transport and disposal of waste material.
2. Applicability and Restrictions
   - Waste disposal location must be pre-approved by owner/operator.
3. Standard Operating Procedures
   - Collect the material removed during the maintenance operation in applicable waste storage container (e.g., traps, bins, vacuum/jetter truck storage, etc.).
   - If necessary, decant or filter wet material prior to disposal as discussed in Section 3.2.
   - Check the waste material for any unusual color or odor that might indicate the presence of oil or other chemicals. If any unusual color or odor is found, notify the owner/operator immediately.
   - Transport the waste material to the approved disposal site or beneficial end use location, as directed by the owner/operator.
   - Dispose of the waste material as directed by disposal site.

EXAMPLES OF COMMON PIPE DEFECTS

STRUCTURAL

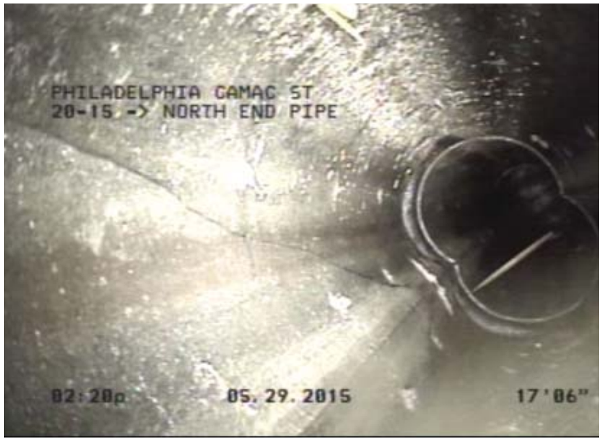


Figure 3-12. Longitudinal Crack, a Break Line that is Visible on the Surface But is Not Visibly Open.

Figure 3-14. Break, a Defect Where Pieces are Noticeably Displaced and Have Moved from Original Position at Least ½ the Thickness of the Pipe.

Figure 3-13. Circumferential Fracture, a Break Line that is Visibly Open and a Gap Can be Seen. The Sections of Pipe Wall are Still in Place and Cannot Move.

Figure 3-15. Hole, a Defect Where Pipe Material is Completely Dislodged from Pipe Wall and the Surrounding Media is Exposed.

EXAMPLES OF COMMON PIPE DEFECTS

STRUCTURAL CONT'D

Figure 3-16. Deformation, Pipe Damage Where the Original Cross-section or Geometry of the Pipe has Noticeably Changed.

Figure 3-18. Offset Joint, a Defective Displacement of at Least One Pipe Thickness at a Joint.

Figure 3-17. Collapse, Deformation so Great that there has been a Complete Loss of the Structural Integrity of the Pipe with More than 40% of Cross-sectional Area Lost.

EXAMPLES OF COMMON PIPE DEFECTS:

OPERATIONAL AND MAINTENANCE

Figure 3-19. Deposited Material in the Invert of the Pipe.

Figure 3-20. Roots - Fine: Small Diameter and Small Quantities of Roots that are Insufficient to Cause a Quantifiable Reduction of Pipe Cross-sectional Area (<5% loss).

Figure 3-21. Tap Roots: Individual Roots that are Greater than ½ in. (10mm) Thick.

Figure 3-22. Roots - Medium: Roots that have Formed a Mass and Restrict the Flow of Water. Cross-sectional Area Lost is Greater than or Equal to 5% up to or Less than or Equal to 50% (5-50%).

EXAMPLES OF COMMON PIPE DEFECTS:

OPERATIONAL AND MAINTENANCE CONT'D

Figure 3-23. Root - Ball: Roots that have Formed a Mass, Typically in the Form of a Ball, and have the Potential to Severely Restrict the Flow. The Cross-sectional Area is Greater than 50%.

Figure 3-24. Construction Debris

MISCELLEOUS FEATURES

Figure 3-25. Water Level: the Depth of Water at the Observed Point in the Pipe (Includes Flowing and Stagnant Water). Water Level Sag Occurs when the Grade of the Pipe is Poor.

Table 3-1. Recommended Equipment for Subsurface General Maintenance

	INSPECTION 3.1	MAINTENANCE 3.1
1 in. – 1.5 in. square key	•	•
10+ megapixel digital camera with spare batteries	•	•
200 ft. of vacuum tubes ranging from 4 in. to 8 in.		•
25 ft. tape measure and/or measuring tape	•	
300 ft. of ⅜ in. jetter hose		•
300 ft. of ⅝ in. jetter hose		•
600 ft. of 1 in. jetter hose		•
Assorted Phillips and standard screwdrivers	•	•
Assorted standard and metric socket wrenches and Allen wrenches	•	•
Assortment of wingnut or plumber's plugs for plugging distribution pipes and underdrains (sizes to include, at a minimum: 6 in., 8 in., 12 in., 15 in., 18 in., and 21 in.)		•
Backflow preventer(s) and associated appurtenances in accordance with PWD's approved list of backflow assemblies (http://www.phila.gov/water/wu/Documents/CCC_Manual.pdf)		•
Battery charging device for CCTV camera	•	
Bryce Fastener #50 Penta-Plus security bit	•	•
CCTV crawler camera with ability to rotate the camera head, zoom, and capture still images (see Figure 2.3 for camera selection guidance)	•	
CCTV push camera housing units (skids)	•	

Table 3-1. Recommended Equipment for Subsurface General Maintenance (cont'd)

	INSPECTION 3.1	MAINTENANCE 3.1
Chisel and mallet	•	•
Confined space entry harness, tripod, and air monitor as per OSHA standard 29 CR 1910.146	•	•
Cordless drill with assortment of bits (sizes to include, at a minimum: ½ in., ⅝ in., ¾ in., ⅞ in., and 1 in.) for drilling underdrain orifices		•
Crowbar	•	•
Extension ladder (minimum 16 ft. length)		•
Fire hydrant center compression lock		•
Fire hydrant wrench		•
Flexible hose guard to protect jetter hose from abrasion		•
Flexstorm pre-treatment device fabric (FX/FX+/FXO models) with frames and brackets (as necessary) for city and highway grate inlets		•
Flushing nozzle		•
Hand tools as necessary for assembling and disassembling tubes and hoses		•
High-velocity water gun or air lance and associated hose and appurtenances for power cleaning structure walls and floor		•
Holding tank equipped with filters or baffles to facilitate removal of sediments		•
Hydraulic lift and dolly to move contained material from vehicle to disposal location, if necessary		•
Impact wrench with assorted sockets	•	•

Table 3-1. Recommended Equipment for Subsurface General Maintenance (cont'd)

	INSPECTION 3.1	MAINTENANCE 3.1
Jet-rodding/vacuuming (jet/vac) truck with hose reel with 600 ft. of 1 in. jetter hose capacity, Water pump with flow of 80 gal. per minute (gpm) @ 2000 lbs. per square in. (psi), Vacuum flow of 2600 cf per minute (cfm), Vacuum lift of 22 in. of mercury (HG), 8 cy. debris tank with strainer and decanting valve, and 1,500 gal. integrated water tank		•
Manhole hooks	•	•
Measuring wheel to determine distances between structures	•	
Penetrating nozzle		•
Pliers, adjustable wrenches, vice grips, and pipe wrenches	•	•
Portland cement (Type I or Type II) mix for formwork around PVC adapter sleeves		•
PVC reducers, adapter sleeves and PVC caps for 8 in. underdrains		•
Rotating nozzle		•
Round-mouth shovel, spades and/or push broom to remove trash/sediment/ organic debris generated from maintenance tasks		•
Self-leveling CCTV push camera with 200+ ft. reel and ability to zoom and capture still images (see Figure 2.3 for camera selection guidance)	•	
Silt sock to contain waste at disposal site		•
Sledge hammer (minimum 16 lbs. head weight)	•	•
Water hose of sufficient strength to withstand kinking and abrasion from concrete surfaces or other hoses as appropriate		•

Table 3-2. Recommended Materials for Subsurface General Maintenance

	INSPECTION 3.1	MAINTENANCE 3.1
50 gal. plastic contractor bags		•
All-purpose rags	•	•
Calcium thiosulfate (30% w/v) dechlorination liquid, or approved alternative		•
Duct tape		•
Electrical tape		•
Fire hydrant operation report form		•
Hard copies of permits and access permissions	•	•
Maintenance maps	•	•
Potable municipal or well water sufficient for cleaning activities		•
Rock salt (winter only)		•

Pervious Pavement Maintenance

division **4**

4.1 ROUTINE MAINTENANCE

1. Description
    - This section sets forth procedures and requirements for pervious pavement routine maintenance.
2. Applicability and Requirements
    - Implement routine maintenance as directed by owner/operator if infiltration rates at test locations are greater than 10 in./hr.
    - The protocol for routine pervious pavement maintenance is applicable to SMPs constructed of the following materials: porous asphalt, pervious concrete, permeable interlocking pavers, or permeable pavers with rigid joint material. Permeable pavers set in loose joint material such as sand or gravel should not be maintained with regenerative air equipment and may require full replacement if they become clogged, at the discretion of the owner/operator.
3. Standard Operating Procedures
    - Manually remove large trash/sediment/organic debris (See Section 2.1.1).
    - Clean pervious pavement using approved regenerative air sweeper listed in Table 4-1 (See Figure 4-1).
        - Sweep the entire surface of the pervious pavement moving at a controlled speed. Use water as needed for dust control.
        - Re-sweep the surface until all visible material is removed from the surface of the pervious pavement.
        - Use a vacuum attachment as needed for any corners or difficult to access sections.
        - Refer to Decanting and Waste Disposal (see Section 4.4) to remove sediment/trash/organic debris.

4.2 RESTORATIVE MAINTENANCE

1. Description
    - This section sets forth procedures and requirements for pervious pavement restorative maintenance.
2. Applicability and Requirements
    - Implement restorative maintenance as directed by owner/operator if infiltration rates at selected test locations are less than 10 in./hr.
    - The protocol for pervious pavement restorative maintenance is applicable to SMPs constructed of the following materials: porous asphalt, pervious concrete, permeable interlocking pavers, permeable pavers with solid joints, or permeable pavers set in loose joint material such as sand or gravel.
    - The pressure washer shall not compromise the structural integrity of the pavement.
    - The vacuum pressure shall be sufficient to prevent sediment-laden water from re-entering the system.
3. Standard Operating Procedure
    - Manually remove large trash/sediment/organic debris (See Section 2.1.1).
    - Divide the site into 18 in. sections, which is based on the width of the vacuum attachment. Mark the divisions on a map of the site.
    - Identify areas with very low infiltration rates by spraying water using a hose gun over the entire SMP area until the surface is saturated. If water ponds for more than a few seconds, mark these areas for more intensive maintenance.
    - Follow a standard cleaning procedure to maintain the entire pervious pavement area using an approved pressure washer

with a vacuum attachment (see Table 4-1 and Figure 4-2).

  - Set up equipment at the upstream end of the system.
  - Maintain the entire site with a steady pace with two passes for each 18 in. wide section.

- Follow an intensive cleaning procedure to maintain the pervious pavement identified as having low infiltration rates using an approved pressure washer with vacuum attachment (see Table 4-1).
  - Set up equipment at the identified areas with very low infiltration rates.
  - Maintain the identified areas at a steady pace with at least two passes in at most 12 in.-wide sections.
- Spray water over the entire SMP area until the surface is saturated to confirm maintenance was performed to an adequate level. If water ponds, repeat the process.
- Follow guidelines for Decanting and Waste Disposal (see Section 4.4) when removing sediment/trash/organic debris from the vactor truck.

Figure 4-1. Regenerative Air Truck

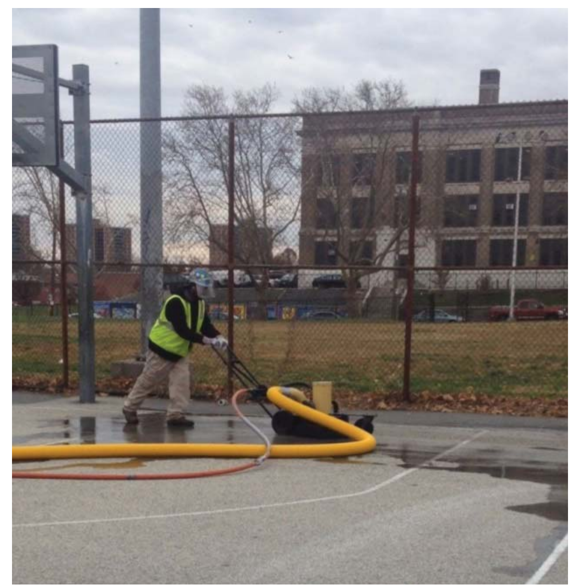


Figure 4-2. Pressure Washer with Vacuum Attachment

4.3 WINTER MAINTENANCE

1. Description
   - This section sets forth procedures and requirements for pervious pavement winter maintenance.
2. Applicability and Requirements
   - Snow piles containing sand shall not be stored on pervious pavement.
   - All de-icers used in the right-of-way must be approved by owner/operator and must be a PennDOT-approved product.
3. Standard Operating Procedure
   - Apply de-icer as pre- and post-treatment for every snow event greater than 0.25 in., for sleet and freezing rain events, and after every plowing event.
     - Apply sodium formate at a rate of 10 lbs./1000 ft^2 for the following:
       - All non-right-of-way (ROW) pervious pavement
       - All non-ROW pervious concrete constructed in the past two years
     - Apply calcium chloride in flake form at a rate of 21 lbs./1000 ft^2. for the following:
       - All pervious pavement in the ROW
     - **For ROW pervious concrete SMP constructed in the past two years, contact owner/operator for a PennDOT-approved product.**
     - Repeat as requested by owner/operator for the duration of the storm.
   - Plow pervious pavement for snow events with snow accumulation of more than 2 in. as directed by the owner/operator.
     - Raise rubber plow blade to ½ in. above the surface. Repeat as requested by owner/operator for the duration of the storm.
     - Follow guidelines for Decanting and Waste Disposal (see Section 4.4) when removing sediment/trash/organic debris from the site.

4.4 DECANTING

1. Description
   - This section describes the protocol for the disposal of water generated or collected during the performance of pervious pavement routine and restorative maintenance activities.
2. Applicability and Restrictions
   - Sediment-laden and/or chlorinated water must not be discharged into the MS4 or to a structure directly connected to a water body. Decanting can only occur in Combined Sewer areas.
3. Standard Operating Procedures
   - Collect the material removed during the maintenance operation in the truck holding tank, and allow it to settle.
   - Check the collected water for any unusual color or odor that might indicate the presence of oil or other chemicals. If any unusual color or odor is found, notify the owner/operator immediately.
   - Transport the water to the approved decanting inlet or manhole.
   - Decant or filter the water prior to discharging it into an inlet or as directed by the owner/operator. This may require the insertion of inlet filters. Ensure that no sediments are discharged to the inlet. The solids, in slurry form, must be transported to an approved disposal site (See Section 4.4.1).

4.5 WASTE DISPOSAL

1. Description
   - This section describes the protocol for:
     - Disposal of non-hazardous waste materials generated or collected during the performance of pervious pavement routine and restorative maintenance activities
     - Proper containment, transport and disposal of waste material
2. Applicability and Restrictions
   - Waste disposal location must be pre-approved by owner/operator.
3. Standard Operating Procedures
   - Collect the material removed during the maintenance operation in applicable waste storage container (e.g., traps, bins, vacuum/jetter truck storage, etc.).
   - If necessary, decant or filter wet material prior to disposal as discussed in Section 4.4.2.
   - Check the waste material for any unusual color or odor that might indicate the presence of oil or other chemicals. If any unusual color or odor is found, notify the owner/operator immediately.
   - Transport the waste material to the approved disposal site or beneficial end use location, as directed by the owner/operator.
   - Dispose of the waste material as directed by disposal site or beneficial end use personnel.

Table 4-1. Recommended Equipment for Pervious Pavement Maintenance

	ROUTINE MAINTENANCE 4.1	RESTORATIVE MAINTENANCE 4.2	WINTER MAINTENANCE 4.3	WASTE DISPOSAL 4.4	DECANTING 4.5
10+ megapixel digital camera with spare batteries	•	•	•	•	•
Adjustable wrenches	•	•			•
Crowbar					•
Hand tools as necessary for assembling and disassembling hoses	•	•			•
Holding tank equipped with filters or baffles for removal of sediments		•		•	•
Hydraulic lift and dolly				•	
Manhole hooks					•
Measuring wheel to determine distances between structures	•	•			
Pipe wrenches					•
Pliers					•
Regenerative air sweeper with a min. sweeping width of 78 in., storage hopper capacity of 2 cy, dust separator, system pressure of 3500 psi, and hydraulic system capacity of 5 gpm.	•				
Shovel, spades and/or push broom to remove trash/sediment/ debris	•	•		•	
Truck with plow blade & salt distributer			•		

Table 4-2. Recommended Equipment for Pervious Pavement Maintenance (cont'd)

	ROUTINE MAINTENANCE 4.1	RESTORATIVE MAINTENANCE 4.2	WINTER MAINTENANCE 4.3	WASTE DISPOSAL 4.4	DECANTING 4.5
Vacuum sweeper equipment with water hose connection & downward facing jets and min. sweeping width of 144 in., storage hopper capacity of 8 cy, hydraulic system capacity of 16 gpm, and 10 micron dust filter		•			
Vice grips	•	•			•
50 gal. plastic contractor bags	•	•		•	•
All-purpose rags	•	•	•	•	•
Calcium chloride in flake form			•		
Duct Tape	•	•		•	•
Hard copies of permits and access permissions	•	•	•	•	•
Maintenance maps	•	•	•	•	•
Material Safety Data Sheets (MSDS) as applicable	•	•	•		
Potable water	•	•			
Rubber plow blade attachment			•		
Silt sock				•	
Sodium formate in flake or granular form			•		

Appendices

division 5

5.1 PERSONNEL CLASSIFICATIONS

5.1.1 REQUIREMENTS

Various aspects of SMP maintenance require the use of specialized personnel. The following personnel classifications are required to carry out one or more tasks described herein:

Certified arborist: Tree care professional recognized by the International Society of Aboriculture (ISA) as an ISA Certified Arborist ®.

Certified utility specialist arborist: Tree care professional recognized by the ISA as a Utility Specialist ISA Certified Arborist ®.

CCTV camera operator: Professional with a minimum of two (2) years experience in the operation of CCTV equipment for inspection of urban storm sewer systems and/or SMPs with NASSCO PACP certification, traffic control in urban areas, and confined space entry as per OSHA standards.

CCTV camera technician: Professional experienced in the operation of CCTV equipment for inspection of urban storm sewer systems and/or SMPs with NASSCO PACP certification, traffic control in urban areas, and confined space entry as per OSHA standards.

Engineer or engineering technician: Professional with an accredited degree in the field of engineering with experience working on a minimum of two (2) projects involving SMPs.

Environmental scientist or environment technician: Professional with an accredited degree in the field of environmental science with experience working on a minimum of two (2) projects involving vegetation identification and health assessment in an urban environment and/or within SMPs.

Facility/landscape manager or facility/landscape maintenance crew foreman: Professional with a minimum of 5 (5) years experience leading facility/landscape operation and maintenance programs and/or maintenance crews and with a minimum of one (1) year experience in the operation and maintenance of SMPs.

Facility/landscape professional: Professional with a minimum of one (1) year experience performing skilled tasks related to facility/landscape maintenance under the direction of a foreman.

Laborer: Paid worker with experience performing unskilled manual tasks related to facility/landscape maintenance under direction of a foreman.

Landscape architect or landscape designer: Professional educated in the field of landscape architecture with experience working on a minimum of two (2) projects involving vegetation identification and health assessment in an urban environment and/or within SMPs.

Mason: Professional with a minimum of two (2) years experience working with concrete and masonry materials.

Vacuum/jetter operator: Professional with a minimum of two (2) years experience with the maintenance of urban storm sewer systems and/or SMPs using vacuuming and jetting equipment, traffic control in urban areas, and confined space entry as per OSHA standards.

Vacuum/jetter technician: Professional experienced with the maintenance of urban storm sewer systems and/or SMPs using vacuuming and jetting equipment, traffic control in urban areas, and confined space entry as per OSHA standards.

Street Regenerative air sweeper operator: Professional with a minimum of two (2) years experience with the operation of regenerative air sweepers.

Snow plow operator: Professional with a minimum of two (2) years experience with the operation of snow plow and de-icer spreader equipment.

Snow plow technician: Professional experienced with the use of snow plow and de-icer spreader equipment.

5.1.2 SURFACE MAINTENANCE PERSONNEL

Surface maintenance events shall be executed by a standard surface maintenance crew comprised of the following minimum personnel classifications:

- One (1) facility/landscape manager or facility/landscape crew foreman; and
- One (1) facility/landscape professional or, laborer.

5.1.3 SUBSURFACE INSPECTION AND MAINTENANCE PERSONNEL

Subsurface inspection events shall be executed by a standard subsurface inspection crew comprised of the following personnel classifications:

- One (1) CCTV camera operator
- CCTV camera technicians shall be added to the inspection crew as required for site inspection, traffic control, and/or confined space entry.

Subsurface maintenance events shall be executed by a standard subsurface maintenance crew comprised of the following personnel classifications:

- One (1) vacuum/jetter operator.
- Vacuum/jetter technicians shall be added to the maintenance crew as required for site maintenance, traffic control, and/or confined space entry.

5.1.4 PERVIOUS PAVEMENT MAINTENANCE PERSONNEL

Pervious pavement routine maintenance events shall be executed by a standard pervious pavement routine maintenance crew comprised of the following personnel classifications:

- One (1) regenerative air sweeper operator.

Pervious pavement restorative maintenance events shall be executed by a standard pervious pavement restorative maintenance crew comprised of the following personnel classifications:

- One (1) vacuum/jetter operator; and
- One (1) vacuum/jetter technician.
- Vacuum/jetter technicians shall be added to the maintenance crew as required.

Pervious pavement winter maintenance events shall be executed by a standard pervious pavement winter maintenance crew comprised of the following personnel classifications:

- One (1) snow plow operator.
- Snow plow technicians shall be added to the maintenance crew as required.

5.2 POINTS OF CONTACT

NAME	CONTACT INFORMATION
Animal Care and Control Team of Philadelphia	111 W. Hunting Park Ave Philadelphia, PA 267-385-3800 www.acctphilly.org/programs/ac
Emergency Police and Fire Services	9-1-1
Pennsylvania 811 / PA One Call	925 Irwin Run Rd. West Mifflin, PA 15122 8-1-1 (800-242-1776) www.pa1call.org
PWD - Water Emergency and General Information	215-685-6300
PWD - Industrial Waste Unit	215-685-6236
Philadelphia Licenses and Inspections	Philadelphia L&I Municipal Services Building, Concourse Level 1401 J.F.K. Blvd. Philadelphia, PA 19102 **Permits:** 215-686-2567 **Certifications:** 215-686-2448 www.phila.gov/li/Pages/default.aspx

NAME	CONTACT INFORMATION
Philadelphia Streets Department	Philadelphia Department of Streets Municipal Services Building 1401 J.F.K. Blvd. Philadelphia, PA 19102 215-686-5560
	Street Closure Permits: www.philadelphiastreets.com/transportation-highways-street_closure-intro.aspx; and www.philadelphiastreets.com/highways/street-closure-permits
	Illegal Dumping Report: www.potholes.phila.gov/tap.nsf/2cf8da9cb0da9bb9852573c9006b7d99?OpenForm
	Dead Animal Report: www.potholes.phila.gov/tap.nsf/85e1a10ac026ffe58525743600760694?OpenForm
Philadelphia Parks and Recreation	One Parkway Building 10th Floor, 1515 Arch Street Philadelphia, PA 19102 215-686-1776 www.phila.gov/parksandrecreation/Pages/default.aspx
Philly 311	3-1-1 (215-686-8686) www.phila.gov/311

5.3 SAMPLE HYDRANT OPERATION REPORT

HYDRANT OPERATION REPORT

(READ BOTTOM OF FORM PRIOR TO COMPLETING)

NAME (Last, First)	SECTION/COMPANY	PHONE

PERMIT NUMBER	201503710

DATE	CCL KEY SERIAL#	HYDRANT LOCATION	SIZE OF CONNECTION TO HYDRANT	TIME ON	TIME OFF

WATER USAGE		
METERED	*ESTIMATED VOLUME*	
ENTER DIFFERENCE OF METER READINGS (indicate unit)	APPROX. DURATION OF HYDRANT USAGE (in minutes)	ENTER VOLUME OF TANK (gallons)

WATER USAGE may be determined by ONE of the following methods:

A. *Metered* - Enter a meter reading if a meter is used

B. *Estimated* - Indicate the size of the connection to the hydrant and the approx. duration of hydrant usage in minutes

C. *Volume* - Enter size of tank

RETURN COMPLETED FORMS BY THE END OF EACH MONTH TO:

George Stokes, Water Conveyance, 4th fl.
11th & Market Sts., ARAMARK TWR
Phila., PA 19107 (or fax to 685-6207)

PROCEDURE

Each time a hydrant is operated, a record on the Hydrant Operation Report sheet must be made.

1) Enter name of responsible party. City employees, enter name of first line supervisor. Permit holders, enter name of permit holder.

2) Enter Department/Section if City Employee, if permit holder enter name of Company or Group name.

3) Enter Phone number for the responsible party.

4) Enter Permit number, or "City" if City employee

5) Enter Date of Hydrant use.

6) Enter CCL key number, if CCL key is not required, enter N/A.

7) Enter Location of the Hydrant. Enter street name which hydrant faces, followed by nearest cross street. If located at a corner, enter geographic location (eg. For a hydrant on 11th above market, at the north west corner, enter NWC 11th and Market Sts.) If located midblock, enter nearest property address (eg. IFO 3939 Main St.)

8) Enter size of connection to hydrant. This is the size of the hose. A garden hose is considered 3/4". If there is no connection, enter NC, and estimate flow from pictures on reverse side of form.

9) Enter time hydrant turned on.

10) Enter time hydrant turned off.

11) If a meter is used, enter the difference in finish and start readings (note the unit of measurement).

12) If no meter is used, calculate number of minutes the hydrant was turned on (difference between time on and time off).

13) If a tank is filled, enter the known size of the tank (in gallons).

Repeat steps 5 to 13 as often as necessary

14) When operation is complete, replace cap on hydrant to protect nozzle threads, prevent trash from being deposited in barrel, and help insulate hydrant in cold weather.

Glossary

division 6

6. GLOSSARY

The following terms are defined as they apply to this document:

2A Modifed subbase: 2A Modified refers to PennDOT approved graded mixture of finer and larger stone, which gives the material excellent compaction.

Access permissions: Documents granting access to and/or use of a given site (e.g., agreements to enter and maintain SMPs on School District of Philadelphia property, PPR Access Permits, etc.).

Access structure: A portal to subsurface structures within a rain garden. Access structures may also serve additional functions, such as joining subsurface pipes.

Anchor trench: A narrow channel used with staples to secure erosion blanket to the ground surface.

Arborist: An individual engaged in the profession of arboriculture who, through experience, education, and related training, possesses the competence to provide for or supervise the management of trees and other woody plants.

Balled and burlapped stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with the ball size not less than the diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.

Choker/filter course: Permeable layer, typically 1 to 2 in. think, placed underneath pervious pavement to provide a level and stable surface.

Closed-circuit television (CCTV): The use of one or more video cameras to transmit a video signal to one or more monitors and/or to video recording equipment. In the context of this protocol, CCTV refers to the use of remotely controlled camera to view and record the condition of subsurface structures.

Cleanout: A solid vertical pipe capped at the surface that provides access to subsurface pipes for pipe jetting, flushing, vacuum cleaning, and inspection.

Container grown stock: Well-rooted plants grown in a container with root system reaching the sides of the container and maintaining a firm ball when removed from the container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plants required.

Conveyance pipes: Pipes that carry stormwater runoff to, from, or within a SMP.

Crown: The leaves and branches of a tree measured from the lowest branch on the trunk to the top of the tree.

Cultipacker: A tool that helps to create a firm seedbed, by pressing down small debris and stones and smoothing the surface.

Decanting: The process by which a mixture or suspension is separated through filtering and/or settling.

Diameter-Breast-Height (DBH): A width measurement of a tree trunk at 4.5 ft. above the ground; a means to measure the size of the trunk above the root flares.

Distribution pipes: Pipes, including perforated and solid pipes that deliver stormwater runoff to an SMP. Distribution pipes are typically located below ground surface within soil media or drainage gravel, but can also be located at the ground surface.

Dredging: The process of excavating and removing sediment from the bottom of a body of water.

Establishment: The point after planting when a tree's root system has grown sufficiently into the surrounding soil to support shoot growth and anchor the tree.

Establishment watering: A series of watering events that aid in long-term survivorship of newly installed plants.

Failure: Complete loss of function.

Filtering: The process by which a mixture or suspension is separated, by passing the mixture through a filtration medium such as a bed of sand or filter cloth; the fluid phase passes through the medium, while solid materials are trapped.

First flush diverter: An element of a stormwater management practice used to capture debris and pollutants from runoff generated during the initial phase of a rain storm.

Flow control structure: Structural components of stormwater drainage system that detain stormwater and allow its controlled release, e.g., weirs, weir walls, orifices, spillways).

Forebay (or sediment forebay): A pool or basin located immediately down-gradient of a stormwater runoff inflow point. Forebays are storage areas designed to trap and settle sediment or other pollutants. Forebays can either be dry (inundated with water during storm events) or wet (inundated with water continuously).

Geotextile: A permeable synthetic fabric that may surround the media and/or drainage stone in an SMP to prevent stormwater from eroding the underlying subbase.

Green inlet: An inlet placed within an existing gutter or other surface flow path that diverts runoff from paved areas and redirects into a green stormwater infrastructure system.

Green stormwater infrastructure (GSI): Engineered systems that use hydrologic processes of infiltration and evaporation to manage stormwater runoff and provide environmental and community benefits.

Hand removal (weeding): The removal of an entire plant (leaves and root system) by pulling with the hands.

Hardscape: A surface or wall composed of traditional or pervious asphalt or concrete or masonry that is located above ground.

Hazardous waste: The regulatory definition of solid waste is contained in 40 CFR Part 261. Generally, a hazardous waste is waste that is dangerous or potentially harmful to health or the environment.

Herbaceous container: A herbaceous plant (annual or perennial flower, grass, sedge or rush) that is approximately 8 in. to 24 in. tall that is available from nurseries in quart, #1, #2, #3, and #5 sized containers. Roots must be healthy, vigorous and established, reaching the sides of the container, but not encircling the sides of the container.

High-pressure vacuum washing: A method used to remove fine soil and sediment from pervious pavement. Water at a high pressure is used to dislodge soil particles/sediment, contaminants and debris from the pores of pervious pavement. A vacuum must be used in conjunction with the washer to remove the debris.

Herbaceous plug: A herbaceous plant (annual or perennial flower, grass, sedge or rush) that is approximately 2 in. to 8 in. tall and grown in soil within a cylindrical container cell of a tray. The roots must be healthy, vigorous and established, reaching the sides of the container, but not encircling the sides of the container.

Hydroseeding: A seeding process that uses a slurry comprised of seed, water, and mulch using a tank and hose.

Infiltration: A hydrologic process where water drains downward through SMPs and soil subbase to groundwater.

Inlet: A point of entry into the storm water drainage system (storm sewer). Common types of inlets may include grate inlets, curb opening inlets and combination grate and curb opening inlets. Inlets may be constructed with pretreatment structures such as inlet inserts, sumps, inlet traps, and screens. Inlets are connected to SMPs and/or storm sewer networks by lateral pipes.

Inlet or catch basin sump: The area within an inlet or catch basin that is below the deepest conveyance pipe outlet of the structure and which provides capacity for sediment accumulation. Sumps within combined sewer inlets are designed to remain filled with water at all times to prevent the release of sewer gas. Sumps within inlets that are not connected to a combined sewer typically drain through weep holes (a series of small diameter drill holes) located in the bottom of the structure.

Inlet trap and hood: A structure installed within an inlet over the connection of an inlet lateral or distribution pipe to provide protection from floatable trash and debris. In inlets directly connected to a combined sewer system, inlet traps define the standing water level of the inlet sump to prevent the escape of sewer gas from the system. Inlet hoods are typically installed in inlets not connected to a combined sewer.

Inorganic fertilizers: Soil additives that are manufactured from minerals or synthetic chemicals.

Invasive vegetation: A plant species that has the tendency to colonize rapidly and outcompete target species. For the purposes of this manual, invasive plants are those species listed as such by the Pennsylvania Department of Conservation and Natural Resources: (www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20026634.pdf)

Jetting: The process of cleaning stormwater drainage systems using a truck- or trailer-mounted cleaning system which pumps high-pressure water through nozzles placed inside the drainage system. The high-pressure water jet-cleaning device operates on the principle of high-volume, high-speed water movement to wash away accumulated soil particles/sediment, dirt, contaminants or debris, dissolve blockages, and clean interior surfaces. The nozzles are connected to the water supply by up to 500 ft. of hose coiled on a reel. The thrust generated by the jets of water propels the nozzle assembly though the structure. The process is also referred to as High-Velocity Jet Cleaning, Hydrocleaning, Hydraulic Cleaning, or High Pressure Cleaning.

Lateral pipes: Pipes that connect inlets to SMPs and/or storm sewer networks.

Maintenance event: Any on-site event devoted to continued functionality of a SMP, where a crew of trained personnel executes a series of prescribed or reactive tasks.

Manhole: A concrete chamber within sewer networks or connected to inlets that provides surface access, via cast iron manhole lids, to subsurface pipe networks for inspection, pipe jetting, pipe flushing, vacuum cleaning, and entry of trained personnel.

Mechanical removal: The removal of the leaves or stems of a plant through cutting and the use of a sharpened tool or equipment.

Municipal Separate Storm Sewer System (MS4): A municipal storm sewer system that is not combined with the sanitary sewer system; usually discharges stormwater directly to surface water bodies.

Native vegetation: A plant species that is native to the mid-Atlantic region.

Non-native vegetation: A plant species that is not native to the mid-Atlantic region.

Non-target vegetation: A plant species that was not specifically planted/seeded within the SMP and is not desired by the owner/operator. Non-target species may include both native and non-native species.

Organic amendments: Various forms of plant debris that are broken down by natural processes and used to ameliorate soil.

Organic debris: Unwanted living, dead, or decomposing plant or animal matter including leaf litter, branches, fruit, flowers, bark, feces, animal carcasses, etc.

Owner/operator: Organization or individual legally responsible for the operation and maintenance of a SMP.

Pervious area: Surfaces which have the ability to infiltrate water into the soil or subbase.

Pesticides: Substances that control, eradicate, or mitigate pest organisms.

As defined by the State of Pennsylvania and for the purposes of this manual they include, but are not limited to, herbicides, fungicides, insecticides, and rodenticides.

Plant transpiration: A biological process in which plants absorb water through their roots and ultimately evaporate this water to the atmosphere through their leaves or stems.

Planting/seeding event watering: A watering event that occurs directly following the new installation of plants or seeding of an area.

Pre-maintenance inspection: A visual inspection used to determine whether or not maintenance is required and whether maintenance should be routine or reactive.

Pretreatment devices: Structures that capture trash, sediment, and/or other pollutants from stormwater runoff before delivery to a surface detention area or media.

Reactive maintenance: A non-routine maintenance task or event that is performed in response to an observed, often unexpected condition or problem during pre-maintenance inspections or routine maintenance.

Regenerative air sweeping: A method used to remove fine soil and sediment from pervious pavement. Air at a high pressure and at an angle is used to dislodge soil particles/sediment, contaminants and debris from the surface of pervious pavement. The air moves along the width of the sweeping head and the vacuum tube transports the material into the storage hopper. With all the material removed, the clean air is reused.

Risers and outlet control structures: Structures that establish a high water level and regulate the overflow of stormwater SMPs. These structures typically consist of catch basins or vertical pipes set within a detention area.

Routine maintenance: A maintenance event or task that is performed based on pre-maintenance inspection usually to address common, predictable conditions or problems.

Secure container: A container that prevents spilling, leaking or blowing of contained material.

Sediment: Non-organic debris that includes fines, sand, gravel, or soil. The latter may contain some organic components but is still considered sediment.

Settling: A reduction in ground elevation due to compaction or soil voids.

Softscape: Refers to the elements of a landscape that comprise live, horticultural elements. A softscape can include, flowers, plants, shrubs, trees, flower beds, etc.

Soil loss: A reduction in elevation and/or development of void space below surface elevation due to soil migration from its original location.

Soil testing: Laboratory tests to characterize soil properties such as mineral, nutrient, or pollutant content or to measure the range of particle sizes.

Solid waste: The regulatory definition of solid waste is contained in 40 CFR Part 261.2. Generally, a solid waste is a discarded or abandoned material. In this case, solid wastes would be materials such as trash or wastes encountered during GSI maintenance activities.

Storage/media: Storage within a rain garden is provided by an earthen depression storage area and underlying media that accepts, filters, and/or infiltrates stormwater runoff.

Stormwater management practices (SMPs): Individual GSI systems.

Stormwater management practice (SMP) component: A related group of SMP elements (e.g., an underdrain comprised of individual pipe sections, fittings, collars, etc.) associated with a specific SMP.

Stormwater management practice (SMP) element: An individual unit (e.g., a pipe section, pretreatment device, tree, etc.) associated with a specific SMP.

Stormwater management practice (SMP) feature: Any SMP element or SMP component associated with a specific SMP.

Stormwater management practice (SMP) maintenance area: All SMP elements and components designated for routine maintenance by the owner/operator.

Structure: When used to describe a component of a SMP, the term “structure” refers to a structural component, commonly a flow control structure such as an inlet, riser, or trench drain, but also may refer to a wall, weir, or other constructed or hardscaped area.

Subbase: the material beneath an engineered or designed surface.

Subsurface chamber storage: Subsurface chambers, typically made of a modular framework of multiple crate-like or arch-like structures used to store and sometimes infiltrate.

Subsurface maintenance: Any maintenance events and associated tasks that apply to SMP elements that are located below ground and can only be maintained with specialized equipment.

Surface maintenance: Any maintenance events and associated tasks that apply to SMP elements that are located above ground and can be maintained from the surface.

Target vegetation: A plant species that was planted/seeded within the SMP or desired by owner/operator. Target species may be native or non-native.

Trench drains: Narrow channels with solid or grated covers that can convey stormwater runoff. They are typically used to convey stormwater runoff under areas of pedestrian traffic such as sidewalks and are typically constructed of concrete or plastic with cast iron or plastic covers.

Underdrain pipes: Perforated pipes that collect water, often from an infiltration bed, and deliver it to a flow control structure. Underdrain pipes are always located beneath the ground surface and are typically plastic (e.g., HDPE, PVC, etc.).

Vacuum cleaning: The use of a truck-mounted stormwater drainage system cleaning device. The cleaning device operates on the principle of large volume, high-speed air movement to lift water, soil particles/sediment, contaminants and debris. A large tube conveys the collected materials into a tank mounted on the truck. The cleaning device also includes a freshwater supply and high-pressure pump system to flush and clean pipes and structures. Collected material is transported in the truck to approved disposal sites. This process is sometimes called vactoring.

Weed: See “Non-target vegetation.”

Green Stormwater Infrastructure

Maintenance Manual

PHILADELPHIA WATER DEPARTMENT

Appendix B – Flow Monitoring

APPENDIX B –
FLOW MONITORING

Page

Table 1 - Summary of All Monitors

	# of Permanent Monitors	# of Temporary Monitors	# of Unknown Monitors
Combined/Separate Sewer Monitors	469	98	-
Outlying Community Monitors	128	-	1
Pumping Stations	82	-	-
Rain Gages	35	-	-
Total	714	98	1

Table 2 - Listing of Monitored Outlying Community Connections

Site ID	Connection Type	Township	Measurement Name	Measurement Type
MA_1	STD	Abington	TEMPORARY	FLOW
MA_2	MTR	Abington	METERING CHAMBER FLOW	FLOW
MA_2	MTR	Abington	METERING CHAMBER LEVEL	LEVEL
MA_2	MTR	Abington	METERING CHAMBER VELOCITY	VELOCITY
MA_3	STD	Abington	TEMPORARY	FLOW
MA_4	STD	Abington	TEMPORARY	FLOW
MAx1	STD	Abington	TEMPORARY	FLOW
MB_1	MTR	Bucks Co.	METERING CHAMBER FLOW	FLOW
MBE_01	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_01	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_01	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_02	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_02	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_02	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_03	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_03	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_03	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_04	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_04	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_04	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_05	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_05	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_05	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_06	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_06	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_06	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_07	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_07	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_07	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_08	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_08	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_08	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_09	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_09	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_09	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_10	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_10	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL

Site ID	Connection Type	Township	Measurement Name	Measurement Type
MBE_10	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_11	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_11	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_11	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_12	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_12	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_12	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_13	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_13	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_13	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_14	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_14	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_14	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_15		Bensalem	UNMONITORED	
MBE_16	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_16	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_16	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MBE_17	MTR	Bensalem	METERING CHAMBER FLOW	FLOW
MBE_17	MTR	Bensalem	METERING CHAMBER LEVEL	LEVEL
MBE_17	MTR	Bensalem	METERING CHAMBER VELOCITY	VELOCITY
MC_1	MTR	Cheltenham	METERING CHAMBER FLOW	FLOW
MC_1	MTR	Cheltenham	METERING CHAMBER LEVEL	LEVEL
MC_1	MTR	Cheltenham	METERING CHAMBER VELOCITY	VELOCITY
MC_2	MTR	Cheltenham	METERING CHAMBER FLOW	FLOW
MC_2	MTR	Cheltenham	METERING CHAMBER LEVEL	LEVEL
MC_2	MTR	Cheltenham	METERING CHAMBER VELOCITY	VELOCITY
MC_3	MTR	Abington	METERING CHAMBER FLOW	FLOW
MC_3	MTR	Abington	METERING CHAMBER LEVEL	LEVEL
MC_3	MTR	Abington	METERING CHAMBER VELOCITY	VELOCITY
MCx_1	MTR	Cheltenham	METERING CHAMBER FLOW	FLOW
MCx_1	MTR	Cheltenham	METERING CHAMBER LEVEL	LEVEL
MCx_1	MTR	Cheltenham	METERING CHAMBER VELOCITY	VELOCITY
MCx_2	MTR	Cheltenham	METERING CHAMBER FLOW	FLOW
MCx_2	MTR	Cheltenham	METERING CHAMBER LEVEL	LEVEL
MCx_2	MTR	Cheltenham	METERING CHAMBER VELOCITY	VELOCITY
MD_1	MTR	Delaware Co.	METERING CHAMBER FLOW	FLOW
ML_1	MTR	Lower Merion	METERING CHAMBER FLOW	FLOW
ML_1	MTR	Lower Merion	METERING CHAMBER LEVEL	LEVEL

Site ID	Connection Type	Township	Measurement Name	Measurement Type
ML_1	MTR	Lower Merion	METERING CHAMBER VELOCITY	VELOCITY
ML_2	STD	Lower Merion	TEMPORARY	FLOW
ML_3	MTR	Lower Merion	METERING CHAMBER FLOW	FLOW
ML_3	MTR	Lower Merion	METERING CHAMBER LEVEL	LEVEL
ML_3	MTR	Lower Merion	METERING CHAMBER VELOCITY	VELOCITY
ML_4	MTR	Lower Merion	METERING CHAMBER FLOW	FLOW
ML_5	MTR	Lower Merion	METERING CHAMBER FLOW	FLOW
ML_5	MTR	Lower Merion	METERING CHAMBER LEVEL	LEVEL
ML_5	MTR	Lower Merion	METERING CHAMBER VELOCITY	VELOCITY
ML_6	MTR	Lower Merion	METERING CHAMBER FLOW	FLOW
ML_6	MTR	Lower Merion	METERING CHAMBER LEVEL	LEVEL
ML_6	MTR	Lower Merion	METERING CHAMBER VELOCITY	VELOCITY
ML_7	MTR	Lower Merion	METERING CHAMBER FLOW	FLOW
ML_7	MTR	Lower Merion	METERING CHAMBER LEVEL	LEVEL
ML_7	MTR	Lower Merion	METERING CHAMBER VELOCITY	VELOCITY
MLM_1	MTR	Lower Moreland	METERING CHAMBER FLOW	FLOW
MLM_1	MTR	Lower Moreland	METERING CHAMBER LEVEL	LEVEL
MLM_1	MTR	Lower Moreland	METERING CHAMBER VELOCITY	VELOCITY
MLM_2	MTR	Lower Moreland	METERING CHAMBER FLOW	FLOW
MLM_2	MTR	Lower Moreland	METERING CHAMBER LEVEL	LEVEL
MLM_2	MTR	Lower Moreland	METERING CHAMBER VELOCITY	VELOCITY
MLM_3	STD	Lower Moreland	TEMPORARY	FLOW
MLM_4	STD	Lower Moreland	TEMPORARY	FLOW
MLM_5	STD	Lower Moreland	TEMPORARY	FLOW
MLM_6	STD	Lower Moreland	TEMPORARY	UNKNOWN
MLM_7	STD	Lower Moreland	TEMPORARY	UNKNOWN
MPNBC_1	NO	PIDC - PNBC	METERING CHAMBER FLOW	FLOW
MS_1	STD	Springfield	TEMPORARY	FLOW
MS_2	MTR	Springfield	METERING CHAMBER FLOW	FLOW
MS_2	MTR	Springfield	METERING CHAMBER LEVEL	LEVEL
MS_2	MTR	Springfield	METERING CHAMBER VELOCITY	VELOCITY
MS_3	MTR	Springfield	METERING CHAMBER FLOW	FLOW
MS_3	MTR	Springfield	METERING CHAMBER LEVEL	LEVEL
MS_3	MTR	Springfield	METERING CHAMBER VELOCITY	VELOCITY
MS_4	STD	Springfield	TEMPORARY	FLOW
MS_5	STD	Springfield	TEMPORARY	FLOW
MS_6	MTR	Springfield	METERING CHAMBER FLOW	FLOW
MS_6	MTR	Springfield	METERING CHAMBER LEVEL	LEVEL

Site ID	Connection Type	Township	Measurement Name	Measurement Type
MS_6	MTR	Springfield	METERING CHAMBER VELOCITY	VELOCITY
MS_7	STD	Springfield	TEMPORARY	UNKNOWN
MS_8	STD	Springfield	TEMPORARY	FLOW
MSH_1	MTR	Southampton	METERING CHAMBER FLOW	FLOW
MSH_1	MTR	Southampton	METERING CHAMBER LEVEL	LEVEL
MSH_1	MTR	Southampton	METERING CHAMBER VELOCITY	VELOCITY
MSH_2	STD	Southampton	TEMPORARY	FLOW
MSHX_1	STD	Southampton	TEMPORARY	FLOW
MSHX_2	STD	Southampton	TEMPORARY	FLOW
MUD_1	MTR	Upper Darby	METERING CHAMBER NEG FLOW N	FLOW
MUD_1	MTR	Upper Darby	METERING CHAMBER NEG FLOW S	FLOW
MUD_1	MTR	Upper Darby	METERING CHAMBER POS FLOW N	FLOW
MUD_1	MTR	Upper Darby	METERING CHAMBER POS FLOW S	FLOW
MUD_1O	MTR	Upper Darby	METERING CHAMBER FLOW	FLOW
MUD_1O	MTR	Upper Darby	METERING CHAMBER LEVEL	LEVEL
MUD_1O	MTR	Upper Darby	METERING CHAMBER VELOCITY	VELOCITY

*STD – temporary flow monitor

**MTR/NO – Permanent monitor

Table 3 - Listing of Combined/Separate Sewer Monitors

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
C_01	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_01	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_02	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_02	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_04	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_04	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_05	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_05	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_06	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_06	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_07	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_07	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_09	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_09	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_10	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_10	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_11	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_11	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_12	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_12	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_14	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_14	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_15	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_15	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_17	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_17	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_18	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_18	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_19	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_19	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_20	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_20	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_21	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_21	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_22	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_22	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_23	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_23	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
C_24	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_24	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_26	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_26	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_28A	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_28A	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_29	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_29	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_30	Cobbs Creek Low Level	Cobbs Creek	SWO LEVEL	LEVEL
C_30	Cobbs Creek Low Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_31	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_31	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_32	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_32	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_33	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_33	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_34	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_34	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_35	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_35	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_36	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_36	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
C_37	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
C_37	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
CSPS	Central Schuylkill	Schuylkill River	INTERCEPTOR LEVEL N	LEVEL
CSPS	Central Schuylkill	Schuylkill River	INTERCEPTOR LEVEL S	LEVEL
D_02	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_02	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_02	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_02	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_02	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_03	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_03	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_03	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_03	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_03	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_04	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_04	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
D_04	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_04	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_04	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_05	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_05	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_05	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_05	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_05	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_06	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_06	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_06	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_07	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_07	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_07	Upper Delaware Low Level	Delaware River	SWO GATE POSITION 1	POSITION
D_07	Upper Delaware Low Level	Delaware River	SWO GATE POSITION 2	POSITION
D_07	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_07	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_08	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_08	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_09	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_09	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_09	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_09	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_09	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_11	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_11	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_11	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_11	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_11	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_12	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_12	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_13	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_13	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_15	Upper Delaware Low Level	Delaware River	DWO GATE POSITION	POSITION
D_15	Upper Delaware Low Level	Delaware River	DWO LEVEL	LEVEL
D_15	Upper Delaware Low Level	Delaware River	SWO GATE POSITION	POSITION
D_15	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_15	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
D_17	Somerset	Delaware River	SWO LEVEL	LEVEL
D_17	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_18	Somerset	Delaware River	SWO LEVEL	LEVEL
D_18	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_19	Somerset	Delaware River	SWO LEVEL	LEVEL
D_19	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_20	Somerset	Delaware River	SWO LEVEL	LEVEL
D_20	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_21	Somerset	Delaware River	SWO LEVEL	LEVEL
D_21	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_22	Somerset	Delaware River	SWO LEVEL	LEVEL
D_22	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_23	Somerset	Delaware River	SWO LEVEL	LEVEL
D_23	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_24	Somerset	Delaware River	SWO LEVEL	LEVEL
D_24	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_25	Somerset	Delaware River	SWO LEVEL	LEVEL
D_25	Somerset	Delaware River	TRUNK LEVEL	LEVEL
D_37	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_37	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_38	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_38	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_39	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_39	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_40	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_40	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_41	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_41	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_42	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_42	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_43	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_43	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_47	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_47	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_48	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_48	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_49	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_49	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
D_50	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_50	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_51	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_51	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_51A	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_52	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_52	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_53	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_53	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_54	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_54	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_58	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_58	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_61	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_61	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_63	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_63	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_64	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_64	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_65	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_65	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_66	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_66	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_67	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_67	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_68	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_68	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_69	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_69	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_70	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_70	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_72	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_72	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
D_73	Lower Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
D_73	Lower Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
F_03	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_03	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_04	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
F_04	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_05	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_05	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_06	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_06	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_07	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_07	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_08	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_08	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_09	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_09	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_10	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_10	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_11	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_11	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_12	Lower Frankford Low Level	Frankford Creek	SWO LEVEL	LEVEL
F_12	Lower Frankford Low Level	Frankford Creek	TRUNK LEVEL	LEVEL
F_13	Lower Frankford Creek	Frankford Creek	DWO LEVEL	LEVEL
F_13	Lower Frankford Creek	Frankford Creek	SWO LEVEL	LEVEL
F_13	Lower Frankford Creek	Frankford Creek	TRUNK LEVEL	LEVEL
F_14	Lower Frankford Creek	Frankford Creek	SWO LEVEL	LEVEL
F_14	Lower Frankford Creek	Frankford Creek	TRUNK LEVEL	LEVEL
F_23	Lower Frankford Creek	Frankford Creek	SWO LEVEL	LEVEL
F_23	Lower Frankford Creek	Frankford Creek	TRUNK LEVEL	LEVEL
F_24	Lower Frankford Creek	Frankford Creek	SWO LEVEL	LEVEL
F_24	Lower Frankford Creek	Frankford Creek	TRUNK LEVEL	LEVEL
F_25	Lower Frankford Creek	Frankford Creek	DWO GATE POSITION	POSITION
F_25	Lower Frankford Creek	Frankford Creek	SWO GATE POSITION 1	POSITION
F_25	Lower Frankford Creek	Frankford Creek	SWO GATE POSITION 2	POSITION
F_25	Lower Frankford Creek	Frankford Creek	SWO LEVEL	LEVEL
F_25	Lower Frankford Creek	Frankford Creek	TRUNK LEVEL	LEVEL
H_29		Schuylkill River	DWO LEVEL	LEVEL
H_29		Schuylkill River	SWO LEVEL	LEVEL
H_29		Schuylkill River	TRUNK LEVEL	LEVEL
H_35		Schuylkill River	BLOWER 1 RUN	EVENT
H_35		Schuylkill River	BLOWER 2 RUN	EVENT
H_35		Schuylkill River	DAM AIR PRESSURE	PSI
H_35		Schuylkill River	DWO GATE POSITION	POSITION

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
H_35		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
H_35		Schuylkill River	SWO GATE POSITION	POSITION
H_35		Schuylkill River	SWO LEVEL	LEVEL
H_35		Schuylkill River	TRUNK LEVEL	LEVEL
I_BYH09		Byberry Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC07	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC12	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC13	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC14	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC17	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC18	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLC34	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCHLH18	Cobbs Creek High Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCLLC19	Cobbs Creek Low Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCLLC20	Cobbs Creek Low Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCLLC22	Cobbs Creek Low Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCLLC24	Cobbs Creek Low Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCLLC26	Cobbs Creek Low Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_CCLLH01	Cobbs Creek Low Level	Cobbs Creek	INTERCEPTOR LEVEL	LEVEL
I_COHOH16		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSESH11	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSESH15	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSESS09	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSESS14	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSESS17	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSESS26	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CSSSH15	Central Schuylkill	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_CVBH08		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_FHLH03	Frankford High Level	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_FHLTT08	Frankford High Level	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_FHLTT15	Frankford High Level	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_FLLH03	Frankford Low Level	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_LDLLD43	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_LDLLD45	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_LDLLD47	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_LDLLD53	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_LDLLD62	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_LDLLD69	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
I_LDLLD70	Lower Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_LFCH07	Lower Frankford Creek	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_LFCH19	Lower Frankford Creek	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_LFLLF08	Lower Frankford Low Level	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_LFLLF10	Lower Frankford Low Level	Frankford Creek	INTERCEPTOR LEVEL	LEVEL
I_LSESH15	Lower Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_LSESS36	Lower Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_LSWSH01	Lower Schuylkill West Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_LSWSS33	Lower Schuylkill West Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_LSWSS38	Lower Schuylkill West Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_LSWSS45	Lower Schuylkill West Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_MRH21	Main Relief Sewer	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_OH12		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_PASYH13		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_PDRLH01		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_PDRLH02		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_PENRH02		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_PH04	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PH05	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PH06	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PH10	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PMPFH03		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_PP02	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PP04	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PP05	Pennypack	Pennypack Creek	INTERCEPTOR LEVEL	LEVEL
I_PQH09	Poquessing	Poquessing Creek	INTERCEPTOR LEVEL	LEVEL
I_PRH10		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SD19	Somerset	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_SD21	Somerset	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_SD25	Somerset	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_SH03	Somerset	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_SRH05		Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGCHLH01	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGEHLH01	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGH17	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
I_SWMGH20	Southwest Main Gravity	Schuylkill River	C GATE POSITION	POSITION
I_SWMGH20	Southwest Main Gravity	Schuylkill River	E GATE POSITION	POSITION
I_SWMGH20	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGH20	Southwest Main Gravity	Schuylkill River	W GATE POSITION	POSITION
I_SWMGS28	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGS34	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGS43	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGS47	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGS50	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_SWMGWH LH01	Southwest Main Gravity	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
I_UDLLD04	Upper Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_UDLLD08	Upper Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_UDLLH03	Upper Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_UDLLH04	Upper Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_UDLLH07	Upper Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_UDLLH14	Upper Delaware Low Level	Delaware River	INTERCEPTOR LEVEL	LEVEL
I_WBH06		Wissahickon Creek	INTERCEPTOR LEVEL	LEVEL
I_WHLH08	Wissahickon High Level	Wissahickon Creek	INTERCEPTOR LEVEL	LEVEL
I_WLLH11	Wissahickon Low Level	Wissahickon Creek	INTERCEPTOR LEVEL	LEVEL
P_01	Pennypack	Pennypack Creek	SWO LEVEL	LEVEL
P_01	Pennypack	Pennypack Creek	TRUNK LEVEL	LEVEL
P_02	Pennypack	Pennypack Creek	SWO LEVEL	LEVEL
P_02	Pennypack	Pennypack Creek	TRUNK LEVEL	LEVEL
P_03	Pennypack	Pennypack Creek	SWO LEVEL	LEVEL
P_03	Pennypack	Pennypack Creek	TRUNK LEVEL	LEVEL
P_04	Pennypack	Pennypack Creek	SWO LEVEL	LEVEL
P_04	Pennypack	Pennypack Creek	TRUNK LEVEL	LEVEL
P_05	Pennypack	Pennypack Creek	SWO LEVEL	LEVEL
P_05	Pennypack	Pennypack Creek	TRUNK LEVEL	LEVEL
R_06	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
R_06	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
R_07	Main Relief Sewer	Schuylkill River	SWO LEVEL	LEVEL
R_07	Main Relief Sewer	Schuylkill River	TRUNK LEVEL	LEVEL
R_12	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
R_12	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
R_13	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
R_13	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
R_14	Upper Delaware Low Level	Delaware River	SWO LEVEL	LEVEL
R_14	Upper Delaware Low Level	Delaware River	TRUNK LEVEL	LEVEL
R_15	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
R_15	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
R_18	Frankford High Level	Tacony Creek	INTERCEPTOR LEVEL	LEVEL
R_18	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
R_20	Central Schuylkill East Side	Schuylkill River	INTERCEPTOR LEVEL	LEVEL
R_20	Central Schuylkill East Side	Schuylkill River	STORMWATER LEVEL	LEVEL
R_24	Cobbs Creek High Level	Cobbs Creek	SWO LEVEL	LEVEL
R_24	Cobbs Creek High Level	Cobbs Creek	TRUNK LEVEL	LEVEL
S_01	Central Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_01	Central Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_03	Central Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_03	Central Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_04	Central Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_04	Central Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_05	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_05	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_06	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_06	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_07	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_07	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_08	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_08	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_09	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_09	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_10	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_10	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_11	Central Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_11	Central Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_12	Central Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_12	Central Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
S_12A	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_12A	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_13	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_13	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_15	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_15	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_17	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_17	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_18	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_18	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_19	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_19	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_22	Central Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_22	Central Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_23	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_23	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_25	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_25	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_26	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_26	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_27	Central Schuylkill East Side	Schuylkill River	DWO LEVEL	LEVEL
S_27	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_27	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_28	Central Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_28	Central Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_30	Southwest Main Gravity	Schuylkill River	SWO LEVEL	LEVEL
S_30	Southwest Main Gravity	Schuylkill River	TRUNK LEVEL	LEVEL
S_31	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_31	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_32	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_32	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_33	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_33	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_34	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_34	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_35	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_35	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_36	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
S_36	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_36A	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_36A	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_37	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_37	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_38	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_38	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_39	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_39	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_40	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_40	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_42	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_42	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_42A	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_42A	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_43	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_43	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_44	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_44	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_45	Lower Schuylkill West Side	Schuylkill River	DWO LEVEL	LEVEL
S_45	Lower Schuylkill West Side	Schuylkill River	SWO LEVEL	LEVEL
S_45	Lower Schuylkill West Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_46	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_46	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_47	Lower Schuylkill East Side	Schuylkill River	SWO LEVEL	LEVEL
S_47	Lower Schuylkill East Side	Schuylkill River	TRUNK LEVEL	LEVEL
S_50	Southwest Main Gravity	Schuylkill River	SWO LEVEL	LEVEL
S_50	Southwest Main Gravity	Schuylkill River	TRUNK LEVEL	LEVEL
S_51	Southwest Main Gravity	Schuylkill River	SWO LEVEL	LEVEL
S_51	Southwest Main Gravity	Schuylkill River	TRUNK LEVEL	LEVEL
T_01	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_01	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_03	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_03	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_04	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_04	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_05	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_05	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL

Site Name	Interceptor	Waterbody	Measurement Name	Measurement Type
T_06	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_06	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_07	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_07	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_08	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_08	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_09	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_09	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_10	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_10	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_11	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_11	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_12	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_12	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_13	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_13	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_14	Frankford High Level	Tacony Creek	DWO GATE 1	POSITION
T_14	Frankford High Level	Tacony Creek	DWO GATE 2	POSITION
T_14	Frankford High Level	Tacony Creek	SWO CREST GATE	POSITION
T_14	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_14	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL
T_15	Frankford High Level	Tacony Creek	SWO LEVEL	LEVEL
T_15	Frankford High Level	Tacony Creek	TRUNK LEVEL	LEVEL

Table 4 - Listing of all Rain Gages (7/1/2017 - 6/30/2018)

Rain Gage	Location	Percent Working
RG_1	70th and Essington Ave	96.36%
RG_2	66th and Regent St	96.17%
RG_3	Fox Chase Rd. and Castor Ave	99.43%
RG_4	State Rd and Pennypack St	95.91%
RG_5	3rd and Mifflin St	96.34%
RG_6	Cardinal Ave and City Line Ave	96.34%
RG_7	G St. and E Annsbury St	80.90%
RG_8	N Water St. and E Clarkson Ave	95.66%
RG_9	54th and Lancaster Ave	95.84%
RG_10	Pine Rd and Susquehanna Rd	92.71%
RG_11	Rising Sun Ave and Lardner St	93.82%
RG_12	Pattison Ave and Columbus Blvd	94.85%

RG_13	Glendale Ave and Algon Ave	82.19%
RG_14	Delaware Ave and Lewis St	79.18%
RG_15	E Montgomery Ave and Thompson St	95.03%
RG_16	19th and Wood St	99.49%
RG_17	Saul St. and Benner St	95.90%
RG_18	Fox St. and Roosevelt Blvd	95.95%
RG_19	Chew Ave and Sharpnack St	96.13%
RG_20	Woodhaven Rd and Knights Rd	94.43%
RG_21	Shawmont Ave and Eva St	95.36%
RG_22	N 67th and Callowhill St	70.55%
RG_23	Penrose Ave and Mingo Ave	98.93%
RG_24	Lockart Rd and Lockart Ln	98.66%
RG_25	24th and Wolf St	96.18%
RG_26	621 Lehigh Ave	95.13%
RG_27	Grant Ave and Ashford Rd	92.47%
RG_28	1350 Southampton Rd	96.09%
RG_29	Springfield Way and PaperMill Rd	74.21%
RG_30	7609 Montgomery Ave	93.46%
RG_31	Valley Rd and Old Valley Rd	95.99%
RG_32	Rozel Ave and Crushmore Rd	94.19%
RG_33	Jackson St and E Broadway Ave	86.50%
RG_34	Lawrence Rd and Chester Ave	75.44%
RG_35	Hagysford Rd and Tower Lane	45.33%

Table 5 - Listing of All Pumping Station Monitors

Monitor ID	Type of Pumping Station	Measurement Name	Measurement Type	Address
PS_26VA	Storm Water	PUMP 1 RUN	EVENT	26th and Vare Ave
PS_26VA	Storm Water	PUMP 2 RUN	EVENT	27th and Vare Ave
PS_26VA	Storm Water	WET WELL LEVEL	LEVEL	28th and Vare Ave
PS_42ST	Waste Water	PUMP 1 RUN	EVENT	761 S 43rd St
PS_42ST	Waste Water	PUMP 2 RUN	EVENT	762 S 43rd St
PS_42ST	Waste Water	PUMP 3 RUN	EVENT	763 S 43rd St
PS_42ST	Waste Water	WET WELL LEVEL	LEVEL	764 S 43rd St
PS_BANK	Waste Water	PUMP 1 RUN	EVENT	15 S Bank St (Bank & Elbow Ln)
PS_BANK	Waste Water	PUMP 2 RUN	EVENT	16 S Bank St (Bank & Elbow Ln)
PS_BANK	Waste Water	WET WELL LEVEL	LEVEL	17 S Bank St (Bank & Elbow Ln)
PS_BELD	Waste Water	PUMP 1 RUN	EVENT	751 S Manatawna St (Belfry & Steeple)
PS_BELD	Waste Water	PUMP 2 RUN	EVENT	752 S Manatawna St (Belfry & Steeple)
PS_BELD	Waste Water	WET WELL LEVEL	LEVEL	753 S Manatawna St (Belfry & Steeple)
PS_BLVD	Storm Water	PUMP 1 RUN	EVENT	4251 N Broad St (Broad & Roosevelt Blvd)
PS_BLVD	Storm Water	PUMP 2 RUN	EVENT	4252 N Broad St (Broad & Roosevelt Blvd)
PS_BLVD	Storm Water	PUMP 3 RUN	EVENT	4253 N Broad St (Broad & Roosevelt Blvd)
PS_BLVD	Storm Water	PUMP 4 RUN	EVENT	4254 N Broad St (Broad & Roosevelt Blvd)
PS_BLVD	Storm Water	WET WELL LEVEL	LEVEL	4255 N Broad St (Broad & Roosevelt Blvd)
PS_CSPS	Waste Water	N GATE POSITION	POSITION	600 University Ave (34th St Bridge & University)

Monitor ID	Type of Pumping Station	Measurement Name	Measurement Type	Address
PS_CSPS	Waste Water	N SIPHON LEVEL	LEVEL	601 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	N SIPHON LEVEL	LEVEL	602 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	N WET WELL LEVEL	LEVEL	603 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	PUMP 1 RUN	EVENT	604 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	PUMP 2 RUN	EVENT	605 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	PUMP 3 RUN	EVENT	606 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	PUMP 4 RUN	EVENT	607 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	PUMP 5 RUN	EVENT	608 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	PUMP 6 RUN	EVENT	609 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	S GATE POSITION	POSITION	610 University Ave (34th St Bridge & University)
PS_CSPS	Waste Water	S WET WELL LEVEL	LEVEL	611 University Ave (34th St Bridge & University)
PS_FORD	Waste Water	PUMP 1 RUN	EVENT	3800 Ford Rd (Across from West Park Hospital)
PS_FORD	Waste Water	PUMP 2 RUN	EVENT	3801 Ford Rd (Across from West Park Hospital)
PS_FORD	Waste Water	WET WELL LEVEL	LEVEL	3802 Ford Rd (Across from West Park Hospital)
PS_HOGI	Waste Water	PUMP 1 RUN	EVENT	3 Hog Island Rd (east of Airport control tower)
PS_HOGI	Waste Water	PUMP 2 RUN	EVENT	4 Hog Island Rd (east of Airport control tower)
PS_HOGI	Waste Water	WET WELL LEVEL	LEVEL	5 Hog Island Rd (east of Airport control tower)
PS_LIND	Waste Water	PUMP 1 RUN	EVENT	5200 Linden Ave (Linden & Milnor)
PS_LIND	Waste Water	PUMP 2 RUN	EVENT	5201 Linden Ave (Linden & Milnor)

Monitor ID	Type of Pumping Station	Measurement Name	Measurement Type	Address
PS_LIND	Waste Water	WET WELL LEVEL	LEVEL	5202 Linden Ave (Linden & Milnor)
PS_LOCK	Waste Water	PUMP 1 RUN	EVENT	10778 Lockart Rd (Lockart St & Locart Ln)
PS_LOCK	Waste Water	PUMP 2 RUN	EVENT	10779 Lockart Rd (Lockart St & Locart Ln)
PS_LOCK	Waste Water	WET WELL LEVEL	LEVEL	10780 Lockart Rd (Lockart St & Locart Ln)
PS_MILN	Waste Water	PUMP 1 RUN	EVENT	9647 Milnor St (between Grant Ave & Eden St)
PS_MILN	Waste Water	PUMP 2 RUN	EVENT	9648 Milnor St (between Grant Ave & Eden St)
PS_MILN	Waste Water	PUMP 3 RUN	EVENT	9649 Milnor St (between Grant Ave & Eden St)
PS_MILN	Waste Water	WET WELL LEVEL	LEVEL	9650 Milnor St (between Grant Ave & Eden St)
PS_MING	Storm Water	BASIN LEVEL	LEVEL	7000 Penrose Ave (Schuylkill River under Platt Bridge)
PS_MING	Storm Water	PUMP 1 RUN	EVENT	7001 Penrose Ave (Schuylkill River under Platt Bridge)
PS_MING	Storm Water	PUMP 2 RUN	EVENT	7002 Penrose Ave (Schuylkill River under Platt Bridge)
PS_MING	Storm Water	PUMP 3 RUN	EVENT	7003 Penrose Ave (Schuylkill River under Platt Bridge)
PS_MING	Storm Water	PUMP 4 RUN	EVENT	7004 Penrose Ave (Schuylkill River under Platt Bridge)
PS_MING	Storm Water	PUMP 5 RUN	EVENT	7005 Penrose Ave (Schuylkill River under Platt Bridge)
PS_MING	Storm Water	PUMP 6 RUN	EVENT	7006 Penrose Ave (Schuylkill River under Platt Bridge)
PS_NEIL	Waste Water	PUMP 1 RUN	EVENT	4000 Neill Dr (Neill Dr & Falls Rd)
PS_NEIL	Waste Water	PUMP 1 RUN	EVENT	4001 Neill Dr (Neill Dr & Falls Rd)
PS_NEIL	Waste Water	PUMP 3 RUN	EVENT	4002 Neill Dr (Neill Dr & Falls Rd)
PS_NEIL	Waste Water	WET WELL LEVEL	LEVEL	4003 Neill Dr (Neill Dr & Falls Rd)
PS_P120	Waste Water	PUMP 1 RUN	EVENT	
PS_P120	Waste Water	PUMP 2 RUN	EVENT	

Monitor ID	Type of Pumping Station	Measurement Name	Measurement Type	Address
PS_P120	Waste Water	WET WELL LEVEL	LEVEL	
PS_P542	Waste Water	PUMP 1 RUN	EVENT	
PS_P542	Waste Water	PUMP 2 RUN	EVENT	
PS_P542	Waste Water	WET WELL LEVEL	LEVEL	
PS_P603	Waste Water	PUMP 1 RUN	EVENT	2000 Langley Ave (PNBC)
PS_P603	Waste Water	PUMP 2 RUN	EVENT	2001 Langley Ave (PNBC)
PS_P603	Waste Water	WET WELL LEVEL	LEVEL	2002 Langley Ave (PNBC)
PS_P648	Waste Water	PUMP 1 RUN	EVENT	PNBC
PS_P648	Waste Water	PUMP 2 RUN	EVENT	PNBC
PS_P648	Waste Water	WET WELL LEVEL	LEVEL	PNBC
PS_P796	Waste Water	PUMP 1 RUN	EVENT	4801 S 13th St (PNBC)
PS_P796	Waste Water	PUMP 2 RUN	EVENT	4802 S 13th St (PNBC)
PS_P796	Waste Water	PUMP 3 RUN	EVENT	4803 S 13th St (PNBC)
PS_P796	Waste Water	WET WELL LEVEL	LEVEL	4804 S 13th St (PNBC)
PS_POLI	Waste Water	PUMP 1 RUN	EVENT	
PS_POLI	Waste Water	PUMP 2 RUN	EVENT	
PS_POLI	Waste Water	WET WELL LEVEL	LEVEL	
PS_RENN	Waste Water	PUMP 1 RUN	EVENT	11064 Rennard St (Philmont Shopping Center)
PS_RENN	Waste Water	PUMP 2 RUN	EVENT	11065 Rennard St (Philmont Shopping Center)

Monitor ID	Type of Pumping Station	Measurement Name	Measurement Type	Address
PS_RENN	Waste Water	WET WELL LEVEL	LEVEL	11066 Rennard St (Philmont Shopping Center)
PS_SPLA	Waste Water	PUMP 1 RUN	EVENT	9021 Buttonwood Pl (Spring Lane Meadows)
PS_SPLA	Waste Water	PUMP 2 RUN	EVENT	9022 Buttonwood Pl (Spring Lane Meadows)
PS_SPLA	Waste Water	WET WELL LEVEL	LEVEL	9023 Buttonwood Pl (Spring Lane Meadows)

Table 6 - Listing of all Temporary Flow Monitors Deployed by Projects

Site Name	Start	End	Project
D73-000575	6/22/2016	7/7/2017	CSO Model Calibration
C12-000015	6/23/2016	7/7/2017	CSO Model Calibration
LDLL-0115	5/15/2014	8/15/2017	CSO Model Calibration
LDLL-0097	12/8/2016	8/17/2017	CSO Model Calibration
LDLL-0030	12/8/2016	8/18/2017	CSO Model Calibration
LDLL-0047	12/15/2016	8/18/2017	CSO Model Calibration
F21-006997	11/16/2016	11/17/2017	CSO Model Calibration
D40-000017	11/17/2016	11/17/2017	CSO Model Calibration
S13-000010	11/17/2016	11/17/2017	CSO Model Calibration
F23-000010	11/16/2016	11/20/2017	CSO Model Calibration
D02-000020	11/23/2016	12/4/2017	CSO Model Calibration
D66-000010	11/23/2016	12/4/2017	CSO Model Calibration
T01-000010	8/16/2016	12/11/2017	CSO Model Calibration
D72-000015	12/15/2016	12/18/2017	CSO Model Calibration
M005-07-0070	9/27/2012	2/26/2018	Stormwater Monitoring
S051-08-0650	6/7/2017	2/28/2018	Stormwater Monitoring
S05-000012	3/18/2011	Present	CSO Model Calibration
P083-03-S0050	10/11/2011	Present	I/I
S45-001110	10/13/2011	Present	CSO Model Calibration
D63-000035	10/14/2011	Present	CSO Model Calibration
BC-0055	12/1/2011	Present	I/I
IALL-B0355	12/12/2011	Present	I/I
C17-003360	12/13/2011	Present	CSO Model Calibration
T14-013875	2/28/2012	Present	CSO Model Calibration
M005-09-0140	9/27/2012	Present	Stormwater Monitoring
BC-B0755	12/10/2012	Present	I/I
P090-02-S0590	12/10/2012	Present	I/I
D47-000065	12/12/2012	Present	CSO Model Calibration
F21-000145	12/12/2012	Present	CSO Model Calibration
WLL-0565	3/7/2013	Present	I/I
USE-0020	8/13/2013	Present	I/I
PC-0040	1/21/2014	Present	I/I
PP-0065	1/24/2014	Present	I/I
T08-000015	1/24/2014	Present	CSO Model Calibration
D45-000015	5/14/2014	Present	CSO Model Calibration

Site Name	Start	End	Project
LFLL-0015	5/28/2014	Present	CSO Model Calibration
UDLL-0045	5/29/2014	Present	CSO Model Calibration
UFLL-0010	5/29/2014	Present	CSO Model Calibration
USE-0365	5/29/2014	Present	I/I
USE-0400	5/29/2014	Present	I/I
LSE-0015	5/30/2014	Present	CSO Model Calibration
SOM-0040	5/30/2014	Present	CSO Model Calibration
SWMG-B0265	6/24/2014	Present	CSO Model Calibration
UDLL-0085	6/25/2014	Present	CSO Model Calibration
SOM-0220	6/26/2014	Present	CSO Model Calibration
CSE-0030	7/18/2014	Present	CSO Model Calibration
SWMG-0065	7/20/2014	Present	CSO Model Calibration
UDLL-0275	9/15/2014	Present	I/I
IALL-0230	3/2/2015	Present	CSO Model Calibration
IALL-0210	3/3/2015	Present	CSO Model Calibration
WLL-0650	3/10/2015	Present	I/I
IALL-0195	3/12/2015	Present	CSO Model Calibration
OA-0020	3/12/2015	Present	CSO Model Calibration
LSW-0077	3/13/2015	Present	CSO Model Calibration
WLL-0675	3/13/2015	Present	I/I
FCHL-0175	3/16/2015	Present	CSO Model Calibration
THL-0085	4/14/2015	Present	CSO Model Calibration
Yeadon	4/27/2015	Present	I/I
IALL-0008	6/25/2015	Present	CSO Model Calibration
UDLL-0120	7/30/2015	Present	I/I
LDLL-B0200	3/30/2016	Present	CSO Model Calibration
S059-02-S0010	4/22/2016	Present	I/I
S052-05-S0030	4/26/2016	Present	I/I
S051-08-S0015	4/28/2016	Present	I/I
S051-08-S0180	4/29/2016	Present	I/I
S059-04-S0027	5/4/2016	Present	I/I
S051-05-S0015	5/13/2016	Present	I/I
CV-0145	6/24/2016	Present	I/I
CCHL-0065	11/16/2016	Present	CSO Model Calibration
WLL-0028	11/29/2016	Present	I/I

Site Name	Start	End	Project
USE-0235	12/14/2016	Present	I/I
OA-B0145	7/18/2017	Present	CSO Model Calibration
S50-010470	7/26/2017	Present	CSO Model Calibration
S50-000180	7/31/2017	Present	CSO Model Calibration
S50-009135	8/1/2017	Present	CSO Model Calibration
F21-000025	8/2/2017	Present	CSO Model Calibration
S50-000230	8/22/2017	Present	CSO Model Calibration
S50-011230	8/29/2017	Present	CSO Model Calibration
D73-000400	9/1/2017	Present	CSO Model Calibration
S45-000315	10/4/2017	Present	CSO Model Calibration
T14-025815	10/5/2017	Present	CSO Model Calibration
D25-013160	10/17/2017	Present	CSO Model Calibration
P01-000080	10/17/2017	Present	CSO Model Calibration
S38-000247	10/26/2017	Present	CSO Model Calibration
D17-000060	10/27/2017	Present	CSO Model Calibration
D08-000020	11/2/2017	Present	CSO Model Calibration
THL-0045	11/23/2017	Present	CSO Model Calibration
P090-02-0010	3/28/2018	Present	Stormwater Monitoring
P090-02-0330	3/28/2018	Present	Stormwater Monitoring
P091-02-0010	3/28/2018	Present	Stormwater Monitoring
P091-03-0015	4/2/2018	Present	Stormwater Monitoring
D48-003660	4/12/2018	Present	CSO Model Calibration
P099-03-0090	4/13/2018	Present	Stormwater Monitoring
P099-03-0125	4/13/2018	Present	Stormwater Monitoring
P099-03-0010	4/26/2018	Present	Stormwater Monitoring
P091-01-0010	4/28/2018	Present	Stormwater Monitoring
ABN-000035	6/21/2018	Present	Stormwater Monitoring
W095-01-S0015	6/25/2018	Present	I/I

Table 7 - Listing of Outlying Community Contract Limits

Metered	Contract Limits					
Standardized	Instantaneous		Daily Max	Township Total		
Site ID	CFS	MGD	MGD	Inst. CFS	Inst. MGD	Daily Max MGD
MA1						
MA2						
MA3						
MA4						
MAx1						
Abington Total				9.542	6.168	4.453
MB1				74.26	47.996	33
Bucks Total						
MBE1						
MBE2						
MBE3						
MBE4						
MBE5						
MBE6						
MBE7						
MBE8						
MBE9						
MBE10						
MBE11						
MBE12						
MBE13						
MBE14						
MBE15						
MBE16						
Bensalem Total				11.74	7.588	6.133
MC1	2.75	1.777				
MC2	18	11.634				
MC3	0.480	0.31				
MCx1	8	5.171	Combined total for all the MCx#			
MCx2						
MCx3						
MCx4						
MCx5						
MCx6						

Metered	Contract Limits					
Standardized	Instantaneous		Daily Max	Township Total		
Site ID	CFS	MGD	MGD	Inst. CFS	Inst. MGD	Daily Max MGD
MCx7						
Cheltenham Total				20.75	13.411	13.380
MD1	155	100.179	50	155	100	50
DELCORA Total				155	100	50
ML1			5.474			
ML2			1.48			
ML3						
ML4			10.264			
ML5			1.848			
ML6			0.252			
ML7			0.84			
Lower Merion Total				31.57	20.404	14.5
MLM1						
MLM2	3.71	2.4	1.8			
MLM3						
MLM4						
MLM5						
MLM6						
MLM7						
Lower Moreland Total				5.88	3.80	2.85
MS1						
MS2						
MS3						
MS4						
MS5						
MS6						
MS7						
MS8						
Springfield Total				8.58	5.55	4.2
MSH1						
MSH2						
MSHX_1						
MSHX_2						
Southampton Total				15.79	10.205	7.14
MUD-N						
MUD-S						

Metered	**Contract Limits**					
Standardized	**Instantaneous**		**Daily Max**	**Township Total**		
Site ID	**CFS**	**MGD**	**MGD**	**Inst. CFS**	**Inst. MGD**	**Daily Max MGD**
MUD-O						
MUD-1						
Upper Darby Total				35	22.621	17

Appendix C – FY18 CSO Program Maintenance Annual Report

PWD COLLECTOR SYSTEMS - FLOW CONTROL UNIT

2018 CSO Program Maintenance

PHILADELPHIA WATER DEPARTMENT

FLOW CONTROL

FLOW CONTROL UNIT

The Collector System Flow Control Unit's primary responsibilities are divided into four groups; Combined Sewer Overflow (CSO) Regulator Maintenance, Pumping Station Operation & Maintenance, Collector System Instrumentation and CCTV Technical Inspections. The Wastewater Pumping Group main office is located at 5202 Pennypack Street in the Torresdale Raw Water Pumping Station. The WWP Group assembles at this facility, which also has a maintenance machine shop, storage garage, and workshop to handle maintenance assignments. The other three groups have maintenance shops and assemble at the Fox Street Headquarters Facility. Brief descriptions of each group's responsibilities and their 2018 fiscal year highlights follow.

CSO REGULATOR MAINTENANCE GROUP

Inspecting and servicing the combined sewer overflow regulating and diversion chambers are completed by 19 Interceptor maintenance personnel. This group is responsible for the operations, maintenance, inspections and cleaning of 175 combined sewer-regulating chambers, 89 tide gate chambers, 26 storm relief chambers, 12 sanitary flow diversions, several siphons and other related wastewater control devices throughout the collection system.

Currently the Philadelphia Water Department Flow Control Unit maintains ten types of CSO regulators and storage systems:

- Brown & Brown (B&B) mechanical
- Computer Controlled Sluice Gates
- Computer Controlled B&B Shutter Gates
- Static Dams
- Slot type regulators
- Mechanical Sluice Gates
- Side Overflow Weirs
- Inflatable Rubber Dam
- Water Hydraulic Sluice Gates
- Computer Controlled Crest Gates

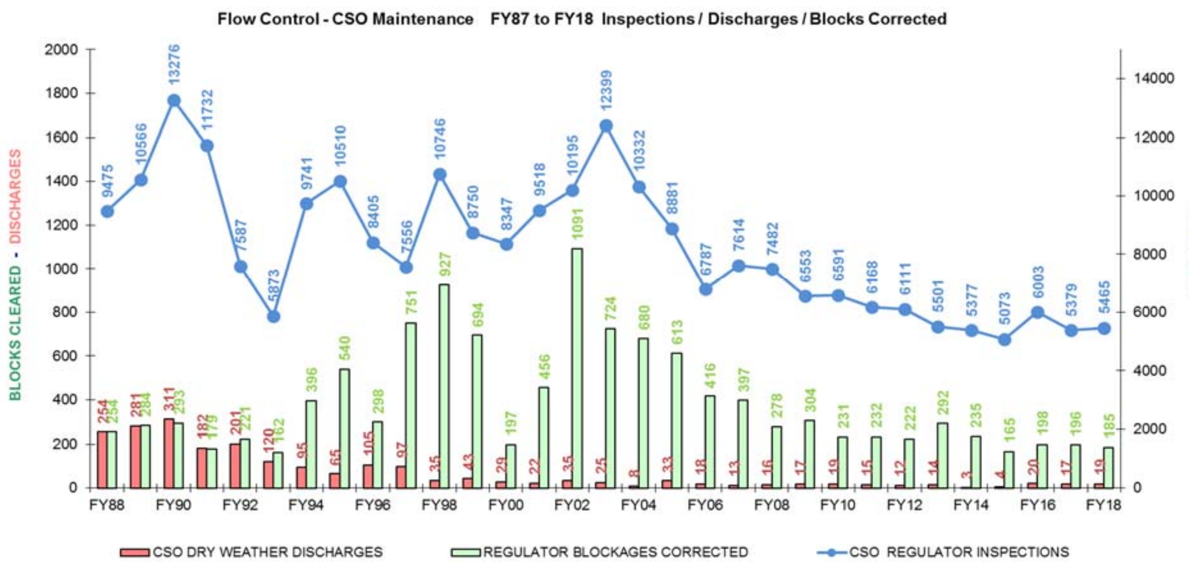
Mechanical or operational malfunctions of regulators and tide gates can cause dry weather discharges and stream and river inflow. These types of events can have a major impact on the Wastewater and Fresh Water Treatment Plant's performance and the quality of stream water. They can also affect the recreational use of our local waterways. Thus, the combined sewer regulator systems are closely monitored for potential blockages and when identified the problems are corrected quickly. CSO chamber Inspections and clearing of any regulator blockages prior to causing a dry weather discharge are the primary responsibilities of this group and are key areas in assessing the group's overall performance.

By continually tracking and analyzing Dry Weather Discharges it can be determined if new or modified maintenance procedures would help to prevent them from occurring. Although our established procedures have greatly reduced the number and duration of these discharges, the combined system picks up all manner of trash and debris that is unpredictable in its pattern of causing flow disruptions. Despite incorporating best management practices such as having all inlets trapped and cleaned, preventative maintenance schedules for sewer flushing and cleaning of the regulators, CCTV inspection of DWO pipes, etc., it is virtually impossible to eliminate all blockages before they occur.

The PWD Flow Control Unit continues to aggressively control and minimize these dry weather overflows by utilizing the latest technology-based controls including our Collector System Remote Monitoring Network that currently includes over 320 sites with over 720 individual level and/or flow measurements. Training the CSO maintenance personnel in the use of the system's computer programs for analyzing the trend data has developed a comprehensive understanding of individual CSO sites and their distinctive flow patterns. This familiarity helps them recognize abnormal conditions quickly at a location so that they can respond before the conditions develop into a dry weather CSO blockage or discharge.

The CSO Maintenance Group performed 5465 inspections of the regulating chambers in FY2018. The work includes frequent visual inspections of the equipment and flow patterns to make sure everything is operating properly. The more comprehensive work such as the cleaning and lubricating of the mechanical equipment is scheduled during lower flow periods between rain events.

In FY2018, the crews cleared 185 regulator blockages before they developed into a CSO dry weather discharge. There were nineteen CSO dry weather discharges for this fiscal year.



Many discharges are a result of debris such as rags, sticks, stones and other debris that become lodged in the CSO regulator diversion or the dry weather outlet pipe during dry weather periods. These types of blockages are virtually unpredictable so frequent inspections and closely observing the monitoring trend data is essential to our prevention program. Following moderate to heavy rain events the CSO regulators can have grit, sticks, rags and other debris caught at various places in and around the regulator that could eventually result in a discharge. The CSO maintenance crews perform quick topside inspections of the CSO sites throughout the City for several days following these events to remove or clear away any of this storm debris. The work schedule will then revert to the more comprehensive maintenance such as cleaning, lubricating, adjusting equipment and performing minor repairs to the mechanical regulators.

The S-22 regulator had numerous problems this year and the results were 7 discharges from this regulator. The issue was discussed with the Collector’s Support Engineering group and the modeling group and it was decided that the S-22 regulator would be chained open without any impact on the system.

WASTEWATER PUMPING STATION MAINTENANCE GROUP

The Wastewater Pumping Station Maintenance Group consisting of 24 maintenance personnel are located at the 5202 Pennypack St. Maintenance Shop. They are responsible for the operations and maintenance of 16 wastewater-pumping stations, 3 stormwater pumping stations, 2 sodium hypochlorite dosing stations, 11 computer controlled CSO storage regulators and several in-line and offline wastewater-storage facilities among other duties.

Many of the pumping stations provide for only one running pump and one reserve pump. This arrangement means that pump breakdowns are responded to immediately and that overhauls need to be completed in a minimum amount of time. The main pump availability statistic is a good indicator of the Maintenance Group's performance in this area. The main pumping units were in service 99% of the time in FY2018. The WWP Group completed twelve main wastewater pump overhauls at the stations. These overhauls consist of repair and replacement of the worn pump and motor components to bring the equipment's performance up to new operating condition.

The Wastewater Pumping Station Maintenance Group had no main pumps out of service during fiscal year 2018 because of failures or breakdowns. The reason for this is that during pump maintenance and overhauls the in-service pump was rotated out of activity and replaced by the spare pump for the station. This accomplishes two things, one the station always has its full complement of pumps available and the spare pump for the station gets used. The only pump station that did have a pump out or was not at full capacity was the Central Schuylkill Pump station which is going through a Capital Project of replacing all pumps. Pump #6 was out of service for 8 weeks while the replacement was being completed. The pump went back in service in April and the project is continuing with the next pumps being replaced in the next fiscal year.

In addition to the pumping station maintenance, the group maintains a variety of other equipment throughout the Collector System. They are responsible for the operations and maintenance of the two sodium hypochlorite dosing stations. The stations are located next to the Queen Lane Raw Water pumping station, which injects hypo into the Upper Schuylkill East Interceptor, and at the Totem Rd. pumping station, which injects hypo into the Bucks County force main. The group is responsible for maintaining adequate supply of the chemical, over 1,028,534 gallons in FY2018, for monitoring the downstream hydrogen sulfide levels and adjusting the dosage levels in addition to the maintenance and repair of the equipment.

The group also fabricates and repairs bar screens, debris grills and other equipment for the Collector System and performs major maintenance of the CSO mechanical regulators such as installation of tide gates, overflow gates and servicing of the Brown & Brown regulators.

COLLECTOR SYSTEM INSTRUMENTATION MAINTENANCE GROUP

The fourteen Instrument and Electronic Technicians located at the Fox Street facility are primarily responsible for installing, calibrating and maintaining the electronic and instrumentation equipment in the Collector System monitoring and control network. They also repair, calibrate and certify the hazardous gas detection meters for the Department as well as install temporary flow and level monitors for various units in the Water Department.

One of the primary responsibilities of the CS Instrumentation Group is to maintain the network of level sensors, flow meters, and rain gauges and keep them up and running with a minimum of downtime while maintaining accurate and reliable data. The network currently consists of 258 level and flow monitoring locations in the NE, SE, and SW Drainage Districts, 35 gauges in the citywide rain gauge network, 56 Township flow-metering stations, and a number of additional monitors at various control sites. It is crucial that the remote site equipment is communicating and downloading data to the server so that the information is available for trend chart viewing and analysis for the users. The CSO maintenance group relies heavily on these charts to monitor the performance of all the CSO regulators while paying special attention to the sites that have had recent or a history of discharges. The monitoring data is used for a wide variety of other purposes such as calibrating the Collector System's hydraulic model, generating township sewage flows for billing and for various Planning and Engineering studies.

CCTV TECHNICAL INSPECTIONS GROUP

The Technical Inspections group consists of one Supervisor, one group leader, and fourteen Technicians who operate and maintain the seven closed circuit TV camera trucks. The seven CCTV trucks and CCTV Contractor logged 51.44 miles of sewer inspections in FY 2018.

The CCTV group has several primary functions which include inspections of sewers turned in for sewer complaints, special inspection requests from the Water/ Sewer Design group and the post construction inspection program which involves videoing the sewer at the completion of all sewer construction work. Another function of the group is to work with the Defective Connection Program group to identify the defective lateral connections.

The CCTV group also started doing the Post-Construction and Pre-Maintenance Inspections for Green Infrastructure. The CCTV Unit completed 395 Post Construction Inspections and 1187 Pre-Maintenance Inspections in FY 2018.

SERVICE LEVEL GOALS

The goal of the Flow Control Unit is to maintain and exceed the service level goals. One area that directly affects the service level of the Flow Control Unit is personnel vacancies.

Month	CSO Discharges per 100 Inspections	% Metering Chambers Operational	% CSO Level Meters Operational	CCTV Inspections -	Main Pump Availability -
Goal -->	0	95% or Higher	90% or Higher	2.8 Miles	95% or Higher
July - 2017	0.3	94.0%	96.3%	2.69	100.00%
August - 2017	0.2	90.0%	97.1%	4.58	100.00%
September - 2017	0.4	86.0%	94.4%	4.57	100.00%
October - 2017	0.2	95.0%	93.6%	7.57	98.70%
November - 2017	0.5	92.0%	91.7%	8.51	98.20%
December - 2017	0	92.0%	95.6%	5.88	98.20%
January - 2018	0	91.0%	93.2%	3.82	98.20%
February - 2018	0.2	91.0%	96.8%	3.22	98.20%
March - 2018	0	91.0%	95.8%	2.30	98.20%
April - 2018	0.4	90.0%	95.7%	2.81	98.20%
May - 2018	1.5	88.0%	94.3%	2.60	99.30%
June - 2018	0.5	88.0%	94.1%	2.89	100.00%
TOTALS/Averages	0.35	91%	94.9%	51.44	99%

FLOW CONTROL PERSONNEL SUMMARY

The Flow Control Unit makes every effort to fill all 92 approved positions in order to maintain the service level goals.

92 Flow Control Positions [92 Listed]	Active	Vacant	Total
Clerk III	1	0	1
Clerk Typist II	1	1	2
Community Apprentice	2	0	2
Data Services Support Clerk	1	0	1
Electrician 1	1	2	3
Electronic Equipment Supervisor	2	0	2
Electronic Technician 1	4	2	6
Electronic Technician 2	15	0	15
Electronic Technician Grp. Ldr.	3	0	3
Ind. Process Mach. Mech. Grp. Ldr.	2	0	2
Industrial Electrician 1	3	0	3
Industrial Electrician Group Leader	1	0	1
Industrial Process Mach. Mech.	6	0	6
Instrumentation Technician I	8	0	8
Interceptor Service Worker I	4	4	8
Interceptor Service Worker II	5	1	6
Interceptor Services Supervisor	2	0	2
Mach. & Equipment Mech.	8	1	9
Public Works Maintenance Trainee	5	0	5
Semiskilled Laborer	1	0	1
Sewer Maintenance Inspector	1	0	1
Water Conveyance Sys. Asst. Supt. (P)	2	0	2
Water Conveyance Sys. Supt.	1	0	1
Water Operations Repair Helper	2	0	2
Totals	81	11	92

APPENDICES

- Appendix A - FY 2018 Annual CSO Report Spreadsheets
- Appendix B - FY 2018 Annual CSO Miscellaneous Site & Maintenance Report
- Appendix C - FY 2018 Main Pump Availability Chart
- Appendix D - Historical CSO Charts

Appendix A
FY 2018 Annual CSO Spreadsheets

PART 1 **DRY WEATHER STATUS REPORT**

PHILADELPHIA WATER DEPARTMENT
WASTE AND STORM WATER COLLECTION
FLOW CONTROL UNIT

Section 1
July 2017-June 2018

COLLECTOR	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Totals
UPPER PENNYPACK - 5 UNITS													
INSPECTIONS	10	13	12	11	13	18	12	12	12	10	11	14	148
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	1	0	1	0	0	1	0	0	0	0	1	4
UPPER DELAWARE LOW LEVEL - 12 UNITS													
INSPECTIONS	21	42	26	37	25	33	26	39	24	37	29	26	365
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	2	4	1	3	4	5	1	11	0	4	0	0	35
LOWER FRANKFORD CREEK - 6 UNITS													
INSPECTIONS	19	14	17	22	16	24	12	11	16	18	21	10	200
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	7	0	2	1	0	0	0	1	1	0	3	1	16
LOWER FRANKFORD LOW LEVEL - 10 UNITS													
INSPECTIONS	23	43	31	42	30	35	19	21	27	37	34	26	368
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	1	3	1	3	1	1	3	0	1	2	0	0	16
FRANKFORD HIGH LEVEL - 14 UNITS													
INSPECTIONS	27	52	54	58	38	54	31	25	36	57	51	37	520
DISCHARGES	0	0	0	0	0	0	0	1	0	0	1	2	4
BLOCKS CLEARED	0	0	3	5	3	2	0	1	1	1	2	2	20
SOMERSET - 9 UNITS													
INSPECTIONS	18	20	24	29	17	27	21	21	24	23	19	20	263
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	1	1	0	1	1	0	0	2	3	0	0	0	9
LOWER DELAWARE LOW LEVEL - 33 UNITS													
INSPECTIONS	54	66	70	70	63	79	75	65	46	76	69	61	794
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	2	1	2	2	0	2	4	1	1	1	2	3	21
CENTRAL SCHUYLKILL EAST - 18 UNITS													
INSPECTIONS	39	42	47	45	28	39	44	32	43	38	35	41	473
DISCHARGES	1	0	0	0	0	0	0	0	0	1	0	0	2
BLOCKS CLEARED	3	3	1	0	0	1	1	0	0	1	0	0	10
LOWER SCHUYLKILL EAST - 9 UNITS													
INSPECTIONS	17	21	18	21	21	15	19	23	24	26	24	22	251
DISCHARGES	0	0	1	0	0	0	0	0	0	1	0	0	2
BLOCKS CLEARED	0	0	0	0	0	0	2	0	0	3	0	0	5
CENTRAL SCHUYLKILL WEST - 9 UNITS													
INSPECTIONS	18	22	19	26	19	19	19	21	22	19	27	21	252
DISCHARGES	0	1	0	1	1	0	0	0	0	0	4	0	7
BLOCKS CLEARED	3	3	0	2	0	2	0	4	2	3	1	3	23
SOUTHWEST MAIN GRAVITY - 10 UNITS													
INSPECTIONS	21	21	23	21	24	18	21	24	21	21	22	26	263
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	2	0	0	0	0	0	0	0	0	0	2	4
LOWER SCHUYLKILL WEST - 4 UNITS													
INSPECTIONS	5	8	10	8	8	8	8	8	15	6	9	10	103
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	0	0	0	0	0	0	0	0	0	1	1
COBBS CREEK HIGH LEVEL - 23 UNITS													
INSPECTIONS	50	55	52	61	47	63	49	59	50	48	49	52	635
DISCHARGES	0	0	0	0	1	0	0	0	0	0	1	0	2
BLOCKS CLEARED	1	2	0	1	0	3	2	1	2	0	0	2	14
COBBS CREEK LOW LEVEL - 13 UNITS													
INSPECTIONS	13	25	29	24	16	25	26	22	22	26	25	25	278
DISCHARGES	0	0	1	0	0	0	0	0	0	0	1	0	2
BLOCKS CLEARED	0	0	0	0	0	2	0	1	1	2	0	0	6
RELIEF SEWERS - 26 UNITS													
INSPECTIONS	36	50	45	56	37	69	48	44	30	42	57	38	552
DISCHARGES	0	0	0	0	0	0	0	0	0	0	0	0	0
BLOCKS CLEARED	0	0	0	0	0	0	0	0	0	0	1	0	1
TOTALS / MONTH for 201 REGULATOR UNITS													Totals
TOTAL INSPECTIONS	371	494	477	531	402	526	430	427	412	484	482	429	5465
TOTAL DISCHARGES	1	1	2	1	2	0	0	1	0	2	7	2	19
TOTAL BLOCKS CLEARED	20	20	10	19	9	18	14	22	12	17	9	15	185
AVER. # of INSP. / BC	19	25	48	28	45	29	31	19	34	28	54	29	32
DISC / 100 INSPECTIONS	0.3	0.2	0.4	0.2	0.5	0.0	0.0	0.2	0.0	0.4	1.5	0.5	0.3

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
UPPER PENNYPACK 5 NEWPC UNITS															
P01	2	3	2	2	2	3	2	2	2	2	2	2	26	2.2	14.0
P02	2	2	2	2	2	4	2	2	2	2	2	3	27	2.3	13.5
P03	2	3	3	2	3	4	3	3	3	2	3	3	34	2.8	10.7
P04	2	3	3	3	3	4	3	3	2	2	2	4	34	2.8	10.7
P05	2	2	2	2	3	3	2	2	3	2	2	2	27	2.3	13.5
UPPER DELAWARE LOW LEVEL 12 NEWPC UNITS															
D02	2	3	2	3	2	3	3	2	2	3	3	2	30	2.5	12.2
D03	3	5	2	3	2	4	3	11	2	3	3	3	44	3.7	8.3
D04	3	3	2	4	2	2	2	7	2	3	3	3	36	3.0	10.1
D05	2	4	2	3	2	2	2	2	2	4	2	2	29	2.4	12.6
D06	2	4	2	3	2	4	2	2	2	2	2	2	29	2.4	12.6
D07	2	4	2	3	2	3	2	2	2	3	2	2	29	2.4	12.6
D08	1	5	3	3	2	3	2	2	2	3	3	2	31	2.6	11.8
D09	1	3	2	4	2	3	2	2	2	3	3	2	29	2.4	12.6
D11	1	3	2	3	2	2	2	3	2	3	2	2	27	2.3	13.5
D12	1	3	3	2	2	2	2	2	2	2	2	2	25	2.1	14.6
D13	1	3	2	2	2	2	2	2	2	2	2	2	24	2.0	15.2
D15	2	2	2	4	3	3	2	2	2	6	2	2	32	2.7	11.4
LOWER FRANKFORD CREEK 6 NEWPC UNITS															
F13	3	3	4	4	3	4	2	2	3	4	3	1	36	3.0	10.1
F14	3	3	5	4	3	4	2	2	3	3	4	2	38	3.2	9.6
F21	3	2	2	4	2	4	1	1	2	3	3	2	29	2.4	12.6
F23	2	2	2	3	3	4	4	3	3	3	5	2	36	3.0	10.1
F24	2	2	2	3	3	4	2	3	2	3	3	2	31	2.6	11.8
F25	6	2	2	4	2	4	1		3	2	3	1	30	2.7	12.2
LOWER FRANKFORD LOW LEVEL 10 NEWPC UNITS															
F03	2	3	3	3	3	4	2	2	2	3	3	3	33	2.8	11.1
F04	2	3	3	3	3	3	2	2	2	2	3	3	31	2.6	11.8
F05	3	3	3	3	3	3	2	2	2	4	4	3	35	2.9	10.4
F06	2	10	3	7	3	4	2	2	2	4	4	3	46	3.8	7.9
F07	2	3	2	4	3	3	2	2	2	4	3	3	33	2.8	11.1
F08	3	2	3	4	3	3	2	2	2	3	3	3	33	2.8	11.1
F09	2	9	7	4	4	4	2	2	4	4	4	2	48	4.0	7.6
F10	2	3	3	4	3	4	2	2	2	3	2	2	32	2.7	11.4
F11	3	4	2	6	3	4	1	2	6	6	4	2	43	3.6	8.5
F12	2	3	2	4	2	3	2	3	3	4	4	2	34	2.8	10.7
FRANKFORD HIGH LEVEL 14 NEWPC UNITS															
T01	2	2	4	3	4	3	2	1	2	3	2	2	30	2.5	12.2
T03	2	6	5	6	3	5	2	2	2	6	6	4	49	4.1	7.4
T04	2	5	6	6	3	5	2	2	2	6	6	3	48	4.0	7.6
T05	2	5	5	3	3	4	2	2	2	3	4	2	37	3.1	9.9
T06	2	5	4	3	3	4	2	2	2	2	5	2	36	3.0	10.1
T07	2	4	4	2	3	4	2	2	2	2	4	2	33	2.8	11.1
T08	2	4	3	5	2	4	2	2	3	5	5	2	39	3.3	9.4
T09	2	4	3	5	2	4	2	2	3	4	3	2	36	3.0	10.1
T10	2	2	3	5	3	4	3	2	4	5	3	2	38	3.2	9.6
T11	2	3	4	4	3	3	2	2	3	4	3	7	40	3.3	9.1
T12	2	3	3	5	3	4	2	1	3	5	2	3	36	3.0	10.1
T13	2	5	4	4	2	4	4	1	4	6	4	2	42	3.5	8.7
T14	2	2	3	4	2	3	2	2	2	3	2	2	29	2.4	12.6
T15	1	2	3	3	2	3	2	2	2	3	2	2	27	2.3	13.5

4 TOTAL DISCHARGES FOR NE & SE DISTRICTS

0.3 AVERAGE DISCHARGES PER MONTH

11.8 AVER. DAYS BEFORE RETURNING TO SITE

3.6 AVER. INSPECTIONS PER DAY PER CREW

DTR = DAYS TO RETURN TO SITE

I/D/C = INSPECTIONS PER DAY PER CREW

I/D = INSPECTIONS PER DISCHARGE

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
SOMERSET LOW LEVEL 9 NEWPC UNITS															
D17	2	2	3	3	2	3	2	2	2	3	3	2	29	2.4	12.6
D18	1	4	3	3	2	3	2	2	2	3	2	3	30	2.5	12.2
D19	2	2	3	3	2	3	2	2	2	3	2	2	28	2.3	13.0
D20	1	2	3	3	2	3	2	2	2	3	2	2	27	2.3	13.5
D21	1	2	2	3	1	3	1	2	1	2	2	2	22	1.8	16.6
D22	1	2	3	3	2	3	2	2	2	3	2	2	27	2.3	13.5
D23	2	2	3	3	2	3	2	2	2	2	2	2	27	2.3	13.5
D24	2	2	2	3	2	3	2	2	2	2	2	2	26	2.2	14.0
D25	6	2	2	5	2	3	6	5	9	2	2	3	47	3.9	7.8
LOWER DELAWARE LOW LEVEL 33 SEWPC UNITS															
D37	2	2	3	2	2	3	2	4	2	3	2	2	29	2.4	12.6
D38	3	2	2	2	2	3	2	4	2	3	2	6	33	2.8	11.1
D39	2	2	2	2	2	3	2	2	5	3	2	2	29	2.4	12.6
D40	2	2	2	2	2	3	2	2	2	3	2	2	26	2.2	14.0
D41	2	2	2	2	2	3	2	2	3	3	2	2	27	2.3	13.5
D42	2	2	2	2	2	2	2	2	2	2	2	2	24	2.0	15.2
D43	2	5	2	2	2	2	2	2	2	2	2	2	27	2.3	13.5
D44	1	2	2	2	1	2	2	3	2	2	1	2	22	1.8	16.6
D45	2	2	2	3	2	6	2	2	1	2	2	2	28	2.3	13.0
D46	2	2	2	3	2	2	2	2	1	2	2	2	24	2.0	15.2
D47	2	2	2	3	2	2	2	2	1	2	2	2	24	2.0	15.2
D48	1	2	2	2	2	2	2	2	1	2	2	2	22	1.8	16.6
D49	2	2	2	2	2	2	2	2	1	2	2	2	23	1.9	15.9
D50	2	2	2	2	2	2	3	2	1	2	2	1	23	1.9	15.9
D51	1	2	2	2	2	3	2	2	1	2	5	1	25	2.1	14.6
D52	1	2	2	2	2	2	3	2	1	2	3	1	23	1.9	15.9
D53	2	2	2	2	2	2	8	2	1	2	2	1	28	2.3	13.0
D54	2	2	2	2	2	2	3	2	3	2	2	1	25	2.1	14.6
D58	1	2	2	3	2	2	2	2	1	3	2	2	24	2.0	15.2
D61	1	2	2	2	2	2	2	2	1	3	2	1	22	1.8	16.6
D62	1	2	3	2	2	2	2	2	1	2	3	1	23	1.9	15.9
D63	1	2	2	2	2	2	2	2	1	1	2	1	20	1.7	18.2
D64	1	2	2	2	2	2	2	2	1	2	2	1	21	1.8	17.4
D65	1	2	2	2	2	2	2	2	1	2	2	5	25	2.1	14.6
D66	1	2	2	2	2	2	2	2	1	2	2	1	21	1.8	17.4
D67	3	2	2	2	4	2	2	2	1	3	2	2	27	2.3	13.5
D68	3	2	2	2	2	5	2	2	1	3	2	3	29	2.4	12.6
D69	2	2	2	2	2	2	3	2	1	4	2	2	26	2.2	14.0
D70	2	2	2	2	2	2	2	2	1	2	2	2	23	1.9	15.9
D71	2	1	2	2	1	2	2		1	2	2	2	19	1.7	19.2
D72	1	1	4	2	1	2	2		1	2	1	1	18	1.6	20.3
D73		1	2	2		2	2		1	2	2	1	15	1.7	24.3
	1	2	2	2	2	2	1	2		2	2	1			
TOTAL	172	250	234	269	202	270	196	194	185	258	234	194	2658		
I /D/C	2.8	4.1	3.8	4.4	3.3	4.4	3.2	3.2	3.0	4.2	3.8	3.2			
UP	10	13	12	11	13	18	12	12	12	10	11	14	148	2.5	12.5
UDLL	21	42	26	37	25	33	26	39	24	37	29	26	365	2.5	12.3
LFC	19	14	17	22	16	24	12	11	16	18	21	10	200	2.8	11.1
LFLL	23	43	31	42	30	35	19	21	27	37	34	26	368	3.1	10.1
FHL	27	52	54	58	38	54	31	25	36	57	51	37	520	3.1	10.1
SLL	18	20	24	29	17	27	21	21	24	23	19	20	263	2.4	13.0
LDLL	54	66	70	70	63	79	75	65	46	76	69	61	775	2.0	15.4

CSO REGULATING CHAMBER DISCHARGE

NEWPC & SEWPC PLANT REGULATORS

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
UPPER PENNYPACK 5 NEWPC UNITS													
P01													0
P02													0
P03													0
P04													0
P05													0
UPPER DELAWARE LOW LEVEL 12 NEWPC UNITS													
D02													0
D03													0
D04													0
D05													0
D06													0
D07													0
D08													0
D09													0
D11													0
D12													0
D13													0
D15													0
LOWER FRANKFORD CREEK 6 NEWPC UNITS													
F13													0
F14													0
F21													0
F23													0
F24													0
F25													0
LOWER FRANKFORD LOW LEVEL 10 NEWPC UNITS													
F03													0
F04													0
F05													0
F06													0
F07													0
F08													0
F09													0
F10													0
F11													0
F12													0
FRANKFORD HIGH LEVEL 14 NEWPC UNITS													
T01													0
T03													0
T04													0
T05													0
T06													0
T07													0
T08													0
T09													0
T10													0
T11												2	2
T12								1					1
T13											1		1
T14													0
T15													0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
SOMERSET LOW LEVEL 9 NEWPC UNITS													
D17													0
D18													0
D19													0
D20													0
D21													0
D22													0
D23													0
D24													0
D25													0
LOWER DELAWARE LOW LEVEL 33 SEWPC UNITS													
D37													0
D38													0
D39													0
D40													0
D41													0
D42													0
D43													0
D44													0
D45													0
D46													0
D47													0
D48													0
D49													0
D50													0
D51													0
D52													0
D53													0
D54													0
D58													0
D61													0
D62													0
D63													0
D64													0
D65													0
D66													0
D67													0
D68													0
D69													0
D70													0
D71													0
D72													0
D73													0
D75													0
													TOTAL DISC
	0	0	0	0	0	0	0	1	0	0	1	2	4

													TOTAL
UP	0	0	0	0	0	0	0	0	0	0	0	0	0
UDLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LFC	0	0	0	0	0	0	0	0	0	0	0	0	0
LFLL	0	0	0	0	0	0	0	0	0	0	0	0	0
FHL	0	0	0	0	0	0	0	1	0	0	1	2	4
SLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LDLL	0	0	0	0	0	0	0	0	0	0	0	0	0

	NO OF UNITS IN DISTRICT BLOCKED												TOTAL
UP	0	0	0	0	0	0	0	0	0	0	0	0	0
UDLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LFC	0	0	0	0	0	0	0	0	0	0	0	0	0
LFLL	0	0	0	0	0	0	0	0	0	0	0	0	0
FHL	0	0	0	0	0	0	0	1	0	0	1	1	3
SLL	0	0	0	0	0	0	0	0	0	0	0	0	0
LDLL	0	0	0	0	0	0	0	0	0	0	0	0	0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
UPPER PENNYPACK 5 NEWPC UNITS													
P01		1											1
P02													0
P03							1						1
P04				1								1	2
P05													0
UPPER DELAWARE LOW LEVEL 12 NEWPC UNITS													
D02		1											1
D03		1				2		10					13
D04								1		1			2
D05										1			1
D06				1									1
D07													0
D08		2	1	2			1						6
D09													0
D11													0
D12													0
D13					1								1
D15	2				3	3				2			10
LOWER FRANKFORD CREEK 6 NEWPC UNITS													
F13											1		1
F14			2					1			1		4
F21	1												1
F23				1					1		1		3
F24												1	1
F25	6												6
LOWER FRANKFORD LOW LEVEL 10 NEWPC UNITS													
F03													0
F04			1										1
F05													0
F06		1		3									4
F07					1		1						2
F08													0
F09	1	2							1				4
F10							1						1
F11						1	1			2			4
F12													0
FRANKFORD HIGH LEVEL 14 NEWPC UNITS													
T01						1							1
T03													0
T04				1									1
T05													0
T06			1										1
T07													0
T08					1								1
T09													0
T10				1	1	1			1				4
T11													0
T12												1	1
T13			2	3	1					1	2	1	10
T14													0
T15								1					1

10.08 AVERAGE BLOCKAGES PER MONTH

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
SOMERSET LOW LEVEL 9 NEWPC UNITS													
D17													0
D18													0
D19		1						1					2
D20					1			1					2
D21													0
D22													0
D23													0
D24													0
D25	1			1					3				5
LOWER DELAWARE LOW LEVEL 33 SEWPC UNITS													
D37	1												1
D38										1		1	2
D39	1												1
D40								1					1
D41									1			1	2
D42													0
D43													0
D44													0
D45						1							1
D46													0
D47													0
D48		1											1
D49													0
D50													0
D51			1			1					1		3
D52													0
D53							4						4
D54													0
D58												1	1
D61			1										1
D62				1									1
D63													0
D64													0
D65				1									1
D66											1		1
D67													0
D68													0
D69													0
D70													0
D71													0
D72													0
D73													0
D75													0
													TOTAL
	13	10	9	16	9	10	9	16	7	8	7	7	121
UP	0	1	0	1	0	0	1	0	0	0	0	1	4
UDLL	2	4	1	3	4	5	1	11	0	4	0	0	35
LFC	7	0	2	1	0	0	0	1	1	0	3	1	16
LFLL	1	3	1	3	1	1	3	0	1	2	0	0	16
FHL	0	0	3	5	3	2	0	1	1	1	2	2	20
SLL	1	1	0	1	1	0	0	2	3	0	0	0	9
LDLL	2	1	2	2	0	2	4	1	1	1	2	3	21

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
CENTRAL SCHUYLKILL EAST SIDE 18 SWWPC UNITS															
S05	4	2	3	2	2	2	3	2	2	2	2	3	29	2.4	12.6
S06	2	2	3	2	2	2	2	2	2	2	2	2	25	2.1	14.6
S07	2	6	3	3	2	2	2	2	2	2	2	2	30	2.5	12.2
S08	2	3	3	2	2	2	2	2	2	2	2	2	26	2.2	14.0
S09	1	2	2	2	2	2	2	2	2	2	2	2	23	1.9	15.9
S10	1	2	3	2	2	2	2	2	2	2	2	2	24	2.0	15.2
S12	3	2	4	4	2	2	3	2	2	2	2	3	31	2.6	11.8
S12A	2	2	4	4	2	2	3	2	1	2	1	2	27	2.3	13.5
S13	5	2	3	3	2	3	3	2	3	4	2	3	35	2.9	10.4
S15	3	2	3	4	2	2	4	3	6	3	2	2	36	3.0	10.1
S16	2	2	2	2	1	2	3	2	3	2	2	2	25	2.1	14.6
S17	2	2	2	2	1	2	3	1	3	2	2	2	24	2.0	15.2
S18	1	2	2	2	1	2	2	2	3	3	2	3	25	2.1	14.6
S19	1	2	2	3	1	4	2	2	2	2	2	2	25	2.1	14.6
S21	2	2	2	2	1	2	2	1	2	2	2	2	22	1.8	16.6
S23	3	3	2	2	1	2	2	1	2	2	2	3	25	2.1	14.6
S25	2	2	2	2	1	2	2	1	2	1	2	2	21	1.8	17.4
S26	1	2	2	2	1	2	2	1	2	1	2	2	20	1.7	18.2
LOWER SCHUYLKILL EAST SIDE 9 SWWPC UNITS															
S31	1	2	2	2	2	2	2	2	2	2	3	2	24	2.0	15.2
S35	1	2	2	2	2	1	2	2	2	2	3	2	23	1.9	15.9
S36	1	1	1	2	2	1	1	1	2	2	2	1	17	1.4	21.5
S36A	1	2	3	2	2	1	2	2	2	6	3	2	28	2.3	13.0
S37	1	1	1	2	1	1	1	1	1	1	1	1	13	1.1	28.1
S42	7	7	4	4	6	3	2	6	6	6	7	8	66	5.5	5.5
S42A	1	2	2	2	2	3	5	5	5	3	2	3	35	2.9	10.4
S44	1	1	1	2	1	1	1	1	1	1	1	1	13	1.1	28.1
S46	3	3	2	3	3	2	3	3	3	3	2	2	32	2.7	11.4
CENTRAL SCHUYLKILL WEST 9 SWWPC UNITS															
S01	2	2	2	4	2	2	2	2	2	2	2	3	27	2.3	13.5
S02	2	2	2	3	2	3	2	2	2	2	2	3	27	2.3	13.5
S03	2	2	2	3	2	2	2	4	2	2	2	2	27	2.3	13.5
S04	1	3	2	2	2	2	2	2	2	2	3	2	25	2.1	14.6
S11	1	2	2	2		2	2	2	3	2	2	2	22	2.0	16.6
S14	1	2	2	2	1	2	2	2	2	2	2	2	22	1.8	16.6
S20	1	2	3	3	2	1	2	2	3	2	2	1	24	2.0	15.2
S22	5	5	2	5	5	3	3	3	4	4	10	4	53	4.4	6.9
S24	3	2	2	2	3	2	2	2	2	1	2	2	25	2.1	14.6
SOUTHWEST MAIN GRAVITY 10 SWWPC UNITS															
S27	2	2	2	2	3	2	2	2	2	2	2	2	25	2.1	14.6
S28	2	2	2	2	3	2	2	2	2	2	2	2	25	2.1	14.6
S30	2	2	2	2	2	2	2	3	2	1	2	2	24	2.0	15.2
S34	1	2	2	2	2	2	2	3	2	2	2	3	25	2.1	14.6
S39	2	2	2	2	2	2	2	2	2	1	2	4	25	2.1	14.6
S40	1	2	2	2	3	1	2	2	2	1	2	2	22	1.8	16.6
S43	2	2	3	1	2	2	2	1	2	1	2	2	22	1.8	16.6
S47	2	2	3	1	1	2	2	2	2	1	2	2	22	1.8	16.6
S50	4	3	3	4	3	1	3	4	3	6	4	4	42	3.5	8.7
S51	3	2	2	3	3	2	2	3	2	4	2	3	31	2.6	11.8
LOWER SCHUYLKILL WEST SIDE 4 SWWPC UNITS															
S32	2	2	2	2	2	2	2	2	4	2	2	3	27	2.3	13.5
S33	1	2	2	2	2	3	2	2	4	2	2	3	27	2.3	13.5
S38	1	2	2	2	2	1	2	2	4	1	2	2	23	1.9	15.9
S45	1	2	4	2	2	2	2	2	3	1	3	2	26	2.2	14.0

15 TOTAL DISCHARGES IN SW DISTRICT DTR = DAYS TO RETURN TO SITE

1.3 AVERAGE DISCHARGES PER MONTH I/D/C = INSPECTIONS PER DAY PER CREW

14.8 AVER. DAYS BEFORE RETURNING TO SITE I/D = INSPECTIONS PER DISCHARGE

2.1 AVER. INSPECTIONS PER DAY PER CREW

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL	AVER	DTR
COBBS CREEK HIGH LEVEL 24 SWWPC UNITS															
C01	2	2	2	3	2	5	2	3	2	2	2	2	29	2.4	12.6
C02	2	2	2	3	2	4	2	3	2	2	2	2	28	2.3	13.0
C04	2	2	2	3	2	3	2	3	2	2	2	2	27	2.3	13.5
C04A	2	2	2	3	2	3	2	3	2	2	2	2	27	2.3	13.5
C05	1	2	2	3	2	3	2	3	2	2	2	2	26	2.2	14.0
C06	2	2	3	3	3	3	2	3	3	2	2	2	30	2.5	12.2
C07	3	2	3	4	2	3	2	3	2	2	2	2	30	2.5	12.2
C09	3	2	2	4	2	3	2	3	2	2	2	2	29	2.4	12.6
C10	2	6	2	3	2	3	2	3	1	2	2	2	30	2.5	12.2
C11	3	3	4	3	2	3	2	4	3	3	3	3	36	3.0	10.1
C12	3	2	2	3	2	1	2	2	2	2	2	2	25	2.1	14.6
C13	2	2	2	2	2	1	2	2	2	2	1	2	22	1.8	16.6
C14	2	2	2	2	2	3	2	2	2	2	2	3	26	2.2	14.0
C15	2	2	2	2	2	2	2	2	2	2	2	2	24	2.0	15.2
C16	2	2	2	2	2	2	2	2	2	2	2	2	24	2.0	15.2
C17	2	2	2	2	2	2	2	2	2	2	2	2	24	2.0	15.2
C18	1	2	2	2	1	2	2	2	2	2	3	4	25	2.1	14.6
C31	2	2	2	2	2	3	4	2	3	2	2	2	28	2.3	13.0
C32	2	3	2	2	1	3	1	2	2	1	2	2	23	1.9	15.9
C33	2	2	2	2	2	3	2	2	2	2	2	2	25	2.1	14.6
C34	2	2	2	2	3	2	2	2	2	2	2	2	25	2.1	14.6
C35	2	2	2	2	1	2	2	2	2	2	2	2	23	1.9	15.9
C36	2	2	2	2	2	2	2	2	2	2	2	2	24	2.0	15.2
C37	2	3	2	2	2	2	2	2	2	2	2	2	25	2.1	14.6
COBBS CREEK LOW LEVEL 12 SWWPC UNITS															
C19	1	2	2	2	2	2	2	2	2	3	3	2	25	2.1	14.6
C20	1	2	2	2	3	2	2	2	2	2	2	2	24	2.0	15.2
C21	1	2	2	2	1	2	2	2	2	2	2	2	22	1.8	16.6
C22	1	2	2	2	1	2	2	2	2	2	3	3	24	2.0	15.2
C23	1	2	3	2	1	2	2	2	2	2	2	2	23	1.9	15.9
C24	1	2	2	2	2	2	2	2	2	2	2	2	23	1.9	15.9
C25	2	2	6	2	2	3	4	2	2	3	2	2	32	2.7	11.4
C26	1	2	2	2	1	2	2	2	2	2	2	2	22	1.8	16.6
C27	1	3	2	2	1	2	2	2	2	2	2	2	23	1.9	15.9
C28A	1	2	2	2	1	2	2	2	2	2	2	2	22	1.8	16.6
C29	1	2	2	2	1	2	2	2	1	2	2	2	21	1.8	17.4
C30	1	2	2	2		2	2		1	2	1	2	17	1.7	21.5
TOTAL	163	194	198	206	163	187	186	189	197	184	191	197	2255		
I /D/C	1.8	2.1	2.2	2.3	1.8	2.0	2.0	2.1	2.2	2.0	2.1	2.2			
CSES	39	42	47	45	28	39	44	32	43	38	35	41	473	2.2	14.2
LSES	17	21	18	21	21	15	19	23	24	26	24	22	251	2.3	16.6
CSW	18	22	19	26	19	19	19	21	22	19	27	21	252	2.4	13.9
SWMG	21	21	23	21	24	18	21	24	21	21	22	26	263	2.2	14.4
LSW	5	8	10	8	8	8	8	8	15	6	9	10	103	2.1	14.2
CCHL	50	55	52	61	47	63	49	59	50	48	49	52	635	2.2	14.0
CCLL	13	25	29	24	16	25	26	22	22	26	25	25	278	2.0	16.0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
CENTRAL SCHUYLKILL EAST SIDE 18 SWWPC UNITS													
S05													0
S06													0
S07													0
S08													0
S09													0
S10													0
S12													0
S12A													0
S13	1									1			2
S15													0
S16													0
S17													0
S18													0
S19													0
S21													0
S23													0
S25													0
S26													0
LOWER SCHUYLKILL EAST SIDE 9 SWWPC UNITS													
S31													0
S35													0
S36													0
S36A										1			1
S37													0
S42			1										1
S42A													0
S44													0
S46													0
CENTRAL SCHUYLKILL WEST 9 SWWPC UNITS													
S01													0
S02													0
S03													0
S04													0
S11													0
S14													0
S20													0
S22		1		1	1						4		7
S24													0
SOUTHWEST MAIN GRAVITY 10 SWWPC UNITS													
S27													0
S28													0
S30													0
S34													0
S39													0
S40													0
S43													0
S47													0
S50													0
S51													0
LOWER SCHUYLKILL WEST SIDE 4 SWWPC UNITS													
S32													0
S33													0
S38													0
S45													0

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
COBBS CREEK HIGH LEVEL 24 SWWPC UNITS													
C01													0
C02													0
C04													0
C04A													0
C05													0
C06													0
C07													0
C09													0
C10													0
C11													0
C12													0
C13													0
C14													0
C15					1								1
C16													0
C17													0
C18											1		1
C31													0
C32													0
C33													0
C34													0
C35													0
C36													0
C37													0
COBBS CREEK LOW LEVEL 12 SWWPC UNITS													
C19													0
C20													0
C21													0
C22											1		1
C23													0
C24													0
C25			1										1
C26													0
C27													0
C28A													0
C29													0
C30													0
													TOTAL DISC
	1	1	2	1	2	0	0	0	0	2	6	0	15

	NO OF UNITS IN DISTRICT BLOCKED												TOTAL
CSE	1	0	0	0	0	0	0	0	0	1	0	0	2
LSE	0	0	1	0	0	0	0	0	0	1	0	0	2
CSW	0	1	0	1	1	0	0	0	0	0	1	0	4
SWG	0	0	0	0	0	0	0	0	0	0	0	0	0
LSW	0	0	0	0	0	0	0	0	0	0	0	0	0
CCHL	0	0	0	0	1	0	0	0	0	0	1	0	2
CCLL	0	0	1	0	0	0	0	0	0	0	1	0	2

	NO OF DISCHARGES IN DISTRICT												TOTAL
CSE	1	0	0	0	0	0	0	0	0	1	0	0	2
LSE	0	0	1	0	0	0	0	0	0	1	0	0	2
CSW	0	1	0	1	1	0	0	0	0	0	4	0	7
SWG	0	0	0	0	0	0	0	0	0	0	0	0	0
LSW	0	0	0	0	0	0	0	0	0	0	0	0	0
CCHL	0	0	0	0	1	0	0	0	0	0	1	0	2
CCLL	0	0	1	0	0	0	0	0	0	0	1	0	2

CSO REGULATING CHAMBER MONTHLY BLOCKS CLEARED

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
CENTRAL SCHUYLKILL EAST SIDE 18 SWWPC UNITS													
S05													0
S06	1	1											2
S07													0
S08		1											1
S09													0
S10													0
S12													0
S12A													0
S13	1	1					1						3
S15													0
S16										1			1
S17													0
S18													0
S19			1										1
S21													0
S23						1							1
S25	1												1
S26													0
LOWER SCHUYLKILL EAST SIDE 9 SWWPC UNITS													
S31													0
S35													0
S36													0
S36A							1			2			3
S37													0
S42													0
S42A										1			1
S44													0
S46							1						1
CENTRAL SCHUYLKILL WEST 9 SWWPC UNITS													
S01													0
S02													0
S03		1						2					3
S04		1											1
S11													0
S14				1									1
S20													0
S22	3	1		1		2		2	2	3	1	3	18
S24													0
SOUTHWEST MAIN GRAVITY 10 SWWPC UNITS													
S27													0
S28													0
S30		1											1
S34												1	1
S39													0
S40													0
S43		1											1
S47												1	1
S50													0
S51													0
LOWER SCHUYLKILL WEST SIDE 4 SWWPC UNITS													
S32													0
S33													0
S38												1	1
S45													0

5.727 AVERAGE BLOCKAGES PER MONTH

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
COBBS CREEK HIGH LEVEL 24 SWWPC UNITS													
C01													0
C02													0
C04				1									1
C04A													0
C05													0
C06													0
C07	1												1
C09													0
C10		2				1	1						4
C11													0
C12													0
C13													0
C14													0
C15													0
C16												1	1
C17													0
C18												1	1
C31						2		1					3
C32													0
C33									1				1
C34							1		1				2
C35													0
C36													0
C37													0
COBBS CREEK LOW LEVEL 12 SWWPC UNITS													
C19								1	1				2
C20										2			2
C21													0
C22													0
C23													0
C24													0
C25						1							1
C26													0
C27													0
C28A													0
C29						1							1
C30													0
													TOTAL
	7	10	1	3	0	8	5	6	5	9	1	8	63

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
CSE	3	3	1	0	0	1	1	0	0	1	0	0	10
LSE	0	0	0	0	0	0	2	0	0	3	0	0	5
CSW	3	3	0	2	0	2	0	4	2	3	1	3	23
SWG	0	2	0	0	0	0	0	0	0	0	0	2	4
LSW	0	0	0	0	0	0	0	0	0	0	0	1	1
CCHL	1	2	0	1	0	3	2	1	2	0	0	2	14
CCLL	0	0	0	0	0	2	0	1	1	2	0	0	6

RELIEF SEWER MONTHLY INSPECTION

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
THOMAS RUN RELIEF SEWER													
R01	2	3	2	2	2	3	2	2	1	2	3	2	26
R02	2	2	2	2	2	3	2	2	1	2	3	2	25
R03	2	2	2	2	2	3	2	2	1	2	3	2	25
R04	2	2	2	2	2	3	2	2	1	2	3	2	25
R05	2	2	2	2	2	3	2	2	1	2	3	2	25
R06	2	2	2	2	2	3	2	2	2	2	2	2	25
MAIN RELIEF SEWER													
R07	1	2	2	3	2	3	2	2	2	1	2	2	24
R08	1	2	2	2	2	3	2	2	2	1	3	2	24
R09	1	2	2	2	2	3	2	2	2	1	3	2	24
R10	1	2	2	2	2	3	2	2	2	1	3	2	24
R11	1	2	2	2	2	3	2	2	1	2	1	2	22
R11A	1	2	2	2	2	3	2	2	1	2	1	2	22
R12	1	2	2	2	1	3	2	1	1	2	2	1	20
WAKLING RELIEF SEWER													
R13	2	2	2	3	2	3	2	2	2	2	2	1	25
R14	2	2	2	2	2	3	2	2	1	2	2	1	23
ROCK RUN STORM FLOOD RELIEF SEWER													
R15	1	3	2	2		2	2	2	2	2	2	1	21
OREGON AVE RELIEF SEWER													
R16	1	2	2	3		2	2	1		1	2	1	17
R17	1	2	2	3		2	2	2		1	2	1	18
FRANKFORD HIGH LEVEL RELIEF SEWER													
R18	2	2	2	2	2	4	2	2	2	2	2	1	25
32ND ST RELIEF SEWER													
R19		2	1	1		2	1			1	1	1	10
MAIN STREET RELIEF SEWER													
R20	1	2		2		2	2		2	2	2	1	16
SOMERSET SYSTEM DIVERSION CHAMBER													
R21													0
TEMPORARY REGULATOR CHAMBER													
R22													
R23	1	1		2		2	2	1	1	2	2	2	16
ARCH ST RELIEF SEWER													
R24	2	1	2	3	3	2	2	3		1	3	1	23
16TH & SNYDER													
R25	2	2	2	4	2	3	1	2		2	3	1	24
GRANT & STATE RD. RELIEF													
R26	2	2	2	2	1	3	2	2	2	2	2	1	23
TOTAL	36	50	45	56	37	69	48	44	30	42	57	38	552
AVER	1.3	1.9	1.7	2.1	1.4	2.6	1.8	1.6	1.1	1.6	2.1	1.4	1.7

RELIEF SEWER MONTHLY DISCHARGE

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
THOMAS RUN RELIEF SEWER													
R01													0
R02													0
R03													0
R04													0
R05													0
R06													0
MAIN RELIEF SEWER													
R07													0
R08													0
R09													0
R10													0
R11													0
R11A													0
R12													0
WAKLING RELIEF SEWER													
R13													0
R14													0
ROCK RUN STORM FLOOD RELIEF SEWER													
R15													0
OREGON AVE RELIEF SEWER													
R16													0
R17													0
FRANKFORD HIGH LEVEL RELIEF SEWER													
R18													0
32ND ST RELIEF SEWER													
R19													0
MAIN STREET RELIEF SEWER													
R20													0
SOMERSET SYSTEM DIVERSION CHAMBER													
R21													0
TEMPORARY REGULATOR CHAMBER													
R22													0
R23													0
ARCH ST RELIEF SEWER													
R24													0
16TH & SNYDER													
R25													0
GRANT & STATE RD. RELIEF													
R26													0
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0
UNITS	0	0	0	0	0	0	0	0	0	0	0	0	

RELIEF SEWER MONTHLY BLOCKS CLEARED

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
THOMAS RUN RELIEF SEWER													
R01													0
R02													0
R03													0
R04													0
R05											1		1
R06													0
MAIN RELIEF SEWER													
R07													0
R08													0
R09													0
R10													0
R11													0
R11A													0
R12													0
WAKLING RELIEF SEWER													
R13													0
R14													0
ROCK RUN STORM FLOOD RELIEF SEWER													
R15													0
OREGON AVE RELIEF SEWER													
R16													0
R17													0
FRANKFORD HIGH LEVEL RELIEF SEWER													
R18													0
32ND ST RELIEF SEWER													
R19													0
MAIN STREET RELIEF SEWER													
R20													0
SOMERSET SYSTEM DIVERSION CHAMBER													
R21													0
TEMPORARY REGULATOR CHAMBER													
R22													0
R23													0
ARCH ST RELIEF SEWER													
R24													0
16TH & SNYDER													
R25													0
GRANT & STATE RD. RELIEF													
R26													0
TOTAL	0	0	0	0	0	0	0	0	0	0	1	0	1
AVER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

FY18 CSO Dry Weather Discharge Listing

Discharge Observed		Discharge Stopped		Last Inspection						
Date	Time	Date	Time	Date	Time	Site ID	Collector	Type Unit	Location	Comment
7/25/2017	11:50 AM	7/25/2017	12:10 PM	7/24/2017	2:10 PM	S-13	CSES	SLOT	Samson St. W of 24th St.	GRIT IN SLOT.
8/23/2017	1:10 PM	8/23/2017	1:40 PM	8/18/2017	10:20 AM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	DEBRIS IN SHUTTER GATE
9/25/2017	9:00 AM	9/25/2017	9:30 AM	9/23/2017	1:20 PM	C-25	CCLL	SLOT	Woodland Ave. E of Island Ave.	DEBRIS IN DWO PIPE.
9/27/2017	10:20 AM	9/27/2017	11:00 AM	9/20/2017	11:00 AM	S-42	LSES	B & B	Passyunk Ave. & 29th St.	FLOAT CHAIN BROKE AND SHUTTER GATE CLOSED.
10/10/2017	11:20 AM	10/10/2017	11:40 AM	9/18/2017	9:10 AM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	SHUTTER GATE STUCK IN CLOSE POSITION.
11/8/2017	10:50 AM	11/8/2017	11:40 AM	10/23/2017	9:00 AM	C-15	CCHL	SLOT	59th St. & Cobbs Creek Parkway	LEAVES AND STICKS IN SLOT.
11/20/2017	9:00 AM	11/20/2017	9:20 AM	11/17/2017	8:40 AM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	SHUTTER GATE STUCK IN CLOSED POSITION.
2/20/2018	9:40 AM	2/20/2018	10:20 AM	1/30/2018	11:10 AM	T-12	FHL	SLOT	Whitaker Ave. E of Tacony Creek	SLOT BLOCKED WITH GRIT.
4/3/2018	10:00 AM	4/3/2018	10:30 AM	3/16/2018	9:20 AM	S-13	CSES	SLOT	Samson St. W of 24th St.	LARGE ROCK INSIDE SLOT.
4/9/2018	9:30 AM	4/9/2018	9:50 AM	4/6/2018	2:30 PM	S-36A	LSES	B & B	34th St. & Mifflin St.	DEBRIS IN REGULATOR INLET AND SHUTTER GATE.
5/14/2018	9:10 AM	5/14/2018	9:20 AM	5/1/2018	11:10 AM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	SHUTTER GATE WAS STUCK IN CLOSE POSITION
5/14/2018	9:20 AM	5/14/2018	9:40 AM	5/14/2018	10:30 AM	C-22	CCLL	SLOT	70th St. & Cobbs Creek Parkway	3 BUNDLES OF SHOPPING CIRCULARS.
5/14/2018	10:20 AM	5/14/2018	10:50 AM	5/7/2018	11:30 AM	C-18	CCHL	SLOT	60th St. @ Cobbs Creek Parkway	PIECES OF CONSTRUCTION WOOD IN SLOT.
5/17/2018	9:40 AM	5/17/2018	9:50 AM	5/15/2018	9:30 AM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	SHUTTER GATE STUCK IN CLOSE POSITION
5/18/2018	9:20 AM	5/18/2018	9:40 AM	5/14/2018	11:20 AM	T-13	FHL	SLOT	Whitaker Ave. W of Tacony Creek	TREE BRANCHES IN SLOT.
5/21/2018	9:10 AM	5/21/2018	9:30 AM	5/18/2018	1:40 PM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	SHUTTER GATE CLOSED.
5/29/2018	8:40 AM	5/29/2018	9:00 AM	5/22/2018	10:40 AM	S-22	CSW	B & B	660 ft S of South St E of Penn Field	SHUTTER GATE CLOSED.
6/20/2018	8:20 AM	6/20/2018	8:40 AM	6/15/2018	8:30 AM	T-11	FHL	SLOT	Ruscomb St. E of Tacony Creek	GRIT IN SLOT.
6/26/2018	8:40 AM	6/26/2018	9:10 AM	6/21/2018	9:50 AM	T-11	FHL	SLOT	Ruscomb St. E of Tacony Creek	GRIT AND DEBRIS IN SLOT.

Dry Weather Discharges are continually tracked and analyzed to determine if new or modified maintenance procedures would help to prevent them from occurring. Although our established procedures have greatly reduced the number and duration of these discharges, the combined system picks up all manner of trash and debris that is unpredictable in its pattern of causing flow disruptions. Despite incorporating best management practices including; having all inlets trapped and cleaned; preventative maintenance schedules for sewer flushing and cleaning or the regulators; CCTV inspection of DWO pipes; etc., it is virtually impossible to eliminate all blockages before they occur.

The City continues to aggressively control and minimize these dry weather overflows by utilizing the latest technology-based controls including our Collector System Remote Monitoring Network that currently includes over 320 sites with over 720 individual level and/or flow measurements. The CSO maintenance personnel are trained in the use of the system's computer programs for analyzing the data and have developed a comprehensive understanding of individual CSO site's distinct flow patterns. This familiarity allows them to quickly recognize abnormal conditions that may indicate accumulating debris so that they can respond before developing into a dry weather CSO blockage.

Appendix B

FY 2018 Annual CSO Miscellaneous Site & Maintenance Report

MISCELLANEOUS SITE INSPECTIONS

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
P-090-02-PFD-01 SANDY RUN CREEK DIVERSION REGULATOR													
	6	12	8	6	6	7	7	10	8	10	9	9	98
T-088-01-CFD-01 PLYMOUTH ST. WEST OF PITTVILLE													
	4	6	2	4	3	4	4	7	2	6	7	4	53
T-088-01-CFD-02 PITTVILLE ST. SOUTH OF PLYMOUTH ST.													
	2	6	3	4	3	4	4	7	2	6	7	7	55
T-088-01-CFD-03 ELSTON ST. E. OF BOUVIER ST.													
	3	5	3	3	2	3	4	5	2	6	7	5	48
T-088-01-CFD-04 ASHLEY ST. W. OF BOUVIER ST.													
		4	3	3	2	4	3	5	2	2	4		32
T-088-01-CFD-05 CHELTENHAM AVE. E. OF 19TH ST.													
	1	4	3	3	2	4	2	2	2	4	5	4	36
T-088-01-CFD-06 VERBENA ST. S. OF CHELTENHAM AVE.													
	1	6	3	3	2	3	2	3	3	4	3	3	36
W-060-01-MFD-01 JANNETTE ST. WEST OF MONASTERY AVE.													
	2	3	3	3	3	3	2		1	3	2	3	28
W-060-01-MFD-02 GREEN LANE NORTH OF LAWNTON ST.													
	2	3	3	3	3	2	2		1	3	2	3	27
T-089-04-CFD-01 FRANKLIN & HASBROOK													
	12	14	7	6	6	7	10	10	8	11	12	8	111
T-088-01-CFD-07 CHELTENHAM E. OF 7 TH ST.													
	7	13	7	7	6	5	7	8	6	8	10	8	92
T-088-01-CFD-08 7 TH ST. S. OF CHELTENHAM													
	7	13	7	7	6	5	6	8	6	8	10	8	91
Totals	47	89	52	52	44	51	53	65	43	71	78	62	707

MISCELLANEOUS SITE DISCHARGES

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
P-090-02-PFD-01 SANDY RUN CREEK DIVERSION REGULATOR													
													0
T-088-01-CFD-01 PLYMOUTH ST. WEST OF PITTVILLE													
													0
T-088-01-CFD-02 PITTVILLE ST. SOUTH OF PLYMOUTH ST.													
													0
T-088-01-CFD-03 ELSTON ST. E. OF BOUVIER ST.													
													0
T-088-01-CFD-04 ASHLEY ST. W. OF BOUVIER ST.													
													0
T-088-01-CFD-05 CHELTENHAM AVE. E. OF 19TH ST.													
													0
T-088-01-CFD-06 VERBENA ST. S. OF CHELTENHAM AVE.													
													0
W-060-01-MFD-01 JANNETTE ST. WEST OF MONASTERY AVE.													
													0
W-060-01-MFD-02 GREEN LANE NORTH OF LAWNTON ST.													
													0
T-089-04-CFD-01 FRANKLIN & HASBROOK													
	2						2			1	2		7
T-088-01-CFD-07 CHELTENHAM E. OF 7 TH ST.													
	1						1						2
T-088-01-CFD-08 7 TH ST. S. OF CHELTENHAM													
													0
Totals	3	0	0	0	0	0	3	0	0	1	2	0	9

MISCELLANEOUS SITE BLOCKAGES CLEARED

SITE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
P-090-02-PFD-01 SANDY RUN CREEK DIVERSION REGULATOR													
						1					1		2
T-088-01-CFD-01 PLYMOUTH ST. WEST OF PITTVILLE													
				1						1			2
T-088-01-CFD-02 PITTVILLE ST. SOUTH OF PLYMOUTH ST.													
				2									2
T-088-01-CFD-03 ELSTON ST. E. OF BOUVIER ST.													
				1									1
T-088-01-CFD-04 ASHLEY ST. W. OF BOUVIER ST.													
			1										1
T-088-01-CFD-05 CHELTENHAM AVE. E. OF 19TH ST.													
						1							1
T-088-01-CFD-06 VERBENA ST. S. OF CHELTENHAM AVE.													
													0
W-060-01-MFD-01 JANNETTE ST. WEST OF MONASTERY AVE.													
			1							1			2
W-060-01-MFD-02 GREEN LANE NORTH OF LAWNTON ST.													
													0
T-089-04-CFD-01 FRANKLIN & HASBROOK													
	1	2			1	1					2		7
T-088-01-CFD-07 CHELTENHAM E. OF 7 TH ST.													
	1	1					1						3
T-088-01-CFD-08 7 TH ST. S. OF CHELTENHAM													
	1	1					1				2		5
Totals	3	4	2	4	1	3	2	0	0	2	5	0	26

Fiscal Year 18 Report - July 2017 through June 2018

D-25 CHAMBER GRIT CLEANINGS

DATE	TONS
11/4/2017	25

CSPS SIPHON GRIT POCKET CLEANINGS

DATE	CU. YARDS
8/4/2017	20 Cu.Yrds.
4/23/2018	25 Cu. Yrds.

CSO B&B REGULATOR MAINTENANCE

DATE	SITE
7/6/2017	S-23
9/9/2017	D-70
9/9/2017	D-71
9/9/2017	S-18
9/9/2017	S-22
9/9/2017	S-24
9/30/2017	S-42
11/10/2017	S-1
12/7/2017	S-33
12/7/2017	S-36A
12/9/2017	D-37
12/9/2017	D-38
12/16/2017	D-65
12/16/2017	D-66
12/20/2017	D-47
12/20/2017	D-39
2/3/2018	D-37
2/3/2018	D-38
2/3/2018	D-47
2/3/2018	S-6
2/3/2018	S-7
2/3/2018	S-8
4/14/2018	S-42
4/14/2018	S-42A
4/14/2018	S-50
5/21/2018	S-22
6/8/2018	S-2
8/3/2017	S-50
8/3/2017	D-15
9/9/2017	D-37
9/9/2017	D-50
9/9/2017	S-15
9/9/2017	S-18
9/12/2017	D-72
11/2/2017	R-13/14
11/3/2017	D-11
11/3/2017	R-13/14
12/14/2017	D-3
12/19/2017	D-3
1/3/2018	D-15
1/3/2018	D-11
1/3/2018	D-3
1/3/2018	F-25
1/3/2018	D-9
1/10/2018	D-11
1/10/2018	D-5
1/11/2018	D-2
1/11/2018	D-3
1/12/2018	't Museum

CSO TIDE GATE MAINTENANCE

DATE	SITE
1/24/2018	D-15
2/1/2018	F-25
2/1/2018	D-9
2/3/2018	D-44
2/3/2018	D-47
2/3/2018	S-6
2/3/2018	S-7
2/5/2018	D-3
2/5/2018	D-2
2/9/2018	Sandy Run
2/22/2018	Art Museum
3/5/2018	D-11
3/5/2018	D-15
3/7/2018	D-3
3/9/2018	F-25
3/9/2018	D-9
3/15/2018	D-2
3/15/2018	D-3
4/6/2018	D-7
4/11/2018	D-15
4/11/2018	D-11
4/12/2018	F-25
4/12/2018	D-9
4/12/2018	D-3
4/12/2018	D-2
4/13/2018	D-15
4/13/2018	D-5
4/18/2018	D-7
5/2/2018	F-25
5/2/2018	D-15
5/2/2018	D-7
5/7/2018	D-11
5/7/2018	D-9
5/10/2018	D-2
5/10/2018	D-3
5/21/2018	D-5
5/30/2018	D-51
5/30/2018	D-52
5/30/2018	D-7
6/1/2018	D-7
6/4/2018	D-5
6/4/2018	D-3
6/6/2018	F-25
6/6/2018	D-15
6/8/2018	S-2
6/8/2018	D-9
6/18/2018	D-2
6/25/2018	Art Museum
6/27/2018	Fish Ladder
6/27/2018	D-11

COMPUTER CONTROL CHAMBER PREVENTATIVE MAINTENANCE

DATE	SITE
7/3/2017	Rock run
7/6/2017	D-2
7/6/2017	D-3
7/7/2017	D-9
7/10/2017	T-14
7/10/2017	Venice
7/12/2017	F-25
7/13/2017	D-11
7/13/2017	D-15
7/13/2017	H-29
7/19/2017	D-5
7/20/2017	State Road
7/22/2017	S-47
7/22/2017	S-50
7/26/2017	Fish Ladder
8/7/2017	D-2
8/9/2017	D-9
8/10/2017	H-35
8/10/2017	D-3
8/14/2017	Venice
8/16/2017	T-14
8/21/2017	F-25
8/21/2017	D-15
8/23/2017	D-11
8/28/2017	Fish Ladder
8/28/2017	H-29
8/28/2017	State Road
8/30/2017	D-5
9/8/2017	D-9
9/8/2017	D-5
9/11/2017	D-3
9/13/2017	D-15
9/14/2017	F-25
9/14/2017	D-11
9/15/2017	State Road
9/18/2017	H-35
9/18/2017	T-14
9/20/2017	Venice
9/20/2017	H-29
9/25/2017	FishLadder
9/27/2017	D-2
10/4/2017	D-5
10/4/2017	D-9
10/4/2017	D-11
10/5/2017	F-25
10/5/2017	State Road
10/5/2017	D-15
10/10/2017	Venice
10/16/2017	H-29
10/16/2017	Rock Run
10/16/2017	D-2
10/16/2017	D-3
10/20/2017	T-14
10/23/2017	Fish Ladder

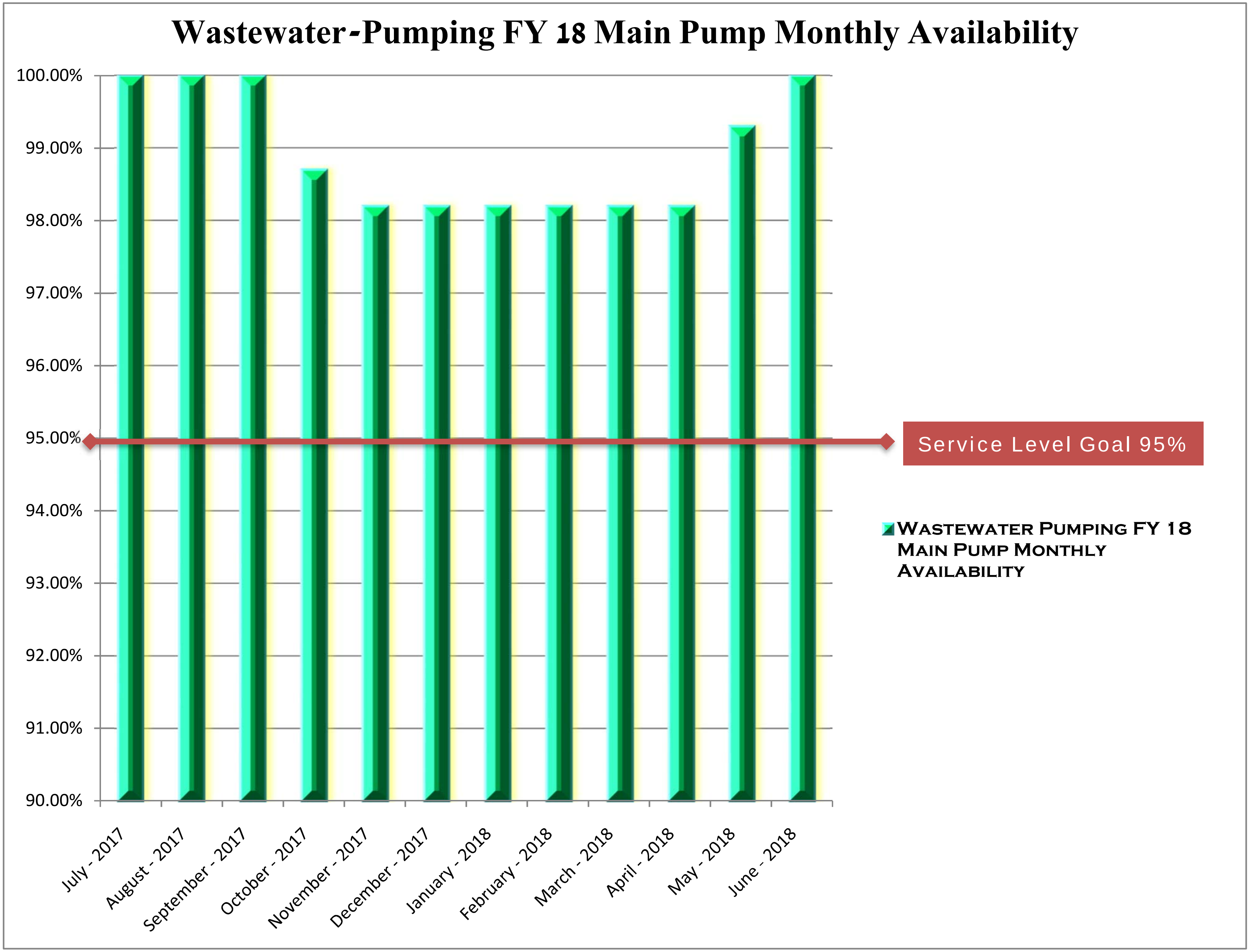
DATE	SITE
11/6/2017	D-5
11/6/2017	D-9
11/8/2017	D-11
11/8/2017	F-25
11/9/2017	State Road
11/10/2017	D-15
11/10/2017	D-3
11/17/2017	D-2
11/17/2017	H-29
11/20/2017	H-35
11/20/2017	Fish Ladder
11/22/2017	T-14
11/22/2017	Venice
12/1/2017	D-5
12/6/2017	D-11
12/6/2017	D-9
12/7/2017	F-25
12/8/2017	State Road
12/11/2017	D-2
12/13/2017	T-14
12/13/2017	D-15
12/13/2017	D-3
12/15/2017	H-35
12/15/2017	Art Museum
12/20/2017	Rock run
1/3/2018	F-25
1/3/2018	D-9
1/10/2018	D-11
1/10/2018	D-5
1/11/2018	D-2
1/11/2018	D-3
1/12/2018	Art Museum
1/16/2018	Venice
1/23/2018	T-14
1/23/2018	Rock run
1/24/2018	D-15
1/25/2018	State Road
2/1/2018	F-25
2/1/2018	D-9
2/2/2018	D-11
2/2/2018	D-15
2/5/2018	D-3
2/5/2018	D-2
2/7/2018	Venice
2/9/2018	D-5
2/12/2018	D-3
2/14/2018	Rock run
2/15/2018	T-14
2/21/2018	State Road
2/22/2018	Art Museum

DATE	SITE
3/5/2018	D-11
3/5/2018	D-15
3/7/2018	D-3
3/9/2018	F-25
3/9/2018	D-9
3/9/2018	D-2
3/12/2018	Rock Run
3/12/2018	T-14
3/14/2018	Venice
3/15/2018	D-5
3/19/2018	State Road
3/23/2018	Art Museum
4/9/2018	Fish Ladder
4/9/2018	Art Museum
4/11/2018	D-15
4/11/2018	D-11
4/12/2018	F-25
4/12/2018	D-9
4/12/2018	D-3
4/12/2018	D-2
4/13/2018	D-5
4/18/2018	Venice
4/19/2018	State Road
4/20/2018	Rock Run
4/23/2018	T-14
5/2/2018	F-25
5/2/2018	D-15
5/7/2018	Fish Ladder
5/7/2018	Art Museum
5/7/2018	D-11
5/7/2018	D-9
5/9/2018	T-14
5/9/2018	Rock Run
5/10/2018	D-2
5/10/2018	D-3
5/21/2018	D-5
5/21/2018	Venice
5/25/2018	State Road
6/4/2018	D-5
6/4/2018	D-3
6/6/2018	F-25
6/6/2018	D-15
6/8/2018	D-9
6/14/2018	Venice
6/18/2018	D-2
6/21/2018	T-14
6/21/2018	Rock Run
6/22/2018	State Road
6/25/2018	Art Museum
6/27/2018	Fish Ladder
6/27/2018	D-11

CSO OUTFALL - DEBRIS GRILL MAINTENANCE

DATE	SITE
6/7/2017	Linden Outfall
7/8/2017	D-11
10/13/2017	R-13/14
10/14/2017	D-63
10/27/2017	D-63
11/2/2017	R-13/14
11/3/2017	D-11
11/3/2017	R-13/14
6/19/2018	Linden Outfal
6/19/2018	D-2
6/19/2018	D-3
6/19/2018	D-5

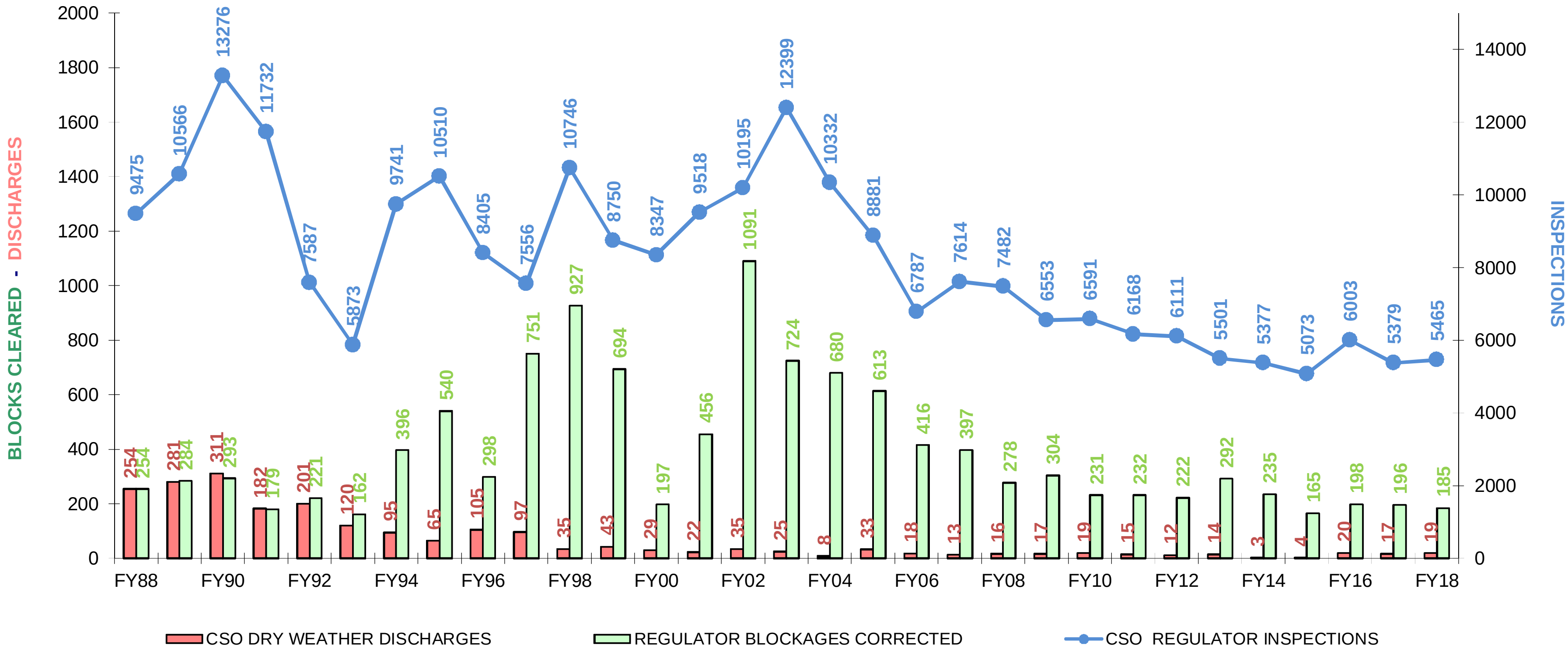
Appendix C
FY 2018 Main Pump Availability Chart

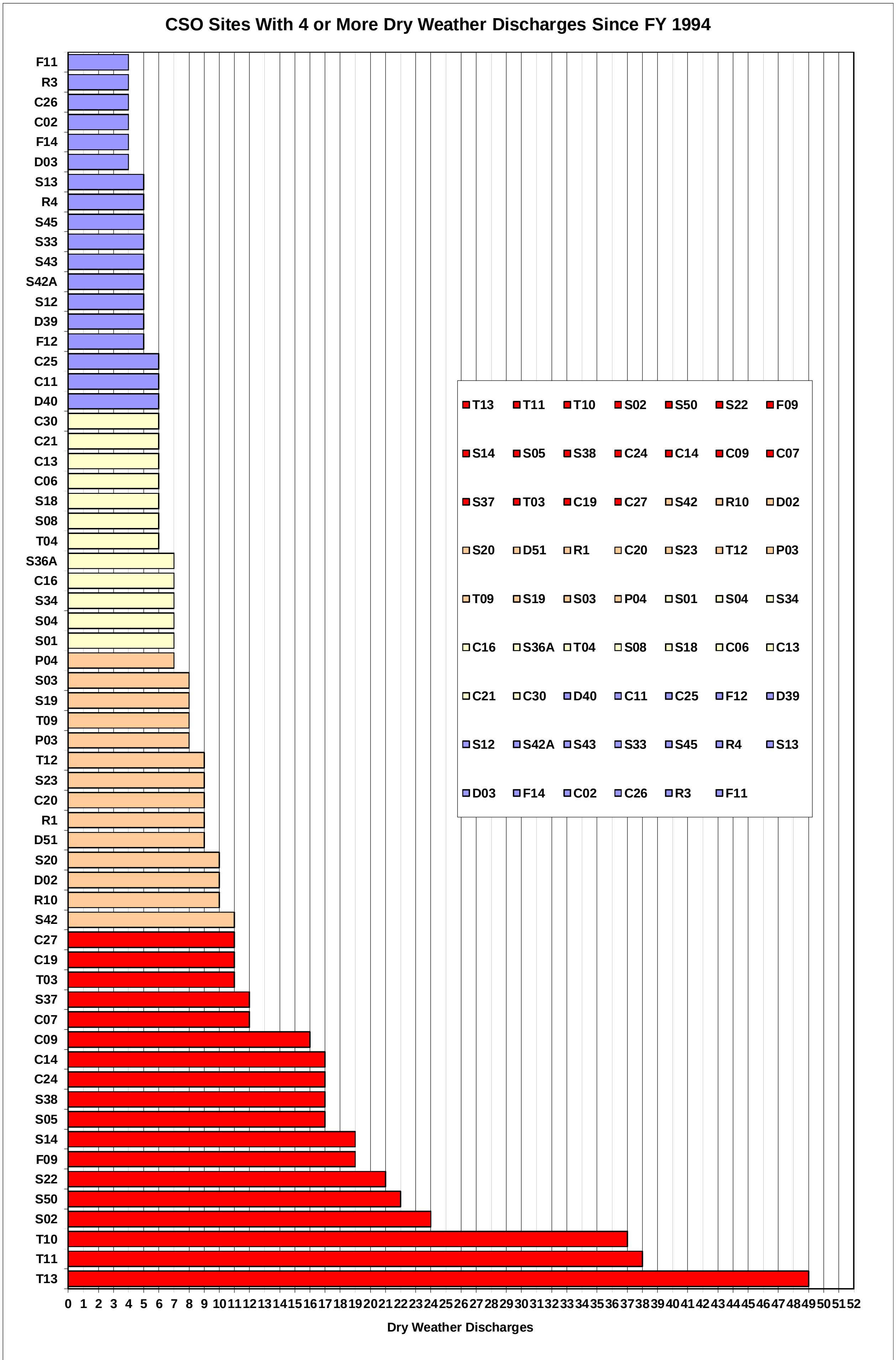


Wastewater-Pumping FY 18 Main Pump Monthly Availability
100.00%
99.00%
98.00%
97.00%
96.00%
95.00%
94.00%
93.00%
92.00%
91.00%
90.00%
July - 2017
August - 2017
September - 2017
October - 2017
November - 2017
December - 2017
January - 2018
February - 2018
March - 2018
April - 2018
May - 2018
June - 2018
Service Level Goal 95%
Wastewater Pumping FY 18 Main Pump Monthly Availability

Appendix D
Historical CSO Charts

Flow Control - CSO Maintenance FY87 to FY18 Inspections / Discharges / Blocks Corrected





CSO Sites With 4 or More Dry Weather Discharges Since FY 1994
F11
R3
C26
C02
F14
D03
S13
R4
S45
S33
S43
S42A
S12
D39
F12
C25
C11
D40
C30
C21
C13
C06
S18
S08
T04
S36A
C16
S34
S04
S01
P04
S03
S19
T09
P03
T12
S23
C20
R1
D51
S20
D02
R10
S42
C27
C19
T03
S37
C07
C09
C14
C24
S38
S05
S14
F09
S22
S50
S02
T10
T11
T13
T13 T11 T10 S02 S50 S22 F09
S14 S05 S38 C24 C14 C09 C07
S37 T03 C19 C27 S42 R10 D02
S20 D51 R1 C20 S23 T12 P03
T09 S19 S03 P04 S01 S04 S34
C16 S36A T04 S08 S18 C06 C13
C21 C30 D40 C11 C25 F12 D39
S12 S42A S43 S33 S45 R4 S13
D03 F14 C02 C26 R3 F11
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Dry Weather Discharges

Appendix D – NPDES Annual CSO Status Report FY18

APPENDIX D – NPDES ANNUAL CSO STATUS REPORT FY 2018

Page

Table 1 - Listing of all CSO permitted outfalls

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
NPDES Permit #0026689 - Northeast						
2	39d 58m 50s	75d 4m 58s	Castor Ave. and Balfour St.	Delaware River	Somerset	D_17
3	39d 58m 45s	75d 5m 6s	Venango St. NW of Casper St.	Delaware River	Somerset	D_18
4	39d 58m 41s	75d 5m 15s	Tioga St. NW of Casper St.	Delaware River	Somerset	D_19
5	39d 58m 43s	75d 5m 28s	Ontario St. NW of Casper St.	Delaware River	Somerset	D_20
6	39d 58m 44s	75d 5m 41s	Westmoreland St. NW of Balfour St.	Delaware River	Somerset	D_21
7	39d 58m 42s	75d 5m 53s	Allegheny Ave. SE of Bath St.	Delaware River	Somerset	D_22
8	39d 58m 38s	75d 6m 12s	Indiana Ave. SE of Allen St.	Delaware River	Somerset	D_23
10	39d 58m 38s	75d 6m 28s	Cambria St. E of Melvale St.	Delaware River	Somerset	D_25
11	40d 1m 18s	75d 1m 44s	Cottman St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_02
12	40d 1m 14s	75d 2m 0s	Princeton Ave SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_03
13	40d 1m 8s	75d 2m 13s	Disston St. SE of Wissinoming St.	Delaware River	Upper Delaware Low Level	D_04
14	40d 0m 58s	75d 2m 34s	Magee St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_05
15	40d 0m 53s	75d 2m 46s	Levick St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_06
16	40d 0m 44s	75d 3m 5s	Lardner St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_07
17	40d 0m 38s	75d 3m 13s	Comly St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_08
18	40d 0m 34s	75d 3m 18s	Dark Run La and Milnor St.	Delaware River	Upper Delaware Low Level	D_09
19	40d 0m 21s	75d 3m 28s	Sanger St. SE of Milnor St.	Delaware River	Upper Delaware Low Level	D_11
20	40d 0m 2s	75d 3m 43s	Bridge St. Se of Garden St.	Delaware River	Upper Delaware Low Level	D_12

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
21	39d 59m 53s	75d 3m 47s	Kirkbride St. and Delaware Ave.	Delaware River	Upper Delaware Low Level	D_13
22	39d 59m 24s	75d 4m 4s	Orthodox St. and Delaware Ave.	Delaware River	Upper Delaware Low Level	D_15
23	40d 2m 36s	75d 1m 15s	Frankford Avenue & Ashburner Street	Pennypack Creek	Pennypack	P_01
24	40d 2m 36s	75d 1m 16s	Frankford Avenue & Holmesburg St.	Pennypack Creek	Pennypack	P_02
25	40d 2m 13s	75d 1m 19s	Torresdale Ave. NW of Pennypack Ck.	Pennypack Creek	Pennypack	P_03
26	40d 2m 23s	75d 1m 21s	Cottage Avenue & Holmesburg Avenue	Pennypack Creek	Pennypack	P_04
27	40d 2m 2s	75d 1m 21s	Holmesburg Ave SE of Hegerman St	Pennypack Creek	Pennypack	P_05
28	40d 4m 34s	75d 9m 44s	Williams Avenue SE of Sedgewick	Tacony Creek	Frankford High Level	T_01
29	40d 2m 28s	75d 6m 56s	Complost Ave West of Tacony Creek	Tacony Creek	Frankford High Level	T_03
30	40d 2m 11s	75d 6m 48s	Rising Sun Ave East of Tacony Creek	Tacony Creek	Frankford High Level	T_04
31	40d 2m 9s	75d 6m 48s	Rising Sun Ave West of Tacony Creek	Tacony Creek	Frankford High Level	T_05
32	40d 2m 3s	75d 6m 41s	Bingham Street East of Tacony Creek	Tacony Creek	Frankford High Level	T_06
33	40d 1m 51s	75d 6m 43s	Tabor Road West of Tacony Creek	Tacony Creek	Frankford High Level	T_07
34	40d 1m 42s	75d 6m 47s	Ashdale Street West of Tacony Creek	Tacony Creek	Frankford High Level	T_08
35	40d 1m 37s	75d 6m 48s	Roosevelt Blvd. West of Tacony Creek	Tacony Creek	Frankford High Level	T_09
36	40d 1m 37s	75d 6m 47s	Roosevelt Blvd. East of Tacony Creek	Tacony Creek	Frankford High Level	T_10
37	40d 1m 29s	75d 6m 43s	Ruscomb Street East of Tacony Creek	Tacony Creek	Frankford High Level	T_11

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
38	40d 1m 23s	75d 6m 41s	Whitaker Avenue East of Tacony Creek	Tacony Creek	Frankford High Level	T_12
39	40d 1m 22s	75d 6m 42s	Whitaker Avenue West of Tacony Ck	Tacony Creek	Frankford High Level	T_13
40	40d 0m 59s	75d 6m 28s	I Street & Ramona Ave.	Tacony Creek	Frankford High Level	T_14
41	40d 0m 57s	75d 6m 20s	J Street & Juniata Park	Tacony Creek	Frankford High Level	T_15
42	40d 0m 57s	75d 5m 51s	Castor Avenue at Unity Street Circle	Frankford Creek	Upper Frankford Low Level	F_03
43	40d 0m 52s	75d 5m 42s	Wingohocking St East of Adams Ave	Frankford Creek	Upper Frankford Low Level	F_04
44	40d 0m 41s	75d 5m 41s	Bristol Street West of Adams Avenue	Frankford Creek	Upper Frankford Low Level	F_05
45	40d 0m 25s	75d 5m 33s	Worrel Street East of Frankford Creek	Frankford Creek	Upper Frankford Low Level	F_06
46	40d 0m 26s	75d 5m 34s	Worrel Street West of Frankford Creek	Frankford Creek	Upper Frankford Low Level	F_07
47	40d 0m 21s	75d 5m 36s	Torresdale Ave & Hunting Park Ave	Frankford Creek	Upper Frankford Low Level	F_08
48	40d 0m 19s	75d 5m 34s	Frankford Ave North of Frankford Ck	Frankford Creek	Upper Frankford Low Level	F_09
49	40d 0m 19s	75d 5m 35s	Frankford Ave South of Frankford Ck	Frankford Creek	Upper Frankford Low Level	F_10
50	40d 0m 15s	75d 5m 26s	Orchard Street South of Vandyke Creek	Frankford Creek	Upper Frankford Low Level	F_11
51	39d 59m 56s	75d 5m 14s	Sepviva Street North of Butler Street	Frankford Creek	Upper Frankford Low Level	F_12
52	39d 59m 49s	75d 5m 3s	Duncan Street Under Delaware Exp.	Frankford Creek	Lower Frankford Low Level	F_13
54	40d 0m 16s	75d 4m 15s	Wakeling Street NW of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_21
55	40d 0m 19s	75d 4m 5s	Bridge Street NW of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_23

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
56	40d 0m 18s	75d 4m 5s	Bridge Street SE of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_24
57	40d 0m 15s	75d 4m 15s	Ash Street West of Creek Basin	Frankford Creek	Lower Frankford Low Level	F_25
58	40d 0m 30s	75d 3m 20s	Levick St. & Everett Ave.	Delaware River	Wakling Relief Sewer	D_FRW
59	40d 2m 16s	75d 6m 53s	Nedro Ave & 7th St.	Tacony Creek	Rock Run Flood Relief Sewer	T_FRRR
60	40d 0m 36s	75d 5m 44s	Castor Ave. & East Hunting Park Ave.	Frankford Creek	Frankford High Level Relief Sewer	F_FRFG
NPDES Permit # 0026662 – Southeast						
2	39d 58m 9s	75d 7m 19s	Dyott Street & Delaware Ave.	Delaware River	Lower Delaware Low Level	D_38
3	39d 58m 7s	75d 7m 23s	Susquehanna Ave. East of Beach Street	Delaware River	Lower Delaware Low Level	D_39
4	39d 58m 5s	75d 7m 26s	Berks Street East of Beach Street	Delaware River	Lower Delaware Low Level	D_40
5	39d 58m 3s	75d 7m 37s	Palmer Street East of Beach Street	Delaware River	Lower Delaware Low Level	D_41
6	39d 57m 54s	75d 7m 42s	Columbia Avenue East of Beach Street	Delaware River	Lower Delaware Low Level	D_42
7	39d 57m 56s	75d 7m 48s	Marlborough Street & Delaware Ave	Delaware River	Lower Delaware Low Level	D_43
8	39d 57m 53s	75d 7m 54s	Shackamaxon St East of Delaware Ave	Delaware River	Lower Delaware Low Level	D_44
9	39d 57m 48s	75d 8m 0s	Laurel Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_45
10	39d 57m 41s	75d 8m 11s	Penn Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_46
11	39d 57m 37s	75d 8m 9s	Fairmont Ave West of Delaware Ave	Delaware River	Lower Delaware Low Level	D_47
12	39d 57m 28s	75d 8m 13s	Willow Street West of Delaware Ave	Delaware River	Lower Delaware Low Level	D_48

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
13	39d 57m 24s	75d 8m 20s	Callowhill Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_49
14	39d 57m 21s	75d 8m 13s	Delaware Avenue North of Vine Street	Delaware River	Lower Delaware Low Level	D_50
15	39d 57m 11s	75d 8m 17s	Race Street West of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_51
16	39d 57m 7s	75d 8m 25s	Delaware Avenue & Arch Street	Delaware River	Lower Delaware Low Level	D_52
17	39d 56m 57s	75d 8m 23s	Market Street & Front Street	Delaware River	Lower Delaware Low Level	D_53
20	39d 56m 50s	75d 8m 24s	Front Street South of Chestnut Street	Delaware River	Lower Delaware Low Level	D_54
21	39d 56m 26s	75d 8m 32s	South Street & Delaware Avenue	Delaware River	Lower Delaware Low Level	D_58
22	39d 56m 12s	75d 8m 33s	Catharine Street East of Swanson Street	Delaware River	Lower Delaware Low Level	D_61
23	39d 56m 10s	75d 8m 32s	Queen Street East of Swanson Street	Delaware River	Lower Delaware Low Level	D_62
24	39d 56m 5s	75d 8m 33s	Christian St West of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_63
25	39d 55m 59s	75d 8m 35s	Washington Ave East of Delaware Ave	Delaware River	Lower Delaware Low Level	D_64
26	39d 55m 45s	75d 8m 29s	Reed Street East of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_65
27	39d 55m 37s	75d 8m 28s	Tasker Street East of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_66
28	39d 55m 26s	75d 8m 21s	Moore Street East of Delaware Avenue	Delaware River	Lower Delaware Low Level	D_67
33	39d 54m 6s	75d 8m 12s	Pattison Avenue & Swanson Street	Delaware River	Lower Delaware Low Level	D_73
36	39d 58m 21s	75d 6m 58s	Cumberland St East of Richmond St	Delaware River	Lower Delaware Low Level	D_37

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
37	39d 57m 12s	75d 8m 24s	Race Street West of Delaware Avenue, North of D-51	Delaware River	Lower Delaware Low Level	D_51A
29	39d 55m 13s	75d 8m 20s	Snyder Avenue & Delaware Avenue	Delaware River	Oregon	D_68
30	39d 54m 60s	75d 8m 13s	Delaware Ave North of Porter Street	Delaware River	Oregon	D_69
31	39d 54m 44s	75d 8m 15s	Oregon Avenue & Delaware Avenue	Delaware River	Oregon	D_70
32	39d 54m 33s	75d 7m 59s	Bigler Street & Delaware Avenue	Delaware River	Oregon	D_71
34	39d 54m 24s	75d 8m 8s	Packer Avenue East of Delaware Ave	Delaware River	Oregon	D_72
NPDES Permit # 0026671 - Southwest						
2	39d 56m 17s	75d 12m 17s	Reed Street & Schuylkill Avenue	Schuylkill River	Lower Schuylkill East Side	S_31
3	39d 55m 54s	75d 12m 28s	35th St. and Mifflin St.	Schuylkill River	Lower Schuylkill East Side	S_36A
4	39d 55m 41s	75d 12m 38s	Vare Avenue & 29th Street	Schuylkill River	Lower Schuylkill East Side	S_37
5	39d 55m 12s	75d 12m 5s	Passyunk Avenue & 29th Street	Schuylkill River	Lower Schuylkill East Side	S_42
6	39d 55m 12s	75d 12m 5s	Passyunk Avenue & 28th Street	Schuylkill River	Lower Schuylkill East Side	S_42A
7	39d 54m 57s	75d 12m 16s	26th Street 700′ North of Hartranft St	Schuylkill River	Lower Schuylkill East Side	S_44
8	39d 53m 53s	75d 12m 39s	Penrose Avenue & 26th Street	Schuylkill River	Lower Schuylkill East Side	S_46
9	39d 57m 38s	75d 10m 50s	24th Street 155′ South of Parktown Pl	Schuylkill River	Central Schuylkill East Side	S_05
10	39d 57m 39s	75d 10m 49s	24th Street 350′ South of Parktown Pl	Schuylkill River	Central Schuylkill East Side	S_06
11	39d 57m 39s	75d 10m 50s	24th Street East of Schuylkill River	Schuylkill River	Central Schuylkill East Side	S_07

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
12	39d 57m 29s	75d 10m 43s	Race Street & Bonsall Street	Schuylkill River	Central Schuylkill East Side	S_08
13	39d 57m 30s	75d 10m 45s	Arch Street West of 23rd Street	Schuylkill River	Central Schuylkill East Side	S_09
14	39d 57m 16s	75d 10m 49s	Market Street 25′ East of 24th Street	Schuylkill River	Central Schuylkill East Side	S_10
15	39d 57m 11s	75d 10m 51s	24th St. N of Chestnut St. Bridge	Schuylkill River	Central Schuylkill East Side	S_12A
16	39d 57m 7s	75d 10m 52s	Sansom Street West of 24th Street	Schuylkill River	Central Schuylkill East Side	S_13
17	39d 57m 5s	75d 10m 53s	Walnut Street West of 24th Street	Schuylkill River	Central Schuylkill East Side	S_15
18	39d 57m 1s	75d 10m 56s	Locust Street & 25th Street	Schuylkill River	Central Schuylkill East Side	S_16
19	39d 56m 57s	75d 11m 0s	Spruce Street & 25th Street	Schuylkill River	Central Schuylkill East Side	S_17
20	39d 56m 52s	75d 11m 5s	Pine Street West of Taney Street	Schuylkill River	Central Schuylkill East Side	S_18
21	39d 56m 49s	75d 11m 9s	Lombard Street West of 27th Street	Schuylkill River	Central Schuylkill East Side	S_19
22	39d 56m 47s	75d 11m 12s	South Street East of 27th Street	Schuylkill River	Central Schuylkill East Side	S_21
23	39d 56m 44s	75d 11m 18s	Schuylkill Avenue & Bainbridge Street	Schuylkill River	Central Schuylkill East Side	S_23
24	39d 56m 34s	75d 11m 28s	Schuylkill Avenue & Christian Street	Schuylkill River	Central Schuylkill East Side	S_25
25	39d 56m 29s	75d 11m 35s	Ellsworth St West of Schuylkill Avenue	Schuylkill River	Central Schuylkill East Side	S_26
26	39d 58m 1s	75d 11m 17s	Mantua Avenue & West River Drive	Schuylkill River	Central Schuylkill West Side	S_01
27	39d 57m 54s	75d 11m 7s	Haverford Avenue & West River Drive	Schuylkill River	Central Schuylkill West Side	S_02

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
28	39d 57m 51s	75d 11m 4s	Spring Garden St W of Schuylkill Expy	Schuylkill River	Central Schuylkill West Side	S_03
29	39d 57m 53s	75d 11m 4s	Powelton Ave W of Schuylkill Expy	Schuylkill River	Central Schuylkill West Side	S_04
30	39d 57m 16s	75d 10m 53s	Market St West of Schuylkill Expy	Schuylkill River	Central Schuylkill West Side	S_11
31	39d 57m 5s	75d 10m 58s	Schuylkill Expressway & Walnut Street	Schuylkill River	Central Schuylkill West Side	S_14
32	39d 56m 51s	75d 11m 14s	440′ Northwest of South Street	Schuylkill River	Central Schuylkill West Side	S_20
33	39d 56m 46s	75d 11m 22s	660′ South of South St E of Pennfield	Schuylkill River	Central Schuylkill West Side	S_22
34	39d 56m 43s	75d 11m 26s	1060′ South of South St E of Pennfield	Schuylkill River	Central Schuylkill West Side	S_24
35	39d 56m 32s	75d 12m 27s	46th Street & Paschall Avenue	Schuylkill River	Southwest Main Gravity	S_30
36	39d 56m 36s	75d 12m 18s	43rd St. and Locust St.	Schuylkill River	Southwest Main Gravity	S_50
37	39d 56m 13s	75d 12m 23s	49th Street South of Botanic Street	Schuylkill River	Lower Schuylkill West Side	S_32
38	39d 56m 8s	75d 12m 24s	51st Street South of Botanic Street	Schuylkill River	Lower Schuylkill West Side	S_33
39	39d 55m 43s	75d 12m 45s	56th Street East of P&R Railroad	Schuylkill River	Lower Schuylkill West Side	S_38
40	39d 54m 39s	75d 12m 55s	64th St. and Buist Ave.	Schuylkill River	Lower Schuylkill West Side	S_45
41	39d 56m 10s	75d 14m 6s	60th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek High Level	C_18
51	39d 58m 51s	75d 16m 4s	City Line Avenue & 73rd Street	Cobbs Creek	Cobbs Creek High Level	C_01
52	39d 58m 51s	75d 16m 1s	City Line Ave 100′ South Side of Creek	Cobbs Creek	Cobbs Creek High Level	C_02
54	39d 58m 30s	75d 15m 26s	Lebanon Ave Southwest of 73rd Street	Cobbs Creek	Cobbs Creek High Level	C_05

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
55	39d 58m 31s	75d 15m 25s	Lebanon Avenue & 68th Street	Cobbs Creek	Cobbs Creek High Level	C_06
56	39d 58m 26s	75d 15m 26s	Lansdowne Avenue & 69th Street	Cobbs Creek	Cobbs Creek High Level	C_07
57	39d 57m 51s	75d 14m 56s	54th Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_09
58	39d 57m 50s	75d 14m 53s	Gross Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_10
59	39d 57m 43s	75d 14m 53s	Cobbs Creek Pky South of Market St	Cobbs Creek	Cobbs Creek High Level	C_11
60	39d 57m 27s	75d 14m 60s	Spruce Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_12
61	39d 56m 45s	75d 14m 58s	62nd Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_13
62	39d 56m 36s	75d 14m 50s	Baltimore Avenue & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_14
63	39d 56m 31s	75d 14m 26s	59th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek High Level	C_15
64	39d 56m 26s	75d 14m 23s	Thomas Avenue & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_16
65	39d 56m 13s	75d 14m 6s	Beaumont Street & Cobbs Creek	Cobbs Creek	Cobbs Creek High Level	C_17
66	39d 58m 29s	75d 16m 48s	Cobbs Creek Pky S of City Line Ave	Cobbs Creek	Cobbs Creek High Level	C_31
67	39d 58m 12s	75d 15m 56s	Brockton Road & Farrington Road	Cobbs Creek	Cobbs Creek High Level	C_33
68	39d 58m 40s	75d 15m 44s	Woodcrest Avenue & Morris Park	Cobbs Creek	Cobbs Creek High Level	C_34
69	39d 58m 47s	75d 15m 54s	Morris Park West of 72nd Street & Sherwood Road	Cobbs Creek	Cobbs Creek High Level	C_35
70	39d 58m 49s	75d 15m 35s	Woodbine Ave South of Brentwood Rd	Cobbs Creek	Cobbs Creek High Level	C_36

Point Source #	Outfall Latitude	Outfall Longitude	Regulator Location	Discharges to:	Interceptor	Outfall Name
71	39d 57m 55s	75d 15m 15s	Cobbs Creek Parkway South of 67th & Callowhill Streets	Cobbs Creek	Cobbs Creek High Level	C_37
72	39d 58m 22s	75d 16m 11s	Cobbs Creek Parkway & 77th Street	Cobbs Creek	Cobbs Creek High Level	C_32
82	39d 58m 38s	75d 15m 28s	Malvern Ave. and 68th St.	Cobbs Creek	Cobbs Creek High Level	C_04A
42	39d 55m 57s	75d 14m 19s	Mount Moriah Cemetary & 62nd Street	Cobbs Creek	Cobbs Creek Low Level	C_19
43	39d 55m 46s	75d 14m 39s	65th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_20
44	39d 55m 37s	75d 14m 40s	68th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_21
45	39d 55m 27s	75d 14m 46s	70th Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_22
46	39d 55m 15s	75d 14m 52s	Upland Street & Cobbs Creek Parkway	Cobbs Creek	Cobbs Creek Low Level	C_23
47	39d 55m 1s	75d 14m 49s	Woodland Avenue East of Island Ave.	Cobbs Creek	Cobbs Creek Low Level	C_25
49	39d 54m 44s	75d 14m 56s	Claymont Street & Grays Avenue	Cobbs Creek	Cobbs Creek Low Level	C_29
50	39d 54m 34s	75d 15m 1s	77th Street West of Elmwood Avenue	Cobbs Creek	Cobbs Creek Low Level	C_30
78	39d 54m 49s	75d 14m 50s	Island Ave. Southeast of Glenmore Ave	Cobbs Creek	Cobbs Creek Low Level	C_28A
75	39d 57m 59s	75d 11m 3s	16th St. & Clearfield St.	Schuylkill River	Main Relief Sewer	S_FRM
83	39d 56m 31s	75d 14m 25s	56th St. & Locust	Cobbs Creek	Thomas Run Relief Sewer	C_FRTR
84	39d 57m 49s	75d 14m 53s	Arch Street & Cobbs Creek	Cobbs Creek	Arch Street Relief Sewer	C_FRA

Table 2 - Overflow Summary for 7/1/2017 – 6/30/2018

District	Permitted Outfall	Frequency	Duration (hours)	Volume (ft^3)
Northeast	D_FRW	54	159.75	44,358,122
Northeast	D02	26	56.75	11,444,929
Northeast	D03	25	49.5	2,916,023
Northeast	D04	20	30.5	649,117
Northeast	D05	48	202.25	65,724,210
Northeast	D06	19	24	791,498
Northeast	D07	52	167.25	33,395,178
Northeast	D08	20	25	441,407
Northeast	D09	8	7.75	449,167
Northeast	D11	21	36.25	5,795,037
Northeast	D12	51	95	344,446
Northeast	D13	20	26.5	858,678
Northeast	D15	18	39	2,092,529
Northeast	D17	52	161.25	12,416,410
Northeast	D18	41	107.25	6,127,377
Northeast	D19	50	184.75	6,828,189
Northeast	D20	32	65.25	3,673,194
Northeast	D21	46	144	9,986,036
Northeast	D22	79	398.5	31,485,605
Northeast	D23	53	88.25	491,165
Northeast	D25	70	345.5	114,921,836
Northeast	F_FRFG	0	0	0
Northeast	F03	30	54.25	3,236,411
Northeast	F04	62	181.5	8,201,883
Northeast	F05	59	164.75	1,136,739
Northeast	F06	24	38.5	1,249,547
Northeast	F07	41	82.5	2,902,532
Northeast	F08	39	74.25	2,317,023
Northeast	F09	66	209	1,493,793
Northeast	F10	26	52	2,132,401
Northeast	F11	65	299.25	14,858,311
Northeast	F12	29	45.5	661,494
Northeast	F13	53	117.5	1,694,471
Northeast	F21	78	437.25	120,393,360
Northeast	F23	55	138	2,183,057
Northeast	F24	52	105	1,012,668

District	Permitted Outfall	Frequency	Duration (hours)	Volume (ft^3)
Northeast	F25	15	26.25	4,283,914
Northeast	P01	19	23.5	791,589
Northeast	P02	55	122	3,391,435
Northeast	P03	33	51.75	707,668
Northeast	P04	14	41.5	2,187,138
Northeast	P05	39	103.25	6,926,683
Northeast	T_FRRR	36	166.5	28,105,853
Northeast	T01	71	333	7,980,265
Northeast	T03	67	171.75	4,582,320
Northeast	T04	61	206.75	4,318,164
Northeast	T05	50	85.25	2,082,135
Northeast	T06	44	104.5	13,314,621
Northeast	T07	18	15.5	353,161
Northeast	T08	64	206	45,900,562
Northeast	T09	40	54	1,170,352
Northeast	T10	63	245.5	3,869,799
Northeast	T11	48	95	1,181,272
Northeast	T12	8	7	86,094
Northeast	T13	51	136	5,604,730
Northeast	T14	36	150.25	170,884,045
Northeast	T15	53	147	7,260,949
Southeast	D37	55	274	22,496,634
Southeast	D38	49	171	23,297,898
Southeast	D39	56	236.5	35,957,800
Southeast	D40	68	266.25	2,279,357
Southeast	D41	50	152	2,528,796
Southeast	D42	19	20.5	172,653
Southeast	D43	21	34	210,189
Southeast	D44	29	64.25	5,033,720
Southeast	D45	46	137.5	63,610,759
Southeast	D46	29	60	973,351
Southeast	D47	64	230.5	7,057,395
Southeast	D48	43	83.5	12,267,783
Southeast	D49	5	4.5	21,055
Southeast	D50	14	10.75	77,629
Southeast	D51	61	163.25	1,208,464
Southeast	D51A	54	124.5	1,118,132

District	Permitted Outfall	Frequency	Duration (hours)	Volume (ft^3)
Southeast	D52	30	43.75	407,800
Southeast	D53	17	20	2,166,915
Southeast	D54	19	32	7,348,777
Southeast	D58	24	34.75	842,506
Southeast	D61	41	72.5	506,548
Southeast	D62	29	35	185,452
Southeast	D63	36	49.25	7,573,014
Southeast	D64	47	74.75	397,646
Southeast	D65	37	89.25	7,948,877
Southeast	D66	61	196.5	11,342,064
Southeast	D67	56	173	7,396,762
Southeast	D68	49	171.25	21,236,316
Southeast	D69	27	63	6,262,764
Southeast	D70	22	48.5	8,395,465
Southeast	D71	26	48.5	4,442,344
Southeast	D72	16	27	3,295,828
Southeast	D73	58	260.5	27,201,469
Southwest	C_FRA	9	7	422,654
Southwest	C_FRTR	85	509	22,056,638
Southwest	C01	21	16.75	248,723
Southwest	C02	2	0.5	119
Southwest	C04A	8	8.75	344,107
Southwest	C05	2	1.5	16,537
Southwest	C06	49	95	2,594,563
Southwest	C07	22	21	411,812
Southwest	C09	40	59.75	1,411,404
Southwest	C10	33	55	427,049
Southwest	C11	44	119.25	12,418,013
Southwest	C12	41	94	1,532,183
Southwest	C13	31	52	811,724
Southwest	C14	31	55.25	1,695,236
Southwest	C15	6	6.25	51,740
Southwest	C16	1	0.5	10
Southwest	C17	53	145.75	20,212,755
Southwest	C18	34	39.5	1,579,270
Southwest	C19	19	14	262,646
Southwest	C20	17	14.5	205,606

District	Permitted Outfall	Frequency	Duration (hours)	Volume (ft^3)
Southwest	C21	9	8.5	103,824
Southwest	C22	37	52.25	1,107,311
Southwest	C23	6	13.5	150,772
Southwest	C25	13	15	466,640
Southwest	C28A	41	53.25	298,578
Southwest	C29	29	95.75	1,818,579
Southwest	C30	29	71	492,779
Southwest	C31	45	80.5	896,166
Southwest	C32	51	75.5	1,130,903
Southwest	C33	24	19.75	306,062
Southwest	C34	12	8.5	151,814
Southwest	C35	8	5	20,590
Southwest	C36	5	3	21,930
Southwest	C37	15	10.25	61,775
Southwest	S_FRM	25	44	8,861,406
Southwest	S01	46	142.5	12,814,214
Southwest	S01T	50	126.5	6,806,725
Southwest	S02	53	129	1,086,617
Southwest	S03	1	0.5	2,149
Southwest	S04	66	216.5	2,167,636
Southwest	S05	83	411.25	42,462,440
Southwest	S06	62	178.75	14,239,608
Southwest	S07	31	55	2,531,892
Southwest	S08	38	57.75	238,792
Southwest	S09	50	102.25	9,516,555
Southwest	S10	80	329.5	4,344,230
Southwest	S11	66	211.25	1,621,035
Southwest	S12A	50	85	711,836
Southwest	S13	20	19.25	317,263
Southwest	S14	78	264.5	2,870,681
Southwest	S15	27	33.75	323,346
Southwest	S16	62	152.5	1,157,231
Southwest	S17	27	37	612,931
Southwest	S18	57	162.5	7,201,095
Southwest	S19	29	36.5	311,581
Southwest	S20	67	357.25	17,489,496
Southwest	S21	33	40.5	207,204

District	Permitted Outfall	Frequency	Duration (hours)	Volume (ft^3)
Southwest	S22	61	142.5	3,014,126
Southwest	S23	72	224	2,209,373
Southwest	S24	42	56	365,059
Southwest	S25	50	111.25	2,230,151
Southwest	S26	70	303	14,021,120
Southwest	S30	9	6	36,047
Southwest	S31	53	110.75	2,298,608
Southwest	S32	18	13	108,400
Southwest	S33	75	361.5	15,662,515
Southwest	S36A	78	300.75	7,005,776
Southwest	S37	72	234.5	2,889,874
Southwest	S38	29	31.5	2,571,583
Southwest	S42	56	198.5	17,448,791
Southwest	S42A	81	441.25	21,979,681
Southwest	S44	49	158.75	10,780,702
Southwest	S45	34	52.5	13,210,293
Southwest	S46	36	81.25	2,416,277
Southwest	S50	76	388.25	172,789,152

Table 3 - Overflow Summary for Typical Year Precipitation (based on Year-5 EAP submission)

District	Permitted Outfall	Frequency	SWO Duration (hrs)	Overflow Volume (MG)
Northeast	D_FRW	44	117.75	96.0
Northeast	D02	26	0	45.3
Northeast	D03	26	61.75	13.3
Northeast	D04	10	21.75	1.7
Northeast	D05	49	251	360.7
Northeast	D06	9	11	1.3
Northeast	D07	54	204.75	135.9
Northeast	D08	40	92.5	3.3
Northeast	D09	5	3.5	0.5
Northeast	D11	21	56.75	24.6
Northeast	D12	46	114.5	1.6
Northeast	D13	9	12.25	1.3
Northeast	D15	15	30	8.0
Northeast	D17	45	169	64.8
Northeast	D18	52	180.25	53.6
Northeast	D19	53	223.75	48.0
Northeast	D20	36	114.5	28.7
Northeast	D21	45	184.75	65.9
Northeast	D22	71	512	251.7
Northeast	D23	42	72	1.6
Northeast	D25	66	422.75	963.3
Northeast	F_FRFG	5	2.5	0.3
Northeast	F03	33	55.75	18.8
Northeast	F04	63	239.25	63.5
Northeast	F05	69	272	8.1
Northeast	F06	20	36.75	5.5
Northeast	F07	40	94.75	20.4
Northeast	F08	39	76.25	11.0
Northeast	F09	59	231	9.2
Northeast	F10	63	322.25	26.5
Northeast	F11	71	431.75	133.7
Northeast	F12	31	53.25	5.8
Northeast	F13	46	130.25	14.0
Northeast	F21	67	385.5	800.2
Northeast	F23	44	113.75	11.6
Northeast	F24	47	99.75	5.1
Northeast	F25	15	32	28.5
Northeast	P01	15	16.25	3.2
Northeast	P02	49	115.75	14.9
Northeast	P03	20	26.25	2.0
Northeast	P04	9	30.25	11.5

District	Permitted Outfall	Frequency	SWO Duration (hrs)	Overflow Volume (MG)
Northeast	P05	27	56.75	22.3
Northeast	T_FRRR	37	274.5	281.9
Northeast	T01	64	262.5	45.1
Northeast	T03	61	158	22.8
Northeast	T04	59	154.25	15.9
Northeast	T05	42	64.25	7.6
Northeast	T06	39	72	55.3
Northeast	T07	9	8.5	1.0
Northeast	T08	62	234.75	257.0
Northeast	T09	44	68.25	5.7
Northeast	T10	63	258.5	22.3
Northeast	T11	59	165.75	10.1
Northeast	T12	8	7	0.2
Northeast	T13	63	191.75	31.4
Northeast	T14	37	356.5	1546.5
Northeast	T15	54	158	42.1
Southeast	D37	54	282	184.0
Southeast	D38	43	169.75	178.9
Southeast	D39	54	270.75	276.7
Southeast	D40	57	282	14.4
Southeast	D41	42	153.75	17.7
Southeast	D42	18	22	1.5
Southeast	D43	19	31.75	1.3
Southeast	D44	23	55	23.8
Southeast	D45	36	121	357.6
Southeast	D46	19	30.75	3.9
Southeast	D47	56	215	46.3
Southeast	D48	40	94.25	112.3
Southeast	D49	6	4.5	0.4
Southeast	D50	14	12.5	1.5
Southeast	D51	56	372	11.4
Southeast	D51A	49	174	12.5
Southeast	D52	22	31	2.7
Southeast	D53	7	7.5	9.6
Southeast	D54	19	30	48.3
Southeast	D58	18	26.5	5.1
Southeast	D61	46	94.75	6.2
Southeast	D62	20	23.25	1.8
Southeast	D63	31	65.25	73.9
Southeast	D64	27	41.75	1.5
Southeast	D65	29	66.25	52.4
Southeast	D66	37	105.75	58.8

District	Permitted Outfall	Frequency	SWO Duration (hrs)	Overflow Volume (MG)
Southeast	D67	31	80.75	28.0
Southeast	D68	41	183.75	156.0
Southeast	D69	24	70.75	47.2
Southeast	D70	20	45.5	48.3
Southeast	D71	24	63	45.5
Southeast	D72	18	34.75	29.2
Southeast	D73	51	236	159.2
Southwest	C_FRA	11	9.5	5.2
Southwest	C_FRTR	83	500.5	161.8
Southwest	C01	15	15.25	1.7
Southwest	C02	6	4.25	0.2
Southwest	C04A	19	28	12.6
Southwest	C05	2	2.75	0.4
Southwest	C06	61	195.75	40.1
Southwest	C07	19	39.25	10.2
Southwest	C09	33	65	13.6
Southwest	C10	16	36.5	1.6
Southwest	C11	42	122.75	97.1
Southwest	C12	39	100	16.7
Southwest	C13	30	68.25	11.0
Southwest	C14	30	80.5	22.1
Southwest	C15	18	40.75	2.7
Southwest	C16	5	4.75	0.2
Southwest	C17	55	266.5	294.4
Southwest	C18	29	64.75	21.0
Southwest	C19	18	21.75	4.6
Southwest	C20	14	22	2.5
Southwest	C21	15	26.25	3.5
Southwest	C22	37	78.75	14.5
Southwest	C23	12	25	1.7
Southwest	C25	22	61	19.5
Southwest	C28A	36	58.5	2.1
Southwest	C29	48	189.25	16.2
Southwest	C30	30	118.5	8.4
Southwest	C31	40	90.25	10.3
Southwest	C32	31	56.25	9.8
Southwest	C33	20	24.25	3.1
Southwest	C34	13	11.75	1.7
Southwest	C35	10	11.25	0.7
Southwest	C36	10	9.25	0.6
Southwest	C37	15	17.5	0.9
Southwest	S_FRM	8	10.75	41.9

District	Permitted Outfall	Frequency	SWO Duration (hrs)	Overflow Volume (MG)
Southwest	S01	41	122	86.4
Southwest	S02	49	142	7.4
Southwest	S03	11	8	0.6
Southwest	S04	72	385.5	19.8
Southwest	S05	71	338.25	236.5
Southwest	S06	65	281.5	98.6
Southwest	S07	16	22.75	9.1
Southwest	S08	36	64.25	1.3
Southwest	S09	39	78	42.8
Southwest	S10	56	185.25	18.9
Southwest	S11	53	153	4.9
Southwest	S12A	44	80.5	4.9
Southwest	S13	17	12.75	2.0
Southwest	S14	62	263.5	16.4
Southwest	S15	22	27.75	1.7
Southwest	S16	67	238.75	9.1
Southwest	S17	25	32.75	3.8
Southwest	S18	51	188.25	45.1
Southwest	S19	29	33.5	1.8
Southwest	S20	78	517.5	145.6
Southwest	S21	22	22	1.0
Southwest	S22	40	85	15.5
Southwest	S23	59	182.25	10.7
Southwest	S24	41	81.25	5.3
Southwest	S25	45	113.5	12.6
Southwest	S26	69	376.25	133.5
Southwest	S30	7	5.5	0.4
Southwest	S31	57	175	32.4
Southwest	S32	14	14	1.3
Southwest	S33	70	349.75	132.0
Southwest	S36A	66	323	59.8
Southwest	S37	60	239	24.1
Southwest	S38	28	48.75	30.1
Southwest	S42	50	185.25	97.9
Southwest	S42A	74	530.25	177.8
Southwest	S44	43	125	59.4
Southwest	S45	41	104.25	139.0
Southwest	S46	25	48	13.5
Southwest	S50	61	326.75	1067.6

Table 4 - July 2017 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
7/1/2017	0.49	0.5	0.86	0.53	0.66	0.64	0.85	0.77	0.69	0.67	0.76	0.5	0.83	0.69	0.7	0.68	0.91	0.5
7/2/2017	0	0.01	0	0	0	0	0	0	0	0.01	0	0	0.001	0	0	0	0	0
7/3/2017	0	0	0.1	0.16	0	0	0	0	0	0.14	0.007	0	0.078	0	0	0	0	0
7/4/2017	0.25	0.64	0	0	0.24	0	0	0	0.18	0	0	0.32	0	0	0.01	0.44	0	0
7/5/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/6/2017	0.24	0.33	0.28	0.43	0.21	0.52	0.53	0.54	0.45	0.3	0.52	0.17	0.348	0.406	0.27	0.28	0.56	0.55
7/7/2017	0.38	0.48	0.13	0.15	0.43	0.36	0.18	0.18	0.42	0.21	0.165	0.4	0.139	0.234	0.31	0.47	0.13	0.28
7/8/2017	0	0.01	0	0	0	0	0.01	0	0	0.01	0.001	0.1	0.001	0.004	0	0	0	0
7/9/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/13/2017	0	0	0.74	0.77	0	0.49	0.99	0.77	0.14	0.76	0.793	0	0.781	0.642	0.14	0.03	0.92	0.66
7/14/2017	0.34	0.39	0.2	0.24	0.32	0.34	0.25	0.26	0.34	0.21	0.246	0.33	0.209	0.276	0.34	0.39	0.24	0.32
7/15/2017	0.01	0.02	0	0	0.02	0	0.01	0.01	0	0.01	0.008	0	0.002	0.004	0	0	0	0.03
7/16/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/17/2017	0.01	0.03	0.35	0.01	0	0	0.01	0.36	0	1.14	0.224	0	0.353	0.044	0	0.01	0.02	0
7/18/2017	0	0	0	0	0	0	0	0	0	0.01	0	0	0.001	0	0	0	0	0
7/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/20/2017	0	0	0.01	0	0	0	0	0	0	0	0	0	0.005	0	0	0	0	0
7/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/22/2017	0.22	0.33	0.36	0.16	0.65	0.4	0.39	0.3	0.65	0.59	0.33	0.06	0.361	0.375	0.42	0.66	0.25	0.39
7/23/2017	0.32	0.39	0.34	0.26	0.34	0.44	0.32	0.36	0.41	0.36	0.39	0.3	0.344	0.314	0.29	0.34	0.3	0.49
7/24/2017	1.45	1.31	1.61	1.64	1.84	1.54	1.76	2.03	1.29	1.64	1.96	1.69	1.748	1.55	1.62	1.49	1.99	1.73
7/25/2017	0	0	0	0.01	0	0.01	0.02	0	0.02	0.01	0	0.03	0.001	0.01	0.01	0.01	0	0.01
7/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/27/2017	0	0	0	0	0.05	0	0.01	0.02	0	0	0	0	0	0	0.03	0	0	0
7/28/2017	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/29/2017	0.44	0.47	0.25	0.31	0.43	0.39	0.32	0.32	0.38	0.3	0.3	0.28	0.275	0.342	0.41	0.42	0.3	0.36
7/30/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/31/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 5 - July 2017 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
7/1/2017	0.55	0.83	0.44	0.657	0.59	0.67	0.5	0.69	0.78	0.62	0.44	0.5	0.66	0.58	0.52	0.08	0.495
7/2/2017	0	0.01	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0.02	0
7/3/2017	0	0.02	0	0	0	0.05	0	0	0.11	0.08	0.08	0	0.18	0.01	0	0.01	0
7/4/2017	0	0	0	0.151	0.49	0	0.27	0	0.01	0	0	0	0	0	0.29	0	0.014
7/5/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/6/2017	0.58	0.23	0.5	0.453	0.25	0.14	0.25	0.32	0.25	0.12	0.31	0.448	0.21	0.06	0.27	0.366	0.496
7/7/2017	0.15	0.15	0.3	0.412	0.53	0.24	0.33	0.33	0.11	0.17	0.27	0.17	0.27	0.35	0.6	0.762	0.318
7/8/2017	0	0	0	0	0.01	0.01	0	0	0	0.08	0	0	0	0.1	0.01	0	0
7/9/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/13/2017	0.64	1.4	0.47	0.218	0	1.2	0	0.36	0.81	1.32	0.77	0.62	1.15	1.137	0	0.195	0.463
7/14/2017	0.25	0.18	0.27	0.341	0.43	0.16	0.34	0.29	0.17	0.16	0.2	0.22	0.19	0.04	0.42	0.363	0.29
7/15/2017	0.01	0.02	0	0.001	0.01	0	0.02	0	0	0	0.01	0.01	0	0.02	0.01	0.006	0.001
7/16/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0.01	0
7/17/2017	0	0.37	0	0.001	0.02	0.19	0.01	0.01	0.36	0.13	0	0.01	0.1	0.01	0.02	0	0.001
7/18/2017	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0
7/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/20/2017	0	0.03	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0
7/21/2017	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/22/2017	0.44	0.51	0.42	0.562	0	0.78	0.27	0.4	0.36	0.7	0.81	0.42	0.81	0.687	0.31	0.48	0.426
7/23/2017	0.44	0.32	0.36	0.414	0.31	0.31	0.34	0.27	0.42	0.24	0.3	0.3	0.4	0.312	0.41	0.395	0.381
7/24/2017	1.39	1.47	1.78	1.361	2.1	1.34	1.46	1.55	1.34	1.4	1.84	2.08	1.42	1.422	1.28	1.258	1.688
7/25/2017	0	0.02	0.02	0.016	0.04	0.01	0	0.03	0.01	0.06	0	0	0.03	0.015	0.01	0	0.017
7/26/2017	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0.01	0	0	0
7/27/2017	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0.01	0	0	0
7/28/2017	0	0	0	0.007	0.01	0	0	0	0	0	0	0	0	0.01	0.24	0.1	0
7/29/2017	0.31	0.22	0.3	0.383	0.34	0.29	0.45	0.36	0.21	0.25	0.28	0.32	0.36	0.4	0.421	0.29	0.32
7/30/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/31/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6 – August 2017 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
8/1/2017	0	0	0.07	0.1	0	0	0	0	0	0	0	0	0.045	0.023	0.108	0	0.006	0
8/2/2017	0.92	0.704	0.34	0.31	0.99	0.88	0.49	0.421	0.8	1.34	0.41	1.55	0.478	0.562	0.865	0.41	0.55	0.6
8/3/2017	0	0	0.24	0.16	0	0	0	0	0	0.03	0.01	0	0.179	0.051	0	0	0.28	0
8/4/2017	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/5/2017	0.84	0.94	1.26	1	0.92	1.57	1.1	1.29	1.21	1.33	1.28	0.93	1.269	1.1	0.93	0.91	1.28	1.32
8/6/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/7/2017	0.66	0.64	0.73	0.57	0.76	0.74	0.56	0.69	0.68	0.89	0.68	0.62	0.707	0.595	0.58	0.69	0.57	0.69
8/8/2017	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0
8/9/2017	0	0	0	0	0	0	0	0	0	0.01	0	0	0.001	0	0	0	0	0
8/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/12/2017	0.08	0.13	0.1	0.12	0.08	0.13	0.09	0.11	0.29	0.13	0.1	0.08	0.101	0.094	0.08	0.14	0.09	0.13
8/13/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/14/2017	0	0	0.02	0	0	0	0.01	0.02	0	0.02	0.02	0	0.018	0.007	0	0	0.01	0.01
8/15/2017	0.18	0.21	0.08	0.13	0.2	0.2	0.14	0.12	0.33	0.08	0.1	0.13	0.096	0.168	0.24	0.39	0.14	0.15
8/16/2017	0	0.01	0	0	0	0	0	0	0.01	0	0.01	0	0.002	0	0	0	0	0.01
8/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/18/2017	0.26	0.64	1.65	1.39	0.46	0.46	0.78	0.91	0.41	1.07	0.96	0.24	1.36	0.756	0.67	0.71	1.13	0.52
8/19/2017	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0
8/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/22/2017	0.49	0.57	0.19	0.2	0.43	0.17	0.16	0.17	0.33	0.25	0.16	0.45	0.14	0.18	0.2	0.33	0.21	0.14
8/23/2017	0.89	1	0.11	0.12	1.12	0.09	0.16	0.16	0.24	0.03	0.14	1.74	0.16	0.26	0.39	0.51	0.2	0.09
8/24/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/29/2017	0.72	0.7	0.77	0.85	0.76	0.75	0.72	0.78	0.75	0.75	0.76	0.64	0.85	0.61	0.73	0.74	0.73	0.76
8/30/2017	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0
8/31/2017	0	0	0	0	0	0	0.03	0.14	0	0	0.05	0	0.05	0	0	0	0.11	0

Table 7 - August 2017 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
8/1/2017	0.01	0.02	0	0	0	0.01	0	0.15	0.27	0.09	0.008	0	0	0.07	0	0	0
8/2/2017	0.19	0.09	0.31	0.8	1.28	0.87	0.77	0.43	0.15	0.11	0.356	0.46	0.21	0.21	0.68	0.1	0.32
8/3/2017	0	0.94	0	0.001	0	0.16	0	0	0.7	1.76	0.024	0	0	0.3	0.02	0.01	0
8/4/2017	0	0.01	0.01	0	0	0	0	0	0	0	0.002	0	0	0.01	0	0	0
8/5/2017	1.48	1.13	1.12	1.277	0.81	1.01	0.86	1	1.12	0.97	1.306	1.34	1.14	0.91	1.06	1.178	1.19
8/6/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/7/2017	0.75	0.68	0.82	0.694	0.65	0.74	0.69	0.56	0.65	0.81	0.76	0.8	0.9	0.82	0.72	0.709	0.72
8/8/2017	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0	0	0
8/9/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/12/2017	0.07	0.09	0.06	0.237	0.09	0.08	0.09	0.11	0.099	0.09	0.082	0.1	0.07	0.07	0.153	0.07	0.05
8/13/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01
8/14/2017	0.02	0.01	0.02	0	0.01	0.01	0	0	0.011	0.01	0.018	0.02	0.02	0.01	0.002	0.01	0.02
8/15/2017	0.09	0.08	0.11	0.288	0.15	0.05	0.28	0.22	0.087	0.05	0.108	0.09	0.05	0.26	0.211	0.21	0.17
8/16/2017	0.01	0	0.01	0	0	0	0	0	0	0	0.006	0	0	0.01	0.006	0.01	0
8/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/18/2017	0.69	1.3	0.65	0.39	0.2	0.83	0.34	0.32	1.312	0.86	0.742	0.69	0.98	0.49	0.512	0.477	0.69
8/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0
8/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.005	0.07	0
8/22/2017	0.18	0.29	0.34	0.42	0.56	0.37	0.42	0.2	0.293	0.36	0.228	0.18	0.33	0.47	0.47	0.19	0.3
8/23/2017	0.02	0.1	0	0.17	1.61	0.02	1.11	0.22	0.1	0.03	0.06	0.03	0.01	0	0.729	0.15	0.02
8/24/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/28/2017	0.02	0	0	0	0	0	0	0	0	0	0.007	0	0	0	0	0	0
8/29/2017	0.67	0.71	0.61	0.65	0.61	0.66	0.7	0.74	0.73	0.71	0.685	0.7	0.73	0.68	0.689	0.686	0.64
8/30/2017	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0.001	0.01
8/31/2017	0.21	0.01	0.05	0	0	0.02	0	0	0	0	0.094	0.02	0.01	0	0	0	0

Table 8 – September 2017 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
9/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/2/2017	0.44	0.52	0.4	0.45	0.51	0.54	0.41	0.49	0.39	0.45	0.44	0.54	0.48	0.35	0.444	0.48	0.36	0.41
9/3/2017	0.02	0.02	0.07	0.04	0.01	0.03	0.03	0.03	0.03	0.05	0.03	0.01	0.05	0.04	0.023	0.02	0.05	0.03
9/4/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/5/2017	0.1	0.04	0.08	0.09	0.08	0.1	0.087	0.09	0.05	0.13	0.1	0.01	0.08	0.09	0.059	0.09	0.07	0.05
9/6/2017	0.61	0.52	0.92	0.54	0.64	0.6	0.671	0.66	0.54	0.69	0.68	0.7	0.81	0.56	0.668	0.65	0.88	0.53
9/7/2017	0.03	0.02	0.04	0.03	0.07	0.02	0.173	0.02	0.02	0.03	0.03	0.05	0.03	0.03	0.04	0.02	0.03	0.03
9/8/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/9/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/13/2017	0.07	0.07	0.08	0.09	0.03	0.17	0.07	0.1	0.13	0.16	0.12	0.03	0.09	0.04	0.04	0.09	0.06	0.11
9/14/2017	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0
9/15/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/16/2017	0.22	0.11	0	0	0.54	0	0	0.03	0	0.01	0	0.86	0	0	1.07	0.14	0	0
9/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/18/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/19/2017	0.05	0.11	0.02	0.07	0.09	0	0.04	0.02	0.02	0.01	0.02	0.09	0.02	0.06	0.08	0.11	0.04	0.02
9/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/22/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/23/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/24/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/29/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/30/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 9 - September 2017 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
9/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/2/2017	0.63	0.46	0.31	0.5	0.44	0.37	0.43	0.45	0.4	0.34	0.486	0.44	0.52	0.38	0.49	0.456	0.29
9/3/2017	0.04	0.04	0.05	0.03	0.03	0.04	0.02	0.02	0.05	0.04	0.04	0.04	0.05	0.06	0.024	0.032	0.05
9/4/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/5/2017	0.14	0.12	0.07	0.07	0.11	0.09	0.1	0.05	0.06	0.04	0.113	0.13	0.14	0.39	0.06	0.077	0.1
9/6/2017	0.67	0.51	0.73	0.57	0.53	0.65	0.63	0.62	0.57	0.68	0.686	0.66	0.72	0.87	0.555	0.628	0.94
9/7/2017	0.02	0.04	0.01	0.02	0.02	0.04	0.03	0.02	0.04	0.03	0.021	0.02	0.02	0.03	0.021	0.022	0.02
9/8/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/9/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/13/2017	0.19	0.11	0.31	0.18	0.05	0.11	0.06	0.07	0.09	0.12	0.18	0.14	0.18	0.28	0.097	0.162	0.23
9/14/2017	0	0	0.01	0.01	0	0	0	0	0	0	0.004	0.01	0.01	0.01	0.002	0	0.01
9/15/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0.01	0
9/16/2017	0	0	0	0.01	1.38	0	0.13	0.11	0	0	0.014	0	0	0	0.44	0	0
9/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/18/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/19/2017	0.01	0.05	0.01	0.01	0.04	0	0.06	0.06	0.04	0.03	0.017	0.01	0.02	0.05	0.08	0	0.01
9/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/22/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/23/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/24/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/29/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/30/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 10 - October 2017 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
10/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/2/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/3/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/4/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/5/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/6/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/7/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/8/2017	0.03	0.12	0.15	0.06	0.03	0.1	0.12	0.17	0.18	0.11	0.17	0.05	0.15	0.06	0.09	0.1	0.13	0.12
10/9/2017	0.8	0.84	0.93	0.73	0.71	0.81	0.9	0.89	0.89	0.898	0.9	0.77	0.9	0.62	0.8	0.87	0.85	0.93
10/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/11/2017	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0
10/12/2017	0.37	0.38	0.36	0.43	0.4	0.47	0.44	0.4	0.44	0.399	0.37	0.25	0.42	0.33	0.42	0.38	0.43	0.44
10/13/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.01	0	0	0
10/14/2017	0.02	0.03	0.04	0.04	0.02	0.03	0.03	0.03	0.03	0.029	0.03	0.03	0.03	0.04	0.02	0.03	0.05	0.02
10/15/2017	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.014	0.02	0.01	0.02	0.02	0.03	0.03	0.01	0.01
10/16/2017	0.09	0.09	0.03	0.02	0.09	0.03	0.02	0.03	0.04	0.022	0.02	0.08	0.02	0.04	0.06	0.06	0.02	0.03
10/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/18/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/22/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/23/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/24/2017	0.39	0.63	0.42	0.33	0.35	0.48	0.34	0.52	0.62	0.1	0.38	0.3	0.33	0.25	0.28	0.59	0.33	0.4
10/25/2017	0	0	0	0	0	0	0	0	0	0.12	0	0	0	0	0	0	0	0
10/26/2017	0	0	0.02	0.01	0	0	0	0	0	0.03	0	0	0	0	0	0	0	0
10/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/29/2017	2.17	2.16	3.16	3.05	2.24	2.24	2.24	2.263	2.19	2.849	2.27	2.64	2.72	1.96	2.09	2.14	2.51	2.13
10/30/2017	0.44	0.44	0.29	0.34	0.45	0.5	0.33	0.318	0.51	0.286	0.3	0.55	0.24	0.27	0.3	0.46	0.28	0.29
10/31/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 11 - October 2017 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
10/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/2/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/3/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/4/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/5/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/6/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/7/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/8/2017	0.09	0.19	0.18	0.13	0.04	0.2	0.04	0.07	0.139	0.12	0.12	0.12	0.11	0.19	0.13	0.125	0.14
10/9/2017	0.77	0.89	0.82	0.84	0.64	0.88	0.7	0.69	0.867	0.93	0.816	0.79	0.9	0.79	0.87	0.843	0.85
10/10/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/11/2017	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0.001	0
10/12/2017	0.36	0.4	0.38	0.39	0.2	0.44	0.29	0.42	0.35	0.53	0.377	0.3	0.47	0.57	0.39	0.399	0.4
10/13/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0.003	0.01
10/14/2017	0.02	0.03	0.03	0.03	0.02	0.01	0.02	0.03	0.06	0.09	0.026	0.03	0.02	0.03	0.04	0.03	0.04
10/15/2017	0.02	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.019	0.02	0.01	0.01	0.02	0.016	0.02
10/16/2017	0.01	0.03	0.02	0.03	0.08	0.01	0.08	0.03	0.03	0.01	0.018	0.02	0.01	0.04	0.08	0.044	0.01
10/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/18/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/22/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/23/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/24/2017	0.42	0.45	0.42	0.42	0.36	0.46	0.45	0.4	0.45	0.41	0.72	0.57	0.58	0.39	0.33	0.29	0.33
10/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/26/2017	0.02	0.01	0.03	0	0	0.04	0	0	0.02	0	0.03	0	0.03	0.02	0	0	0.01
10/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/29/2017	2.21	2.98	2.31	2.06	1.97	2.96	1.93	1.97	2.83	2.76	2.29	2.359	2.68	3.17	2.07	1.959	0.54
10/30/2017	0.38	0.32	0.48	0.45	0.44	0.27	0.4	0.37	0.32	0.33	0.5	0.311	0.33	0.35	0.43	0.452	0.46
10/31/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12 - November 2017 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
11/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/2/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/3/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/4/2017	0.04	0.06	0.01	0.02	0.03	0.04	0.03	0.025	0.05	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.01	0.03
11/5/2017	0.13	0.15	0.11	0.11	0.12	0.15	0.13	0.12	0.16	0.09	0.11	0.12	0.11	0.08	0.11	0.13	0.11	0.14
11/6/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/7/2017	0.46	0.48	0.47	0.63	0.43	0.52	0.54	0.53	0.49	0.58	0.51	0.43	0.53	0.42	0.46	0.45	0.51	0.43
11/8/2017	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0.01	0	0
11/9/2017	0	0	0.01	0.01	0	0.02	0.01	0.02	0.01	0	0.02	0.01	0.02	0.01	0	0	0.02	0.02
11/10/2017	0.01	0	0	0.01	0	0	0.01	0	0	0.01	0	0	0	0	0	0	0	0
11/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/13/2017	0.27	0.27	0.2	0.23	0.27	0.28	0.26	0.26	0.28	0.26	0.24	0.27	0.24	0.21	0.25	0.27	0.24	0.24
11/14/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/15/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/16/2017	0.02	0.03	0.02	0.03	0.03	0	0.02	0.02	0.03	0.01	0.02	0.04	0.01	0.02	0.01	0.03	0.02	0.02
11/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/18/2017	0.04	0.05	0.05	0.09	0.03	0.05	0.08	0.05	0.07	0.07	0.05	0.05	0.06	0.08	0.08	0.08	0.07	0.05
11/19/2017	0.38	0.36	0.32	0.24	0.44	0.17	0.3	0.32	0.26	0.27	0.29	0.42	0.32	0.32	0.37	0.36	0.33	0.16
11/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/22/2017	0.08	0.11	0.09	0.1	0.07	0.12	0.09	0.12	0.13	0.1	0.11	0.12	0.1	0.06	0.05	0.08	0.06	0.12
11/23/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/24/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/29/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/30/2017	0.02	0.02	0.02	0.02	0.02	0.01	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02

Table 13 - November 2017 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
11/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/2/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/3/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/4/2017	0.05	0.01	0.03	0.05	0.03	0.01	0.03	0.06	0.01	0.01	0.04	0.023	0.01	0.02	0.06	0.06	0.05
11/5/2017	0.11	0.09	0.12	0.15	0.11	0.1	0.11	0.12	0.09	0.07	0.11	0.108	0.1	0.14	0.16	0.12	0.13
11/6/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/7/2017	0.49	0.51	0.52	0.43	0.4	0.5	0.38	0.48	0.48	0.6	0.55	0.52	0.58	0.63	0.44	0.47	0.55
11/8/2017	0	0	0	0	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0
11/9/2017	0	0.01	0	0.01	0	0.01	0	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0	0.01	0.01
11/10/2017	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0.01	0	0.01	0.01
11/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/13/2017	0.26	0.19	0.27	0.26	0.26	0.22	0.25	0.25	0.2	0.21	0.25	0.2	0.27	0.26	0.26	0.268	0.28
11/14/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0
11/15/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/16/2017	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0	0.01
11/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/18/2017	0.05	0.06	0.07	0.08	0.03	0.1	0.03	0.1	0.05	0.07	0.063	0.06	0.13	0.23	0.09	0.071	0.06
11/19/2017	0.18	0.33	0.17	0.23	0.4	0.22	0.37	0.26	0.33	0.27	0.212	0.22	0.21	0.22	0.28	0.25	0.23
11/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/21/2017	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0
11/22/2017	0.12	0.15	0.1	0.12	0.08	0.09	0.06	0.07	0.1	0.06	0.1	0.09	0.09	0.09	0.17	0.12	0.12
11/23/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/24/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/25/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/29/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/30/2017	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Table 14 – December 2017 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
12/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/2/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/3/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/4/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/5/2017	0.27	0.3	0.42	0.27	0.24	0.28	0.34	0.46	0.47	0.47	0.45	0.23	0.51	0.26	0.3	0.28	0.36	0.42
12/6/2017	0.01	0	0	0.01	0	0	0	0	0.01	0	0	0	0	0	0	0	0.01	0
12/7/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/8/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/9/2017	0.29	0.29	0.31	0.326	0.299	0.267	0.305	0.309	0.288	0.312	0.31	0.295	0.31	0.3	0.297	0.3	0.309	0.216
12/10/2017	0.02	0.019	0.02	0.016	0.029	0.023	0	0	0.027	0.018	0	0.025	0.014	0.01	0.027	0.03	0.002	0.011
12/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/13/2017	0	0	0.02	0	0	0	0	0	0	0	0.03	0	0	0	0	0.02	0	0
12/14/2017	0	0	0.02	0	0	0	0	0	0	0	0.02	0	0	0	0	0.03	0	0
12/15/2017	0.1	0.099	0.09	0.109	0.1	0.102	0.126	0.13	0.1	0.095	0.13	0.1	0.102	0.113	0.101	0.1	0.125	0.103
12/16/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/18/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/22/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/23/2017	0.5	0.55	0.63	0.59	0.52	0.57	0.58	0.6	0.6	0.63	0.59	0.48	0.64	0.49	0.54	0.59	0.56	0.53
12/24/2017	0.14	0.13	0.1	0.14	0.14	0.1	0.14	0.12	0.09	0.12	0.12	0.12	0.14	0.1	0.11	0.13	0.11	0.13
12/25/2017	0.03	0.04	0.06	0.08	0.03	0.07	0.07	0.07	0.07	0.1	0.07	0.06	0.06	0.03	0.04	0.05	0.06	0.07
12/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/29/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/30/2017	0.02	0.022	0.04	0.057	0.029	0.039	0.048	0.05	0.032	0.044	0.05	0.025	0.043	0.046	0.031	0.03	0.048	0.056
12/31/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 15 - December 2017 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
12/1/2017	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/2/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/3/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/4/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/5/2017	0.25	0.35	0.25	0.38	0.23	0.41	0.24	0.26	0.4	0.38	0.22	0.37	0.27	0.28	0.54	0.21	0.275
12/6/2017	0.01	0	0	0	0	0	0	0.01	0	0	0	0.01	0.01	0.01	0	0.01	0
12/7/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/8/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/9/2017	0.19	0.34	0.197	0.284	0.29	0.32	0.297	0.29	0.323	0.331	0.208	0.295	0.31	0.319	0.289	0.276	0.227
12/10/2017	0.01	0.01	0.009	0.023	0.02	0.02	0.027	0.025	0.015	0.014	0.01	0.002	0.016	0.019	0.022	0.018	0.014
12/11/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/12/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/13/2017	0.03	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0	0	0
12/14/2017	0.02	0.06	0	0	0.03	0.06	0	0	0	0	0	0	0	0	0	0	0
12/15/2017	0.1	0.12	0.098	0.099	0.1	0.1	0.1	0.103	0.105	0.112	0.101	0.121	0.103	0.102	0.1	0.101	0.102
12/16/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/17/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/18/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/19/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/20/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/21/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/22/2017	0	0.01	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0
12/23/2017	0.63	0.6	0.7	0.59	0.45	0.64	0.46	0.49	0.61	0.63	0.73	0.59	0.73	0.86	0.64	0.591	0.654
12/24/2017	0.1	0.1	0.13	0.11	0.12	0.07	0.1	0.13	0.1	0.1	0.12	0.13	0.13	0.1	0.1	0.107	0.121
12/25/2017	0.06	0.07	0.06	0.05	0.02	0.1	0.03	0.05	0.06	0.08	0.07	0.08	0.08	0.11	0.06	0.057	0.063
12/26/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/27/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/28/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/29/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/30/2017	0.06	0.08	0.057	0.031	0.02	0.07	0.027	0.035	0.063	0.076	0.059	0.051	0.059	0.068	0.022	0.034	0.051
12/31/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 16 - January 2018 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/2/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/3/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/4/2018	0.1	0.097	0.11	0.086	0.118	0.102	0.141	0.15	0.112	0.103	0.15	0.11	0.122	0.122	0.121	0.12	0.14	0.074
1/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/6/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/8/2018	0.06	0.054	0.04	0.043	0.042	0.041	0.049	0.05	0.041	0.044	0.05	0.049	0.043	0.044	0.039	0.04	0.048	0.033
1/9/2018	0	0	0	0.002	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0
1/10/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/12/2018	1.4	1.85	1.56	0.75	1.17	1.63	1.51	1.74	1.91	1.9	1.63	1.07	1.59	1.464	1.49	1.68	1.28	1.72
1/13/2018	0.06	0.08	0.22	0.14	0.1	0.07	0.14	0.15	0.09	0.18	0.15	0.15	0.21	0.137	0.11	0.08	0.2	0.08
1/14/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/15/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/16/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/17/2018	0.07	0.08	0.11	0.08	0.05	0.12	0.13	0.1	0.13	0.07	0.14	0.05	0.08	0.092	0.07	0.09	0.08	0.05
1/18/2018	0	0	0	0.01	0	0.01	0	0	0	0.02	0	0	0	0	0	0	0	0
1/19/2018	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0
1/20/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/21/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/22/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/23/2018	0.4	0.41	0.53	0.39	0.46	0.42	0.49	0.38	0.4	0.45	0.37	0.6	0.46	0.457	0.45	0.41	0.53	0.37
1/24/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/25/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/27/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/28/2018	0.41	0.34	0.31	0.32	0.49	0.29	0.32	0.31	0.29	0.37	0.29	0.59	0.31	0.32	0.35	0.38	0.31	0.29
1/29/2018	0	0	0	0	0	0	0.01	0.01	0	0	0	0	0	0.004	0	0	0	0
1/30/2018	0.11	0.11	0.07	0.09	0.12	0.09	0.06	0.08	0.1	0.08	0.1	0.14	0.08	0.069	0.08	0.11	0.07	0.08
1/31/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 17 - January 2018 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/2/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/3/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/4/2018	0.06	0.05	0.063	0.106	0.1	0	0.114	0.117	0.069	0.03	0.067	0.129	0.046	0.01	0.104	0.096	0.078
1/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/6/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/8/2018	0.03	0.04	0.029	0.092	0.06	0.07	0.046	0.04	0.043	0.052	0.032	0.046	0.057	0.066	0.056	0.044	0.034
1/9/2018	0	0	0	0	0	0.02	0	0	0.002	0.008	0	0	0.012	0.018	0	0	0
1/10/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/12/2018	1.69	1.04	1.92	1.85	1.45	1.67	1.2	1.23	1.17	1.4	1.81	1.69	2.1	2.01	1.77	1.76	1.837
1/13/2018	0.08	0.14	0.09	0.08	0.05	0.25	0.06	0.11	0.15	0.17	0.11	0.09	0.17	0.24	0.08	0.091	0.086
1/14/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/15/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/16/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0
1/17/2018	0.12	0.12	0.11	0.18	0.07	0.13	0.06	0.06	0.07	0.04	0.1	0.07	0.09	0.07	0.17	0.123	0.114
1/18/2018	0	0	0	0	0	0	0	0	0	0.01	0.02	0.03	0.01	0.01	0	0.01	0.002
1/19/2018	0	0	0.02	0	0	0	0	0	0	0	0	0	0.01	0	0	0.01	0.012
1/20/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/21/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/22/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/23/2018	0.45	0.48	0.64	0.4	0.47	0.49	0.36	0.35	0.51	0.49	0.58	0.45	0.49	0.58	0.37	0.58	0.561
1/24/2018	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0
1/25/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/27/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/28/2018	0.32	0.32	0.33	0.29	0.41	0.39	0.36	0.25	0.3	0.35	0.31	0.31	0.38	0.4	0.33	0.29	0.317
1/29/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/30/2018	0.07	0.06	0.04	0.11	0.13	0.06	0.1	0.07	0.08	0.05	0.07	0.07	0.1	0.07	0.12	0.07	0.054
1/31/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 18 – February 2018 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
2/1/2018	0.02	0.03	0.03	0.03	0.02	0.04	0.03	0.04	0.03	0.04	0.03	0.02	0.04	0.028	0.02	0.02	0.03	0.02
2/2/2018	0.2	0.18	0.17	0.21	0.23	0.19	0.21	0.22	0.19	0.22	0.21	0.25	0.19	0.193	0.18	0.18	0.2	0.18
2/3/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/4/2018	0.89	0.91	0.9	0.93	1.01	0.98	1	1.01	0.94	0.98	0.96	1.09	0.93	0.944	0.96	0.99	0.88	0.91
2/5/2018	0.01	0	0	0	0	0.01	0	0	0	0.01	0	0	0.01	0	0	0	0	0
2/6/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/7/2018	0.84	0.88	0.82	0.85	0.96	0.84	0.87	0.91	0.87	0.92	0.86	1.16	0.81	0.86	0.83	0.94	0.84	0.88
2/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/10/2018	0.39	0.37	0.37	0.33	0.42	0.36	0.358	0.37	0.35	0.38	0.36	0.54	0.36	0.37	0.35	0.38	0.32	0.37
2/11/2018	1.47	1.51	1.72	1.56	1.78	1.5	1.583	1.62	1.46	1.62	1.62	2.22	1.66	1.64	1.58	1.67	1.53	1.56
2/12/2018	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
2/13/2018	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/14/2018	0.02	0.02	0.06	0.05	0.02	0.05	0.05	0.07	0.04	0.07	0.06	0.05	0.06	0.04	0.02	0.04	0.06	0.06
2/15/2018	0.42	0.39	0.96	0.72	0.47	0.56	0.72	0.71	0.54	0.84	0.78	0.47	0.89	0.44	0.34	0.41	0.74	0.65
2/16/2018	0.26	0.24	0.29	0.26	0.28	0.27	0.25	0.25	0.3	0.25	0.27	0.4	0.27	0.26	0.254	0.32	0.24	0.21
2/17/2018	0.411	0.411	0.44	0.437	0.409	0.415	0.43	0.439	0.41	0.436	0.43	0.412	0.438	0.425	0.41	0.41	0.431	0.418
2/18/2018	0	0	0	0.001	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0
2/19/2018	0	0	0.02	0	0	0	0	0.01	0	0.04	0.01	0	0.01	0	0	0	0.01	0.01
2/20/2018	0	0.01	0	0.01	0	0	0	0	0	0.01	0	0	0.01	0.01	0	0	0	0.01
2/21/2018	0	0	0	0	0	0	0	0.01	0	0	0.01	0	0	0	0	0	0	0
2/22/2018	0.06	0.1	0.12	0.12	0.1	0.13	0.11	0.11	0.12	0.15	0.13	0.092	0.13	0.11	0.12	0.11	0.1	0.11
2/23/2018	0.24	0.27	0.08	0.13	0.3	0.15	0.12	0.11	0.17	0.08	0.1	0.19	0.1	0.17	0.16	0.2	0.1	0.11
2/24/2018	0.05	0.05	0.07	0.11	0.05	0.08	0.1	0.1	0.12	0.06	0.08	0.05	0.07	0.07	0.07	0.06	0.1	0.11
2/25/2018	0.64	0.67	0.82	0.84	0.87	0.74	0.82	0.77	0.72	0.82	0.74	0.55	0.8	0.75	0.69	0.75	0.76	0.73
2/26/2018	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/27/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/28/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 19 - February 2018 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
2/1/2018	0.03	0.02	0.03	0.03	0.02	0.03	0.01	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.02	0.03	0.032
2/2/2018	0.21	0.18	0.18	0.18	0.19	0.19	0.18	0.16	0.19	0.2	0.16	0.22	0.21	0.2	0.19	0.15	0.182
2/3/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/4/2018	0.94	0.87	1.03	0.9	0.88	0.84	0.81	0.78	0.87	0.84	0.99	0.91	0.97	0.98	0.95	0.95	1.001
2/5/2018	0	0	0	0	0.01	0	0	0	0	0	0.01	0	0	0	0	0	0.002
2/6/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/7/2018	0.84	0.81	0.83	0.86	0.83	0.9	0.75	0.48	0.81	0.82	0.84	0.85	0.96	0.94	0.57	0.785	0.835
2/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0
2/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/10/2018	0.35	0.33	0.36	0.35	0.38	0.39	0.33	0.27	0.33	0.38	0.37	0.34	0.38	0.39	0.38	0.361	0.359
2/11/2018	1.34	1.67	1.14	1.51	1.54	1.43	1.32	1.12	1.7	1.46	1.25	1.34	1.35	1.32	1.46	1.478	1.263
2/12/2018	0	0.03	0	0.02	0.02	0	0.02	0.01	0.02	0	0	0.01	0	0	0.02	0.016	0.004
2/13/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.001	0
2/14/2018	0.06	0.05	0.08	0.05	0.03	0.08	0.02	0.04	0.05	0.06	0.06	0.07	0.07	0.05	0.02	0.039	0.068
2/15/2018	0.81	0.74	0.9	0.5	0.32	0.5	0.35	0.41	0.87	0.62	0.47	0.83	0.47	0.7	0.46	0.512	0.785
2/16/2018	0.23	0.28	0.21	0.26	0.31	0.26	0.25	0.2	0.27	0.26	0.24	0.21	0.26	0.27	0.26	0.265	0.228
2/17/2018	0.42	0.44	0.42	0.412	0.412	0.41	0.41	0.413	0.437	0.43	0.422	0.43	0.419	0.416	0.413	0.416	0.42
2/18/2018	0	0	0	0	0	0.01	0	0	0.001	0.004	0	0	0.006	0.009	0	0	0
2/19/2018	0.02	0.02	0.02	0.01	0	0.04	0	0	0.02	0.04	0.03	0.03	0.04	0.05	0	0.003	0.014
2/20/2018	0	0	0	0	0.01	0	0.01	0	0	0	0	0	0	0	0	0.001	0
2/21/2018	0	0.01	0	0	0	0.02	0	0	0	0	0.02	0	0.01	0.06	0	0	0
2/22/2018	0.13	0.11	0.13	0.13	0.06	0.08	0.05	0.13	0.1	0.12	0.12	0.15	0.13	0.12	0.09	0.109	0.127
2/23/2018	0.09	0.08	0.11	0.19	0.22	0.08	0.22	0.13	0.08	0.08	0.07	0.1	0.08	0.12	0.3	0.203	0.117
2/24/2018	0.13	0.05	0.1	0.09	0.06	0.08	0.04	0.08	0.05	0.04	0.11	0.1	0.09	0.12	0.07	0.081	0.096
2/25/2018	0.72	0.84	0.72	0.68	0.58	0.81	0.52	0.66	0.88	0.86	0.75	0.77	0.84	0.77	0.76	0.711	0.723
2/26/2018	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0.001	0
2/27/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/28/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 20 – March 2018 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3/1/2018	0.53	0.545	0.69	0.672	0.619	0.606	0.613	0.61	0.618	0.671	0.61	0.586	0.667	0.622	0.63	0.63	0.62	0.582
3/2/2018	1.18	1.196	1.27	1.267	1.278	1.29	1.38	1.388	1.285	1.286	1.39	1.239	1.302	1.337	1.3	1.29	1.372	1.3
3/3/2018	0	0	0	0.001	0	0	0	0	0	0.001	0	0	0	0	0	0	0	0
3/4/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/2018	0.17	0.177	0.1	0.1	0.224	0.193	0.141	0.124	0.215	0.1	0.106	0.2	0.1	0.168	0.225	0.23	0.104	0.137
3/7/2018	1.36	1.39	2.25	2.229	1.579	1.492	1.66	1.515	1.56	2.244	2.035	1.49	2.25	1.745	1.593	1.6	2.185	1.298
3/8/2018	0.02	0.016	0	0	0.002	0.002	0	0	0.002	0	0	0.01	0	0	0	0	0	0
3/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/10/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/12/2018	0.05	0.07	0.01	0	0.05	0.06	0.03	0.03	0.06	0.013	0.02	0.03	0.013	0.02	0.03	0.04	0.02	0.03
3/13/2018	0.07	0.06	0.05	0.15	0.07	0.1	0.09	0.08	0.11	0.043	0.07	0.02	0.055	0.05	0.04	0.07	0.07	0.06
3/14/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/15/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/16/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/17/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/18/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/19/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/2018	0.29	0.295	0.23	0.242	0.344	0.309	0.26	0.26	0.332	0.23	0.26	0.322	0.24	0.271	0.339	0.35	0.255	0.248
3/21/2018	0.56	0.586	0.81	0.795	0.748	0.709	0.736	0.736	0.735	0.788	0.74	0.668	0.788	0.748	0.76	0.77	0.745	0.637
3/22/2018	0	0.001	0.03	0.028	0.009	0.016	0.048	0.05	0.011	0.035	0.05	0.005	0.036	0.035	0.011	0.01	0.046	0.03
3/23/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/24/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/25/2018	0	0.05	0	0	0	0	0.02	0	0	0.01	0	0	0	0	0	0.03	0.03	0
3/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/27/2018	0.01	0.02	0	0	0.01	0.02	0.01	0.01	0.02	0	0.01	0.01	0	0	0.01	0.01	0	0.01
3/28/2018	0.01	0.02	0.01	0	0.01	0.02	0.01	0.01	0.02	0.03	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.03
3/29/2018	0.11	0.12	0.09	0.07	0.09	0.1	0.1	0.09	0.1	0.08	0.09	0.09	0.08	0.09	0.11	0.13	0.08	0.09
3/30/2018	0.19	0.21	0.13	0.18	0.19	0.2	0.16	0.13	0.15	0.16	0.12	0.16	0.13	0.16	0.18	0.2	0.16	0.1
3/31/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 21 - March 2018 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
3/1/2018	0.57	0.67	0.576	0.602	0.53	0.59	0.6	0.623	0.67	0.641	0.576	0.609	0.617	0.601	0.55	0.583	0.584
3/2/2018	1.3	1.23	1.304	1.271	1.18	1.29	1.257	1.304	1.256	1.257	1.303	1.374	1.296	1.29	1.207	1.255	1.297
3/3/2018	0	0	0	0	0	0.01	0	0	0.001	0.004	0	0	0.006	0.009	0	0	0
3/4/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/2018	0.12	0.1	0.123	0.202	0.17	0.1	0.212	0.215	0.1	0.102	0.121	0.117	0.104	0.107	0.18	0.177	0.14
3/7/2018	1.23	2.216	1.252	1.513	1.36	2.214	1.528	1.574	2.25	2.201	1.265	1.478	2.091	2.077	1.407	1.447	1.321
3/8/2018	0	0	0	0.004	0.02	0	0.006	0	0	0	0	0	0	0	0.016	0.008	0
3/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/10/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/12/2018	0.03	0	0.041	0.07	0.04	0.01	0.05	0	0.01	0.01	0.05	0.03	0.01	0.02	0.07	0.07	0.053
3/13/2018	0.04	0.07	0.062	0.09	0.04	0.05	0.07	0.01	0.08	0.09	0.07	0.1	0	0.09	0.07	0.09	0.085
3/14/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/15/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/16/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/17/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/18/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/19/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/2018	0.23	0.25	0.233	0.32	0.29	0.21	0.332	0.326	0.238	0.234	0.233	0.251	0.223	0.216	0.301	0.291	0.251
3/21/2018	0.6	0.82	0.609	0.702	0.56	0.66	0.707	0.751	0.799	0.759	0.626	0.722	0.7	0.679	0.6	0.661	0.642
3/22/2018	0.03	0.01	0.029	0.009	0	0.06	0.007	0.016	0.023	0.03	0.032	0.046	0.049	0.055	0.002	0.016	0.028
3/23/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/24/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/25/2018	0	0	0	0	0	0	0	0.005	0	0	0	0.01	0	0	0	0	0
3/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/27/2018	0.01	0	0.02	0.02	0.01	0	0.01	0.01	0	0	0.01	0	0.01	0	0.02	0.02	0.019
3/28/2018	0.02	0.02	0.03	0.02	0.01	0.04	0.02	0.019	0.01	0.01	0.03	0.02	0	0.03	0.02	0.02	0.023
3/29/2018	0.09	0.09	0.09	0.1	0.1	0.08	0.1	0.104	0.09	0.09	0.1	0.09	0.083	0.08	0.14	0.1	0.092
3/30/2018	0.08	0.15	0.09	0.09	0.19	0.09	0.19	0.167	0.14	0.12	0.09	0.19	0.148	0.08	0.18	0.141	0.115
3/31/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 22 - April 2018 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/2/2018	0.11	0.135	0.28	0.279	0.271	0.256	0.294	0.298	0.268	0.272	0.3	0.208	0.285	0.285	0.285	0.29	0.295	0.226
4/3/2018	0.12	0.15	0.15	0.17	0.12	0.16	0.15	0.16	0.14	0.13	0.16	0.09	0.16	0.15	0.16	0.16	0.15	0.17
4/4/2018	0.04	0.02	0.07	0.04	0.07	0.06	0.04	0.06	0.06	0.06	0.05	0.05	0.06	0.04	0.02	0.05	0.04	0.03
4/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/6/2018	0.03	0.04	0.04	0.03	0.03	0.06	0.04	0.05	0.05	0.04	0.05	0.03	0.04	0.04	0.04	0.03	0.04	0.05
4/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/10/2018	0.01	0.01	0.019	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.01
4/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/12/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/13/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/14/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/15/2018	0.48	0.49	0.31	0.65	0.65	0.52	0.43	0.45	0.48	0.38	0.39	0.217	0.43	0.35	0.4	0.54	0.34	0.49
4/16/2018	2.08	2.24	2.15	1.95	2.37	2.53	2	2.01	2.5	2.44	2.02	1.65	2.38	2.16	1.92	2.56	2.33	2.25
4/17/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/18/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/19/2018	0.01	0.01	0.03	0.02	0.01	0.03	0.03	0.02	0.02	0.04	0.03	0.009	0.06	0.01	0.01	0.01	0.02	0.01
4/20/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/21/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/22/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/23/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2018	0.11	0.14	0.12	0.09	0.14	0.16	0.14	0.13	0.14	0.12	0.12	0.133	0.11	0.13	0.11	0.13	0.12	0.14
4/25/2018	0.22	0.19	0.25	0.31	0.3	0.33	0.21	0.24	0.26	0.3	0.2	0.228	0.26	0.19	0.14	0.25	0.17	0.35
4/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/27/2018	0.21	0.23	0.24	0.24	0.28	0.15	0.28	0.22	0.21	0.21	0.23	0.269	0.21	0.23	0.21	0.24	0.22	0.19
4/28/2018	0.09	0.12	0.29	0.11	0.08	0.16	0.17	0.12	0.17	0.18	0.14	0.07	0.25	0.07	0.1	0.11	0.12	0.12
4/29/2018	0.11	0.13	0.15	0.09	0.09	0.16	0.12	0.14	0.16	0.15	0.14	0.17	0.13	0.09	0.09	0.13	0.13	0.13
4/30/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 23 – April 2018 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
4/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/2/2018	0.21	0.3	0.215	0.241	0.11	0.17	0.236	0.283	0.279	0.253	0.22	0.287	0.216	0.188	0.147	0.21	0.227
4/3/2018	0.14	0.15	0.14	0.08	0.09	0.11	0.1	0.155	0.15	0.1	0.1	0.12	0.122	0.11	0.15	0.112	0.14
4/4/2018	0.06	0.06	0.13	0.03	0.11	0.09	0.04	0.029	0.05	0.12	0.13	0.08	0.01	0.22	0.06	0.044	0.103
4/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/6/2018	0.04	0.04	0.05	0.03	0.03	0.05	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.06	0.04	0.016	0.049
4/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/10/2018	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.04	0.02	0.02	0.02	0.01	0.01
4/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/12/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/13/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/14/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/15/2018	0.48	0.43	0.49	0.484	0.31	0.35	0.364	0.5	0.57	0.51	0.4	0.45	0.5	0.45	0.44	0.39	0.488
4/16/2018	2.24	1.86	2.47	2.472	2.04	1.89	2.01	1.51	1.97	1.93	2.28	1.86	2.45	2.41	2.18	1.97	2.447
4/17/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0
4/18/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/19/2018	0.04	0.03	0.04	0.021	0.01	0.06	0.01	0.01	0.02	0.04	0.05	0.04	0.05	0.07	0.01	0.03	0.036
4/20/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/21/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/22/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/23/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/24/2018	0.14	0.08	0.15	0.144	0.11	0.09	0.09	0.1	0.1	0.09	0.15	0.13	0.14	0.14	0.15	0.14	0.15
4/25/2018	0.36	0.35	0.48	0.272	0.22	0.31	0.206	0.17	0.41	0.3	0.38	0.27	0.37	0.41	0.27	0.22	0.419
4/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/27/2018	0.24	0.26	0.2	0.196	0.22	0.2	0.21	0.18	0.2	0.22	0.16	0.18	0.21	0.19	0.22	0.198	0.191
4/28/2018	0.2	0.14	0.19	0.163	0.1	0.17	0.09	0.1	0.15	0.18	0.2	0.22	0.23	0.2	0.13	0.139	0.178
4/29/2018	0.21	0.12	0.1	0.159	0.14	0.14	0.1	0.1	0.11	0.11	0.12	0.16	0.16	0.15	0.16	0.148	0.118
4/30/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0

Table 24 – May 2018 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
5/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/2/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/3/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/4/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/6/2018	0	0.03	0	0.02	0	0.01	0.025	0.03	0.03	0	0.03	0.02	0	0	0.01	0.02	0.01	0.01
5/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/10/2018	0	0.01	0	0	0	0	0	0	0	0.01	0	0	0	0	0.01	0.01	0	0
5/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/12/2018	1.19	1.13	0.83	0.93	1.36	0.97	0.887	0.88	1.05	0.86	0.9	1.17	0.9	0.85	0.99	1.1	0.96	0.96
5/13/2018	0.5	0.43	0.41	0.28	0.48	0.42	0.449	0.48	0.39	0.45	0.51	0.39	0.43	0.33	0.33	0.42	0.35	0.47
5/14/2018	0	0	0.26	0.28	0.02	0.01	0.234	0.25	0.02	0.19	0.17	0.01	0.2	0.32	0.09	0.02	0.25	0.33
5/15/2018	0.44	0.34	0.17	0.27	0.52	0.32	0.223	0.23	0.31	0.24	0.22	0.65	0.18	0.24	0.24	0.32	0.16	0.25
5/16/2018	0.22	0.22	0.24	0.25	0.29	0.25	0.226	0.23	0.22	0.23	0.22	0.2	0.23	0.23	0.23	0.26	0.22	0.23
5/17/2018	0.48	0.74	1.18	0.78	0.48	0.94	0.977	1.02	1.18	1.04	1.02	0.33	1.12	0.65	0.73	0.68	1.03	1.29
5/18/2018	0.04	0.05	0.06	0.07	0.04	0.1	0.062	0.06	0.09	0.04	0.06	0.02	0.05	0.06	0.06	0.07	0.08	0.08
5/19/2018	0.68	0.75	0.63	0.67	0.77	0.8	0.646	0.66	0.69	0.65	0.6	0.48	0.62	0.55	0.67	0.78	0.58	0.76
5/20/2018	0.17	0.09	0	0	0.09	0.07	0.005	0	0.03	0	0	0.01	0.01	0.04	0.02	0.07	0	0
5/21/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/22/2018	0.26	0.32	0.32	0.35	0.36	0.39	0.35	0.37	0.32	0.42	0.34	0.3	0.31	0.32	0.3	0.32	0.32	0.41
5/23/2018	0	0	0	0	0	0	0	0	0	0.01	0	0	0.01	0	0	0	0	0
5/24/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/25/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/26/2018	0.03	0.08	0	0	0	0.04	0.058	0	0.07	0	0	0.01	0	0.4	0.07	0.02	0.09	0.01
5/27/2018	0	0.03	1.25	1.27	0.02	0.66	0.603	0.43	0.68	1.81	0.91	0.07	0.82	1.59	1.17	0.92	0.72	0.62
5/28/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/29/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/30/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/31/2018	0	0.01	0.03	0.06	0.01	0.02	0.037	0.04	0.01	0.04	0.04	0.01	0.04	0.01	0.01	0.02	0.02	0.04

Table 25 - May 2018 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
5/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/2/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/3/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/4/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/5/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/6/2018	0	0.002	0.01	0.026	0	0	0	0.02	0	0	0.01	0	0.02	0.02	0.08	0.02	0.012
5/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/9/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/10/2018	0	0	0.01	0	0	0	0	0	0	0.01	0	0	0	0.01	0	0	0.007
5/11/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/12/2018	0.79	1.05	0.72	1.039	1.36	0.87	1.19	0.8	0.81	0.9	0.94	0.889	0.95	1.11	1.22	1.086	0.804
5/13/2018	0.68	0.35	0.84	0.402	0.43	0.34	0.51	0.28	0.37	0.38	0.76	0.492	0.46	0.42	0.43	0.447	0.707
5/14/2018	0.12	0.14	0.14	0.019	0.01	0.16	0	0.12	0.24	0.15	0.05	0.191	0.13	0.07	0.01	0.032	0.112
5/15/2018	0.16	0.13	0.27	0.318	0.45	0.19	0.48	0.25	0.14	0.14	0.24	0	0.23	0.16	0.4	0.346	0.278
5/16/2018	0.215	0.23	0.21	0.222	0.24	0.16	0.21	0.21	0.24	0.22	0.173	0.203	0.23	0.22	0.24	0.231	0.217
5/17/2018	0.855	0.92	1.01	1.089	0.39	1.03	0.49	0.76	1.1	1.16	1.22	0.82	1.02	1.16	0.96	0.928	0.999
5/18/2018	0.01	0.04	0.04	0.086	0.02	0.031	0.03	0.08	0.04	0.02	0.04	0.04	0.02	0.02	0.07	0.069	0.052
5/19/2018	0.733	0.57	0.92	0.722	0.67	0.46	0.63	0.63	0.59	0.62	0.83	0.64	0.72	0.69	0.84	0.78	0.869
5/20/2018	0	0	0.01	0.043	0.03	0.01	0.12	0.03	0	0	0.01	0.01	0	0.01	0.13	0.082	0.025
5/21/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/22/2018	0.39	0.3	0.37	0.338	0.3	0.32	0.27	0.26	0.28	0.33	0.38	0.34	0.36	0.39	0.32	0.359	0.51
5/23/2018	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/24/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/25/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/26/2018	0.05	0	0.13	0.065	0.28	0	0.02	0.46	0	0	0	0.01	0	0	0.18	0.106	0.11
5/27/2018	0.725	1.224	0.48	0.639	0.06	0.69	0.02	0.51	1.07	1.41	0.88	1	0.57	0.79	0.29	0.495	0.81
5/28/2018	0.001	0	0.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/29/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/30/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/31/2018	0.031	0.07	0.03	0.011	0.01	0.03	0	0.06	0.04	0.07	0.01	0.04	0.04	0.04	0.02	0.018	0.02

Table 26 - June 2018 PWD Rain Gage Records

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
6/1/2018	0.12	0.48	0.13	0.03	0.03	0.22	0.194	0.21	0.32	0.4	0.27	0.04	0.12	0.03	0.02	0.19	0.09	0.81
6/2/2018	0.44	0.53	1.39	0.53	0.57	0.95	0.792	0.71	1.1	0.12	0.79	0.2	1.5	1.77	1.92	1.94	0.46	0.35
6/3/2018	0.67	0.84	1.19	0.79	0.84	0.42	1.357	1.42	0.45	1.42	1.28	0.54	1.57	1.4	1.18	0.55	1.32	0.55
6/4/2018	0.17	0.23	0.15	0.14	0.19	0.15	0.142	0.15	0.23	0.18	0.14	0.15	0.12	0.09	0.09	0.15	0.11	0.17
6/5/2018	0.15	0.1	0.08	0.14	0.24	0.11	0.128	0.14	0.08	0.06	0.12	0.02	0.1	0.11	0.04	0.16	0.1	0.14
6/6/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/9/2018	0.01	0	0	0	0.05	0	0	0	0	0	0	0.06	0	0	0	0	0	0
6/10/2018	0.69	0.81	1.24	1.99	0.77	1	2.132	2.39	0.85	1.26	2.18	0.34	1.66	1.04	0.91	1.05	2.26	1.23
6/11/2018	1.39	1.2	1.07	1.87	1.74	1.49	3.157	3.55	1.38	0.86	2.24	1	1.66	1.79	1.29	1.52	4.63	1.19
6/12/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/13/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/14/2018	0	0	0.02	0	0	0	0.016	0.02	0	0	0.02	0	0	0	0	0	0.02	0
6/15/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/16/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/17/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/18/2018	0	0	0.2	0.32	0	0	0.149	0.17	0	0.2	0.2	0	0.24	0.05	0	0	0.12	0.08
6/19/2018	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0
6/20/2018	0.01	0.07	0	0	0.01	0	0	0	0	0	0	0.01	0	0	0	0.02	0	0
6/21/2018	0.26	0.21	0	0	0.26	0.01	0.031	0.03	0.01	0	0.03	0.22	0.01	0.02	0.06	0.2	0.04	0.02
6/22/2018	0.09	0.06	0.16	0.18	0.23	0.03	0.17	0.12	0.04	0.15	0.14	0.211	0.15	0.15	0.14	0.11	0.14	0.06
6/23/2018	0.01	0.04	0.06	0.05	0.08	0.32	0.04	0.05	0.12	0.12	0.07	0.07	0.05	0.04	0.04	0.02	0.03	0.14
6/24/2018	0	0	0.35	0.33	0	0.06	0.187	0.2	0.03	0.24	0.3	0.001	0.39	0	0	0	0.2	0.05
6/25/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/27/2018	0	0.02	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0.01	0	0
6/28/2018	0.09	0.17	0.34	0.32	0.14	0.17	0.236	0.23	0.37	0.31	0.2	0.137	0.31	0.13	0.14	0.26	0.41	0.17
6/29/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/30/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 27 - June 2018 PWD Rain Gage Records

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
6/1/2018	0.424	0.116	0.11	0.21	0.16	0.27	0.08	0.1	0.03	0.17	0.12	0.58	0.79	0.295	0.15	0.08	0.13
6/2/2018	0.458	0.182	0.2	0.55	0.25	0.03	0.6	0.87	0.17	0.06	0.06	0.48	0.09	0	0.55	0.53	0.22
6/3/2018	0.738	0.685	0.34	0.33	0.62	0.59	0.61	1.06	0.74	0.55	0.48	1.401	1.31	0.818	0.74	0.89	0.32
6/4/2018	0.174	0.129	0.19	0.09	0.21	0.16	0.18	0.15	0.15	0.11	0.23	0.145	0.16	0.148	0.18	0.16	0.18
6/5/2018	0.142	0.02	0.28	0.02	0	0.01	0.18	0.1	0.05	0.01	0.08	0.12	0.02	0.02	0.07	0.05	0.26
6/6/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/7/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/8/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/9/2018	0	0	0	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0
6/10/2018	1.6	1.4	3	0.49	0.48	1.46	0.72	0.97	1.18	1.54	1.829	1.993	2.03	1.529	0.61	0.64	1.26
6/11/2018	1.17	0.78	2.97	0.56	0.91	0.88	1.42	1.46	0.9	0.75	1.659	2.234	0.8	0.939	0.93	1.14	1.6
6/12/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/13/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/14/2018	0	0	0.01	0	0	0	0	0	0	0	0.006	0.02	0	0	0	0	0
6/15/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/16/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/17/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/18/2018	0.09	0.04	0.12	0	0	0.04	0	0.02	0.16	0.06	0.017	0.15	0.16	0.15	0	0	0
6/19/2018	0	0	0.01	0	0	0	0	0	0	0	0	0.01	0	0	0	0	0
6/20/2018	0	0	0	0	0.08	0	0.02	0	0	0	0	0	0	0	0.14	0	0
6/21/2018	0	0	0.02	0.01	0.21	0	0.29	0.03	0	0.02	0.01	0.02	0	0	0.16	0.01	0.03
6/22/2018	0.01	0.12	0.03	0.03	0.1	0.07	0.12	0.08	0.14	0.1	0.01	0.06	0.07	0.14	0.03	0.03	0.03
6/23/2018	0.06	0.063	0.05	0.14	0.01	0.08	0.01	0.04	0.04	0.08	0.02	0.04	0.08	0.09	0.2	0.02	0.05
6/24/2018	0.2	0.186	0.28	0.01	0	0.21	0	0.01	0.21	0.13	0	0.52	0.27	0.19	0	0.12	0.14
6/25/2018	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0
6/26/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/27/2018	0	0	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0.01	0	0
6/28/2018	0.2	0.438	0.48	0.21	0.14	0.35	0.09	0.26	0.5	0.42	0	0.22	0.47	0.89	0.3	0.16	0.31
6/29/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/30/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 28 - Rain Gage records by year and month for FY18

Date/RG	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Jul17	4.15	4.93	5.23	4.67	5.19	5.13	5.65	5.92	4.97	6.37	5.704	4.18	5.477	4.891	4.55	5.22	5.62	5.32
Aug17	5.04	5.544	5.56	4.96	5.72	5	4.25	4.811	5.05	5.94	4.68	6.38	5.456	4.406	4.793	4.83	5.306	4.42
Sep17	1.54	1.41	1.61	1.31	1.97	1.46	1.481	1.44	1.18	1.53	1.43	2.29	1.56	1.17	2.424	1.6	1.49	1.18
Oct17	4.33	4.71	5.41	5.02	4.31	4.67	4.44	4.641	4.91	4.857	4.46	4.68	4.83	3.6	4.1	4.67	4.61	4.37
Nov17	1.45	1.53	1.3	1.49	1.44	1.36	1.5	1.495	1.5	1.43	1.4	1.52	1.44	1.25	1.39	1.48	1.39	1.23
Dec17	1.38	1.45	1.71	1.598	1.387	1.451	1.609	1.739	1.687	1.789	1.77	1.335	1.819	1.349	1.446	1.56	1.584	1.536
Jan18	2.61	3.021	2.95	1.911	2.55	2.773	2.85	2.97	3.073	3.229	2.88	2.759	2.895	2.709	2.71	2.91	2.658	2.697
Feb18	5.931	6.071	6.89	6.608	6.929	6.325	6.671	6.769	6.28	6.937	6.67	7.514	6.798	6.32	5.994	6.49	6.351	6.348
Mar18	4.55	4.756	5.67	5.734	5.223	5.117	5.258	5.033	5.218	5.691	5.511	4.85	5.671	5.266	5.248	5.38	5.697	4.552
Apr18	3.62	3.905	4.099	3.999	4.421	4.586	3.924	3.918	4.468	4.342	3.85	3.134	4.395	3.765	3.505	4.52	3.995	4.166
May18	4.01	4.23	5.38	5.23	4.44	5	4.782	4.68	5.09	5.99	5.02	3.67	4.92	5.59	4.93	5.03	4.79	5.46
Jun18	4.1	4.76	6.38	6.69	5.15	4.93	8.731	9.39	5	5.32	7.98	2.999	7.89	6.62	5.83	6.18	9.93	4.96
Total	**42.711**	**46.317**	**52.189**	**49.22**	**48.73**	**47.802**	**51.146**	**52.806**	**48.426**	**53.425**	**51.355**	**45.311**	**53.151**	**46.936**	**46.92**	**49.87**	**53.421**	**46.239**

Date/RG	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
Jul17	4.76	5.79	4.86	4.977	5.14	5.39	4.27	4.61	4.95	5.33	5.35	5.098	5.78	5.183	4.811	4.335	4.91	
Aug17	4.41	5.46	4.11	4.929	5.97	4.83	5.27	3.95	5.522	5.85	4.486	4.43	4.45	4.32	5.257	3.871	4.14	
Sep17	1.7	1.33	1.5	1.4	2.6	1.3	1.46	1.4	1.25	1.28	1.561	1.45	1.66	2.07	1.77	1.387	1.65	
Oct17	4.3	5.31	4.69	4.37	3.76	5.28	3.94	4	5.076	5.19	4.916	4.52	5.14	5.56	4.37	4.162	2.81	
Nov17	1.29	1.38	1.3	1.36	1.36	1.29	1.28	1.39	1.31	1.35	1.385	1.271	1.44	1.69	1.49	1.399	1.47	
Dec17	1.46	1.75	1.501	1.567	1.31	1.79	1.281	1.393	1.676	1.723	1.518	1.659	1.708	1.868	1.773	1.404	1.507	
Jan18	2.82	2.25	3.242	3.108	2.74	3.08	2.3	2.227	2.404	2.6	3.099	2.885	3.465	3.474	3	3.084	3.095	
Feb18	6.32	6.53	6.26	6.172	5.882	6.15	5.29	4.913	6.708	6.244	5.942	6.4	6.325	6.555	5.973	6.112	6.256	
Mar18	4.35	5.626	4.459	5.013	4.5	5.404	5.089	5.124	5.667	5.548	4.506	5.037	5.337	5.334	4.763	4.879	4.65	
Apr18	4.37	3.83	4.665	4.302	3.5	3.64	3.496	3.187	4.059	3.903	4.25	3.877	4.528	4.628	3.977	3.637	4.556	
May18	4.76	5.026	5.21	5.019	4.25	4.291	3.97	4.47	4.92	5.41	5.543	4.675	4.75	5.11	5.19	4.999	5.532	
Jun18	5.266	4.159	8.1	2.66	3.17	4.15	4.33	5.15	4.27	4	4.521	7.993	6.26	5.209	4.07	3.83	4.53	
Total	**45.806**	**48.441**	**49.897**	**44.877**	**44.182**	**46.595**	**41.976**	**41.814**	**47.812**	**48.428**	**47.077**	**49.295**	**50.843**	**51.001**	**46.444**	**43.099**	**45.106**	

Table 29 - SSO Statistics for Period July 1 2017 – June 30 2018

Main & Shurs					
Event No.	**Start of Overflow Date Time**	**End of Overflow Date Time**	**Event Duration (hours:mins)**	**Flow Volume (ft^3)**	**Flow Volume (Millions of gallons)**
0			0	0	0

PC-30					
Event No.	**Start of Overflow Date**	**End of Overflow Date**	**Event Duration (hours:mins)**	**Flow Volume (ft^3)**	**Flow Volume (Millions of gallons)**
0			0	0	0

Appendix E – PCB PMP 11th Annual Report

PCB

Pollutant Minimization Plan

Eleventh Annual Report

Table of Contents

1 PMP Achievement Executive Summary

The Philadelphia Water Department (PWD) submitted its PCB Pollutant Minimization Plan (PCB PMP) on September 30, 2005 and was issued a Completeness Determination letter on January 12, 2006. PWD initiated the actions called for in its PCB PMP on March 4, 2006.

PWD's PCB PMP set out the following approaches to achieving PCB minimization:

- Sample three Water Pollution Control Plants' effluent every two years and analyze using Method 1668A.
- Visit and inspect three hundred ninety-nine (399) sites listed by either EPA or other agencies as housing PCB-containing devices and report the number of devices that have been removed from each site, both prior to our inspection and subsequent to it.
- Visit and inspect thirty-one (31) sites listed by the Philadelphia Department of Public Health as having previously undergone some type of PCB remediation activity, and report the number of sites removed from the list as posing no threat of PCB discharge to PWD's sewer system.
- Report any reductions in PCB concentrations in the wastestreams from our three Water Treatment Plants by measuring PCBs in the ferric chloride used in the treatment process as well as reductions of PCBs in the source water (Delaware River or Schuylkill River).
- Continue the sewershed PCB trackdown sampling program for each of our three Water Pollution Control Plants.

Revisions to the original PMP have been made over the years. Refer to the First through the Tenth Annual Reports for specific information on PMP efforts during Years 1 - 10. No changes to the PMP were made in Year 11 (2017). Year 11 efforts are detailed in the attached report.

During the eleventh year of PWD's PCB PMP, the following tasks were performed:

- Wet-weather PCB sampling and analysis of the three Water Pollution Control Plants' (WPCPs') effluent was performed as required by PWD's NPDES permits. See Section 7, "Tabular Summary", for data.

- PWD inspected 81 of the 337 sites remaining on list identified by EPA or other agencies as housing PCB-containing devices. This exceeds the goal of 70 site inspections per year. (In 2016, PWD increased its goal of 50 site inspections per year to 70 inspections per year, and a schedule was developed to plan site inspections through calendar year 2020.) These inspections identified 15 locations where transformers and/or capacitors had been removed from the site. Historical information for these sites will be retained, but they will be removed from the schedule for future inspection.

- PWD's PCB database was developed in 2017 and is now being populated. The database was utilized to track and report the 2017 inspections. Going forward, the database will allow us to track "active" sites (where LCEE devices are still located on site) versus "inactive" sites (where LCEE devices were previously located but have been removed). Each location has been given a unique ID and has been geocoded in PWD's GIS database. Maps of PCB sites inspected in 2017 by water pollution control plant drainage area and those in separate sewer areas were developed, and can be found in Attachment B of this report.

- In 2017, PWD continued to monitor outlying township connection points for PCBs using EPA Method 680. Results for the locations sampled were below the detection limit, and are presented in Section 8, Township Data.

- PWD issued 12 new groundwater discharge permits in 2017. Every permit was compliant with PWD's published PCB limit of "non-detection by EPA Method 608." Preliminary samples at one location showed detectable levels of two Aroclors. However, the lab reported the RPD between the primary and secondary columns for this analysis was greater than 40%. PWD required the site to perform additional monitoring, and every subsequent sample showed results below the detection limit.

- PWD wet weather and dry weather WPCP effluent data have been entered into the DRBC PCB database.

- Significant reductions in WPCP effluent PCB loadings have been observed over the course of the PMP (see “Tabular Summary”).

2 Facility and Contact Information

Facility Name and Address:	Philadelphia Water Department 1101 Market Street Philadelphia, PA 19107
Water Pollution Control Plants:	Northeast WPCP 3899 Richmond St. Philadelphia, PA 19137
	Southeast WPCP 25 Pattison Ave. Philadelphia, PA 19148
	Southwest WPCP 8200 Enterprise Ave. Philadelphia, PA 19153
Contact Person:	Nicole Charlton Manager, Industrial Waste 1101 Market St., 6th Floor Philadelphia, PA 19107
	Phone: 215-685-8093 Fax: 215-685-8008 Email: nicole.charlton@phila.gov
Date of Submittal of PMP:	September 30, 2005
Date of Completeness Determination:	January 12, 2006
Date of Initiation of PMP:	March 4, 2006
Reporting Period:	Year 11 (Calendar Year 2017)

3 Revisions to PMP

During Year 11, no revisions were made to the PMP.

4 Material and Process Modifications

During Year 11 of the PMP, there were no material or process modifications made relevant to PCB minimization.

5 Measures to Address Known, Probable and Potential Sources

5.1 Known and Probable Sources

Two known sources of PCBs were identified in PWD's PCB PMP. These were the source water for PWD's Water Treatment Plants (Delaware and Schuylkill Rivers) and the ferric chloride supplied to PWD by DuPont and used in the water treatment process. A change of ferric chloride supplier in Year 5 resulted in a 95% reduction in PCB content of the product used by PWD in its water treatment process.

A probable source of PCBs identified in PWD's PCB PMP is sludge stored in lagoons at both NEWPCP and SWWPCP. Trackdown efforts conducted in the sewersheds of both NEWPCP and SWWPCP included sampling of the lagoons. The data are available in Attachment B of the Year 5 report.

5.2 Potential Sources

Numerous potential sources of PCBs were identified in PWD's PCB PMP. These were identified from databases supplied by EPA, the Philadelphia Fire Department, the Philadelphia Department of Public Health and others. The thirty-one (31) potential sources supplied by the Philadelphia Department of Public Health were identified as sites at which some form of prior PCB remediation had taken place. All thirty-one (31) of these sites were inspected during Year 1 of the PMP.

The remaining potential sources of PCBs, taken from information supplied by EPA and others, were identified as sites on which PCB devices were believed to be present. These sites were separated into three groups by sewershed (NEWPCP, SEWPCP or SWWPCP). Approximately one hundred sixty-seven (167), seventy-three (73) and one hundred fifty-seven (157) sites were listed for NEWPCP, SEWPCP and SWWPCP, respectively. During 2017 (Year 11 of the PMP), PWD's Industrial Waste group inspected forty-two (42) of the NEWPCP-related sites, twenty-one (21) of the SEWPCP-related sites and eighteen (18) of the SWWPCP-related sites. Details of these inspections are summarized in the Tables, "Inspections of Potential Source Sites" in Attachment B of this report

Inspections confirmed that 15 of these sites have had transformers and/or capacitors removed from the site. Historical information for these sites will be retained, but the sites will be removed from the schedule for future inspection.

PCB Database

During 2017, PWD created a PCB database to more effectively manage data. The database was developed as a separate module to PWD's existing Pretreatment Program compliance tracking software, LINKO. This allows for easy cross-referencing of PCB sites and permitted Industrial Users. The database is currently being populated. It was used to create the PCB inspection report shown in Attachment B.

All PCB data locations have been geocoded so that they can be included on GIS Maps. Maps detailing the 2017 PCB inspection sites are included in Attachment B. These include an overall site inspection map, as well as inspections broken down by water pollution control plant drainage area and those conducted in separate sewer areas.

New Construction and Groundwater Remediation Sites:

In an effort to minimize the amount of PCBs entering the City's sewer system, PWD has begun to implement PCB monitoring in all Groundwater Discharge Permits. These permits are used to regulate specific pollutants of concern from groundwater discharges to the City sewer. Generally, these permits are for remediation sites with groundwater contaminated with petroleum products, such as former gasoline stations. However, all temporary discharges from construction activities are also permitted under the Groundwater Discharge Permit Program. The Groundwater Discharge Permits require all Contractors and/or Subcontractors to monitor their discharges monthly for PCBs via sampling and to report their activities and results. All Groundwater Discharge Permits include PWD's published PCB limit of "non-detection by EPA Method 608" limitation. All PCB detections require additional monitoring by the contractor or subcontractor to show compliance with the permit limitation. In 2017, 12 new groundwater permits were issued. Preliminary samples at one location showed detectable levels of two Aroclors. However, the lab reported the RPD between the primary and secondary columns for this analysis was greater than 40%. PWD required the site to perform additional monitoring, and every subsequent sample showed results below the detection limit.

Township Connections

PWD has agreements with the surrounding townships to convey and treat township wastewater, which is ultimately discharged at NEWPCP and SWWPCP. Part of the agreement includes sampling the respective township's wastewater at the connection to the City's sewer system (i.e. near Philadelphia border). In 2017, PWD sampled one additional township connection and resampled one connection, previously sampled in 2016, using EPA Method 680 to determine if there are PCB loadings entering the City through the surrounding township connections. Results of this sampling are presented in Attachment C. PWD plans on sampling additional township connections in 2018.

6 Incremental and Cumulative Changes from the Baseline Loading

6.1 Loading Baseline

PWD's PCB PMP provides the following baseline loadings (see Section 7, "Tabular Summary):

WPCP	Baseline Loading (mg/day)
NEWPCP	11,510
SEWPCP	7,559
SWWPCP	10,970

These loadings differ from those found in the TMDL. This is because the data are from different sampling events, the PMP baseline loadings are weighted by wet versus dry weather results, the analyses are for different numbers of congeners and there is a difference in analytical methods.

6.2 Baseline Loading Reduction – Direct Measurement

During Year 11, wet-weather effluent sampling for PCBs was performed at each of PWD's three Water Pollution Control Plants (WPCPs), as required by PWD's NPDES permits. See Section 7 ("Tabular Summary") for data. Loadings were generally comparable to those calculated in Year 10 (2016). Wet weather sample results at SEWPCP were higher than in 2016 but on par with 2015. The October 9th sample from SEWPCP showed an unusual pattern, with the bulk of the constituents being mono- and di-chlorobiphenyls. Typically, the tetra-, penta- and hexa- homologs make up the majority of PWD PCB samples. Curiously, an unusually high rinsate blank (concentration 9387 pg/L) from the same sample event at SWWPCP showed the same pattern. Overall, results of the 2017 sampling show substantial reductions of 63-92% from the baseline PCB loading levels.

6.3 Baseline Loading Reduction – Other Measures of Progress

See Attachment B (“Potential Sources and Inspection Findings”). A report with results from 2017 inspections is shown in this section. This was the first report developed from the new PCB database. PWD may refine this report and the maps associated with it in future reports.

Two outlying township locations were sampled in 2017, using EPA method 680. The first location, Grant, was sampled in 2016 as well and drains to NEWPCP. The second location, Northwest, drains to SEWPCP. Both locations had results below the detection level. In 2018, additional outlying township connection sampling is planned.

On November 1st, 2017 PWD responded to a report of a discharge at an outfall in the Pennypack Creek. The discharge had a chemical odor, and was sampled for VOCs and PCBs. The source was discovered to be paint that was rinsed into a sink that was cross-connected to a storm drain. The cross connection was eliminated as a result. The results of the PCB sample were non-detect by method 608.

7 Tabular Summary

Facility: Philadelphia Water Department
Contact Information
Name: Nicole Charlton
Phone: 215-685-8093
Email: nicole.charlton@phila.gov

NPDES No(s).: PA0026689 (Northeast Water Pollution Control Plant, NEWPCP)
PA0026662 (Southeast Water Pollution Control Plant, SEWPCP)
PA0026671 (Southwest Water Pollution Control Plant, SWWPCP)

Date of Completeness Determination: January 12, 2006
Date of Initiation of PMP: March 4, 2006

Cumulative Percent Reductions

Baseline Loading Calculations Date: 2005
Revisions Date: N/A

Year	Loading (milligrams per day)		Estimated Reductions (from baseline) (milligrams per day)		Cumulative Reductions (% from baseline)	
TMDL Estimated Loading (to be added by DRBC)						
Discharger Computed Baseline						
NEWPCP	11,510					
SEWPCP	7,559					
SWWPCP	10,970					
			N/A		N/A	
2007	December 3, 2007		December 3, 2007		December 3, 2007	
NEWPCP	8,594		2,916		25.3	
SEWPCP	4,595		2,964		39.2	
SWWPCP	6,369		4,601		41.9	
2009	March 27, 2009	October 16, 2009	March 27, 2009	October 16, 2009	March 27, 2009	October 16, 2009
NEWPCP	5,846	6,571	5,664	4,939	49.2	42.9
SEWPCP	3,435	4,287	4,124	3,272	54.6	43.3
SWWPCP	7,334	5,690	3,636	5,280	33.1	48.1
2010	April 21, 2010	December 2, 2010 (Dec. 13 for NEWPCP)	April 21, 2010	December 2, 2010 (Dec. 13 for NEWPCP)	April 21, 2010	December 2, 2010 (Dec. 13 for NEWPCP)
NEWPCP	5,490	4,615	6,020	6,895	52.3	59.9
SEWPCP	2,155	2,736	5,404	4,823	71.5	63.8
SWWPCP	2,948	5,027	8,022	5,943	73.1	54.2
2011	September 6, 2011	November 17, 2011	September 6, 2011	November 17, 2011	September 6, 2011	Novermber 17, 2011
NEWPCP	6,224	3,745	5,286	7,765	45.9	67.5
SEWPCP	4,135	1,368	3,424	6,191	45.3	81.9
SWWPCP	10,270	4,280	700	6,690	6.4	61.0
2012	June 13, 2012	October 16, 2012	June 13, 2012	October 16, 2012	June 13, 2012	October 16, 2012
NEWPCP	11,189	2,542	321	8,968	2.8	77.9
SEWPCP	5,659	1,296	1,900	6,263	25.1	82.9
SWWPCP	5,766	2,663	5,204	8,307	47.4	75.7
2013	April 20, 2013	October 8, 2013	April 20, 2013	October 8, 2013	April 20, 2013	October 8, 2013
NEWPCP	2,849	2,349	8,661	9,161	75.2	79.6
SEWPCP	2,803	2,599	4,756	4,960	62.9	65.6
SWWPCP	3,673	3,040	7,297	7,930	66.5	72.3
2014	April 16, 2014	September 25, 2014	April 16, 2014	September 25, 2014	April 16, 2014	September 25, 2014
NEWPCP	2,315	1,552	9,195	9,958	79.9	86.5
SEWPCP	6,370	1,827	1,189	5,732	15.7	75.8
SWWPCP	2,939	2,882	8,031	8,088	73.2	73.7
2015	May 28, 2015 (August 12, 2015 for SWWPCP)	October 10, 2015	May 28, 2015 (August 12, 2015 for SWWPCP)	October 10, 2015	May 28, 2015 (August 12, 2015 for SWWPCP)	October 10, 2015
NEWPCP	3,157	2,291	8,353	9,219	72.6	80.1
SEWPCP	2,744	2,795	4,815	4,764	63.7	63.0
SWWPCP	4,265	3,610	6,705	7,360	61.1	67.1
2016	May 14, 2016	October 23, 2016 (October 28, 2016 for SEWPCP)	May 14, 2016	October 23, 2016 (October 28, 2016 for SEWPCP)	May 14, 2016	October 23, 2016 (October 28, 2016 for SEWPCP)
NEWPCP	1,755	1,479	9,755	10,031	84.8	87.1
SEWPCP	1,525	1,058	6,034	6,501	79.8	86.0
SWWPCP	3,662	1,416	7,308	9,554	66.6	87.1
2017	May 6, 2017	October 9, 2017	May 6, 2016	October 9, 2017	May 6, 2017	October 9, 2017
NEWPCP	1,749	972	9,761	10,538	84.8	91.6
SEWPCP	2,762	1,212	4,797	6,347	63.5	84.0
SWWPCP	3,273	3,294	7,697	7,676	70.2	70.0

Measures

Description	Date Initiated	Date Completed	Comments/Status:
SEWPCP Phase 2 Trackdown Sampling	October 17, 2006	October 20, 2006	Complete
NEWPCP Phase 1 Trackdown Sampling	November 3, 2010	November 4, 2010	
NEWPCP Phase 2 Trackdown Sampling	January 26, 2012	January 27, 2012	
SWWPCP Phase 1 Trackdown Sampling	October 12, 2011	October 13, 2011	
SWWPCP Phase 2 Trackdown Sampling	February 23, 2012	February 24, 2012	
Inspections of "Potential Source" sites	March 4, 2006	April 2011	363 Completed
(Phila. Health Dept. list)	October 30, 2006	March 21, 2007	31 of 31 Completed

7 Tabular Summary

Plant Monitoring Data

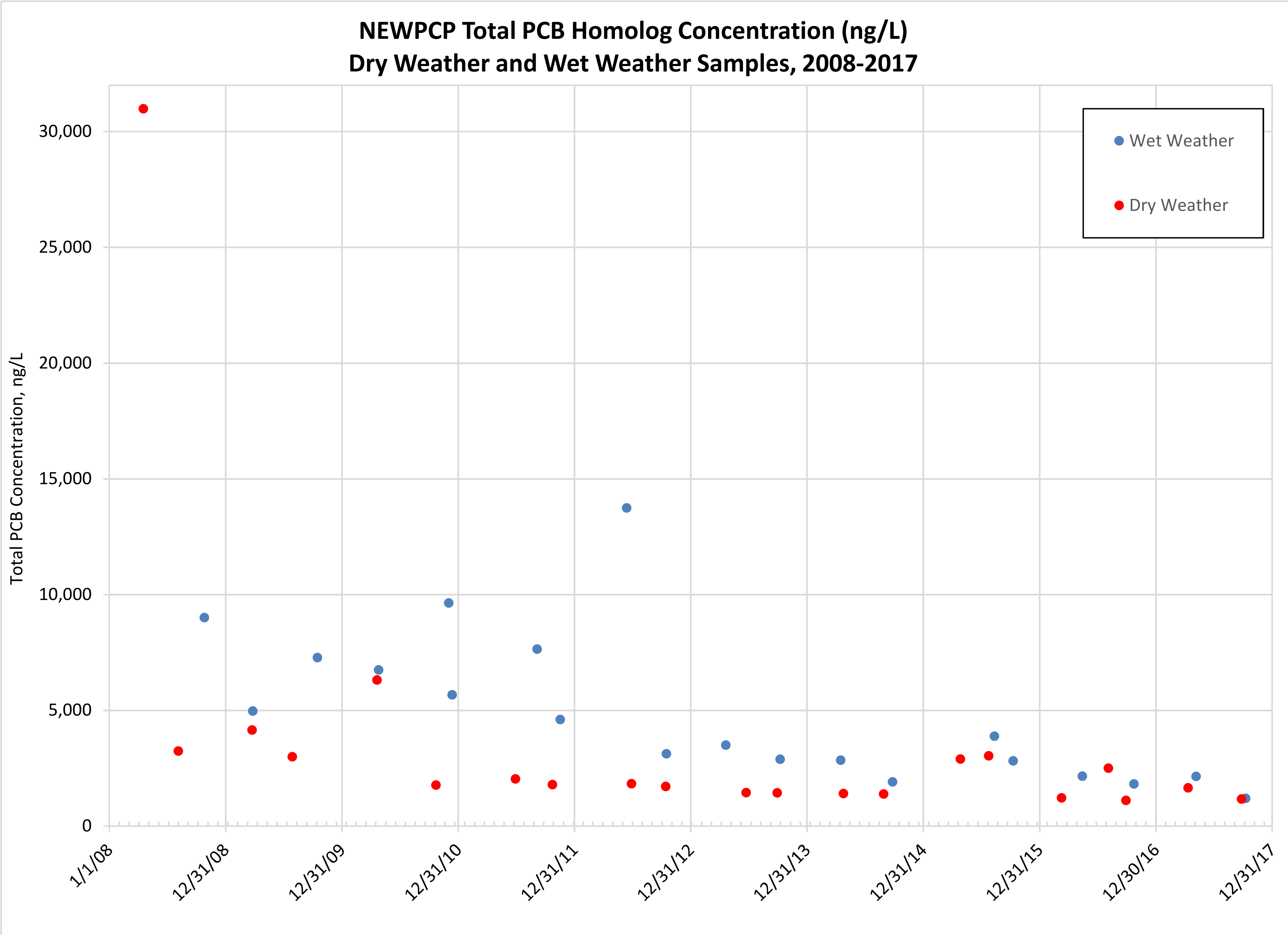
Sample Location	Date of Sample Collection	Date Results Received	Total PCBs (pg/l)	Penta-PCBs (pg/l)
SEWPCP Phase 2 Trackdown Sampling	October 17-20, 2006	May 1, 2007		
NEWPCP, SEWPCP & SWWPCP effluent	December 2-3, 2007	March 28, 2008		
NEWPCP			13,709	2340
SEWPCP			13,580	2233
SWWPCP			7,362	1,314
NEWPCP, SEWPCP & SWWPCP effluent	March 27, 2009	May 29, 2009		
NEWPCP			4,047	850
SEWPCP			1,593	373
SWWPCP			8,866	1,474
NEWPCP, SEWPCP & SWWPCP effluent	October 16, 2009	December 23, 2009		
NEWPCP			5,924	1,238
SEWPCP			3,797	711
SWWPCP			4,612	886
NEWPCP, SEWPCP & SWWPCP effluent	April 21, 2010	June 18, 2010		
NEWPCP			6,746	1,629
SEWPCP			5,322	1,114
SWWPCP			3,623	729
NEWPCP, SEWPCP & SWWPCP effluent	December 2, 2010	January 31, 2011		
NEWPCP	(December 13, 2010)		5,671	1,379
SEWPCP			6,755	1,348
SWWPCP			6,177	1,110
NEWPCP, SEWPCP & SWWPCP effluent	September 6, 2011	October 25, 2011		
NEWPCP			7,646	1,624
SEWPCP			10,206	1,723
SWWPCP			12,385	1,911
NEWPCP, SEWPCP & SWWPCP effluent	November 17, 2011	January 13, 2012		
NEWPCP			4,600	1,159
SEWPCP			3,376	635
SWWPCP			5,162	997
NEWPCP, SEWPCP & SWWPCP effluent	June 13, 2012	Juyl 24, 2012		
NEWPCP			13,745	2,057
SEWPCP			13,968	2,954
SWWPCP			6,954	1,331
NEWPCP, SEWPCP & SWWPCP effluent	October 16, 2012	November 30, 2012		
NEWPCP			3,123	791
SEWPCP			3,198	595
SWWPCP			3,211	558
NEWPCP, SEWPCP & SWWPCP effluent	April 20, 2013	May 29, 2013		
NEWPCP			3,500	806
SEWPCP			6,918	1,566
SWWPCP			4,429	932
NEWPCP, SEWPCP & SWWPCP effluent	October 8, 2013	January 20, 2014		
NEWPCP			2,886	669
SEWPCP	(November 27, 2013)		6,414	1,204
SWWPCP			3,666	757
NEWPCP, SEWPCP & SWWPCP effluent	April 16, 2014	May 26, 2014		
NEWPCP			2,844	622
SEWPCP			15,722	3,182
SWWPCP	(April 26, 2014)	(June 2, 2014)	3,544	737
NEWPCP, SEWPCP & SWWPCP effluent	September 25, 2014	October 26, 2014		
NEWPCP	(September 26, 2014)		1,907	458
SEWPCP			4,510	912
SWWPCP			3,476	745

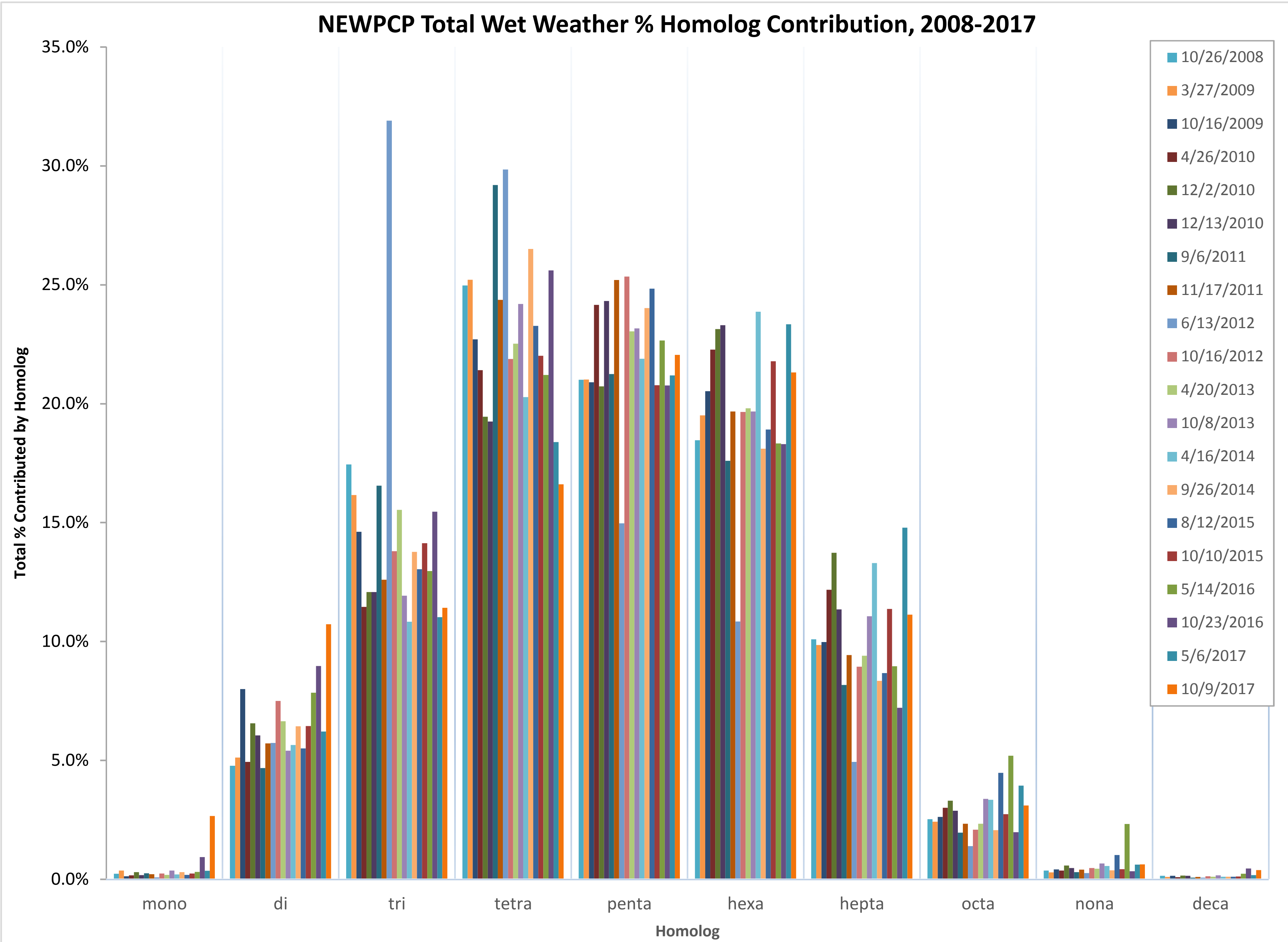
7 Tabular Summary

Sample Location	Date of Sample Collection	Date Results Received	Total PCBs (pg/l)	Penta-PCBs (pg/l)
NEWPCP, SEWPCP & SWWPCP effluent	May 28, 2015	August 4, 2015		
NEWPCP	N/A	N/A	N/A	N/A
SEWPCP	N/A	N/A	N/A	N/A
SWWPCP	5,143		4,265	1,338
NEWPCP, SEWPCP & SWWPCP effluent	August 12, 2015	November 2, 2015		
NEWPCP	3878		3,157	963
SEWPCP	6774		2,744	1,411
SWWPCP	N/A	N/A	N/A	N/A
NEWPCP, SEWPCP & SWWPCP effluent	October 10, 2015	December 21, 2015		
NEWPCP			2,291	584
SEWPCP			2,795	1,516
SWWPCP			3,610	790
NEWPCP, SEWPCP & SWWPCP effluent	May 14, 2016	June 27, 2016		
NEWPCP			2,156	488
SEWPCP			3,765	847
SWWPCP			4,416	979
NEWPCP, SEWPCP & SWWPCP effluent	October 23, 2016 (October 28, 2016 for SEWPCP)	November 28, 2016		
NEWPCP			1,817	377
SEWPCP			2,612	452
SWWPCP			1,708	307
NEWPCP, SEWPCP & SWWPCP effluent	May 6, 2017	December 5, 2017		
NEWPCP			2,149	455
SEWPCP			6,817	1,044
SWWPCP			3,948	634
NEWPCP, SEWPCP & SWWPCP effluent	October 9, 2017	December 27, 2017		
NEWPCP			1,194	263
SEWPCP			2,993	257
SWWPCP			3,972	681

Attachment A

Data Graphs


NEWPCP Total PCB Homolog Concentration (ng/L)
Dry Weather and Wet Weather Samples, 2008-2017
Total PCB Concentration, ng/L
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/08
12/31/08
12/31/09
12/31/10
12/31/11
12/31/12
12/31/13
12/31/14
12/31/15
12/30/16
12/31/17
Wet Weather
Dry Weather


NEWPCP Total Wet Weather % Homolog Contribution, 2008-2017
Total % Contributed by Homolog
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
mono
di
tri
tetra
penta
hexa
hepta
octa
nona
deca
Homolog
10/26/2008
3/27/2009
10/16/2009
4/26/2010
12/2/2010
12/13/2010
9/6/2011
11/17/2011
6/13/2012
10/16/2012
4/20/2013
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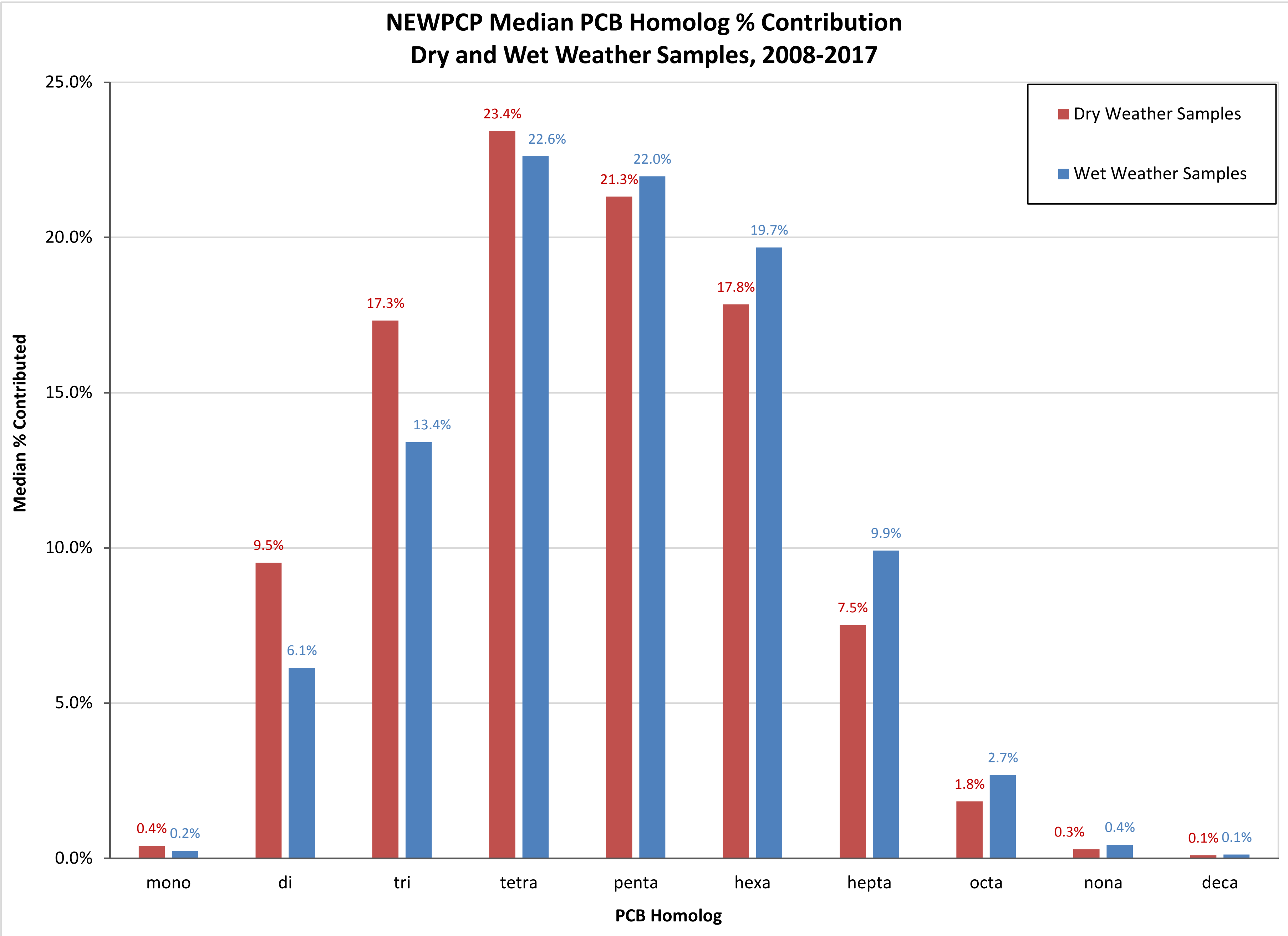
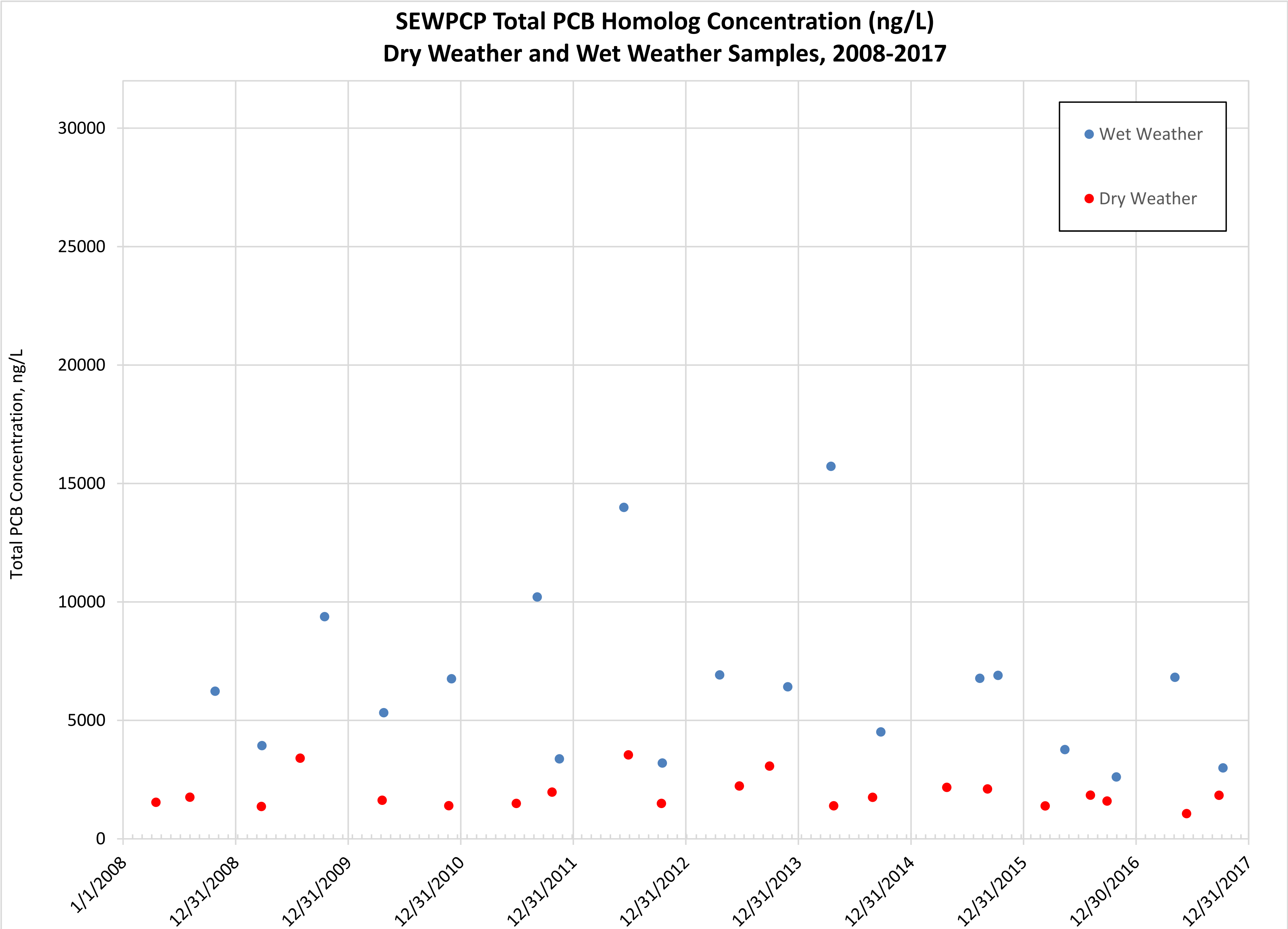
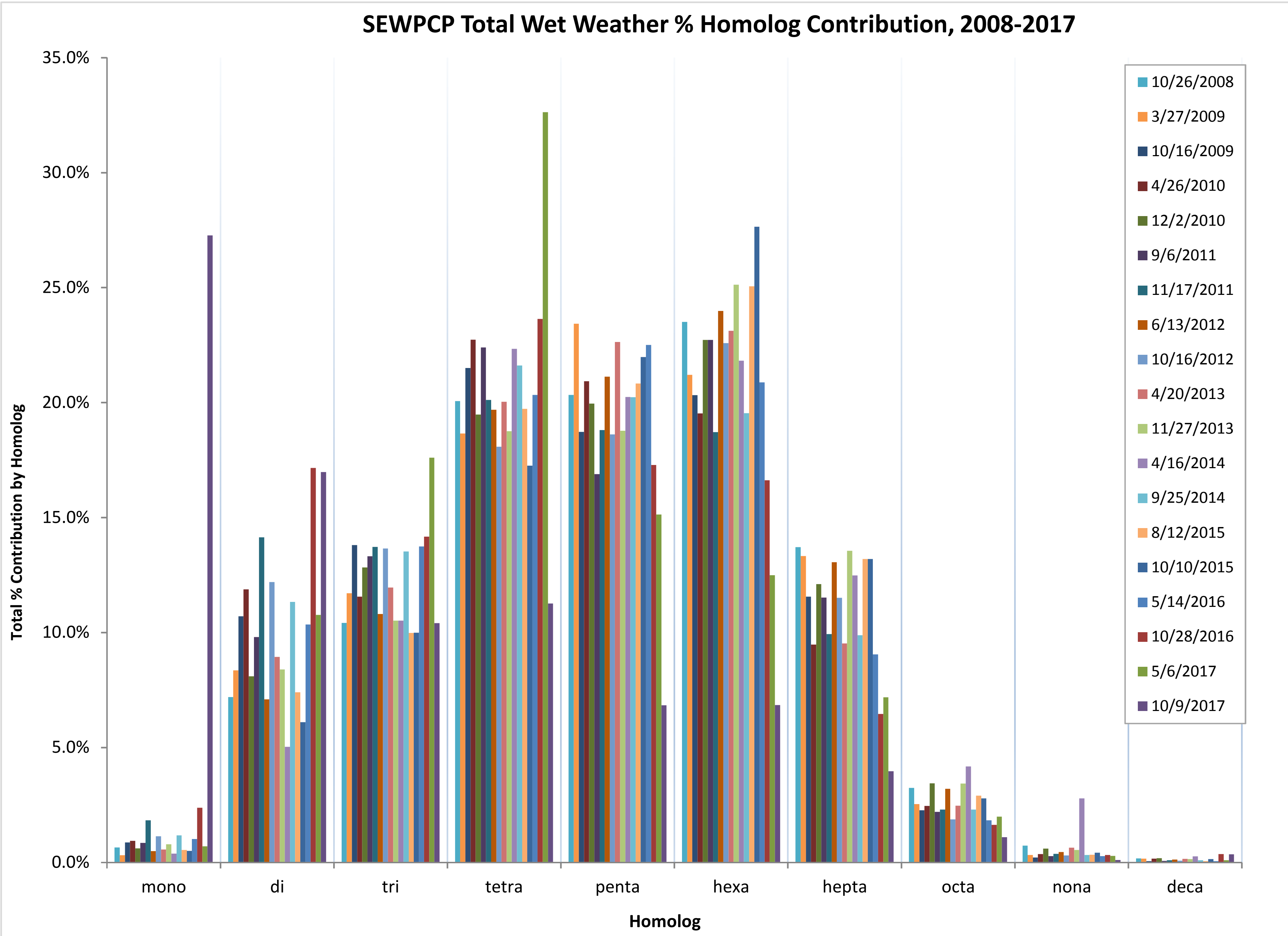
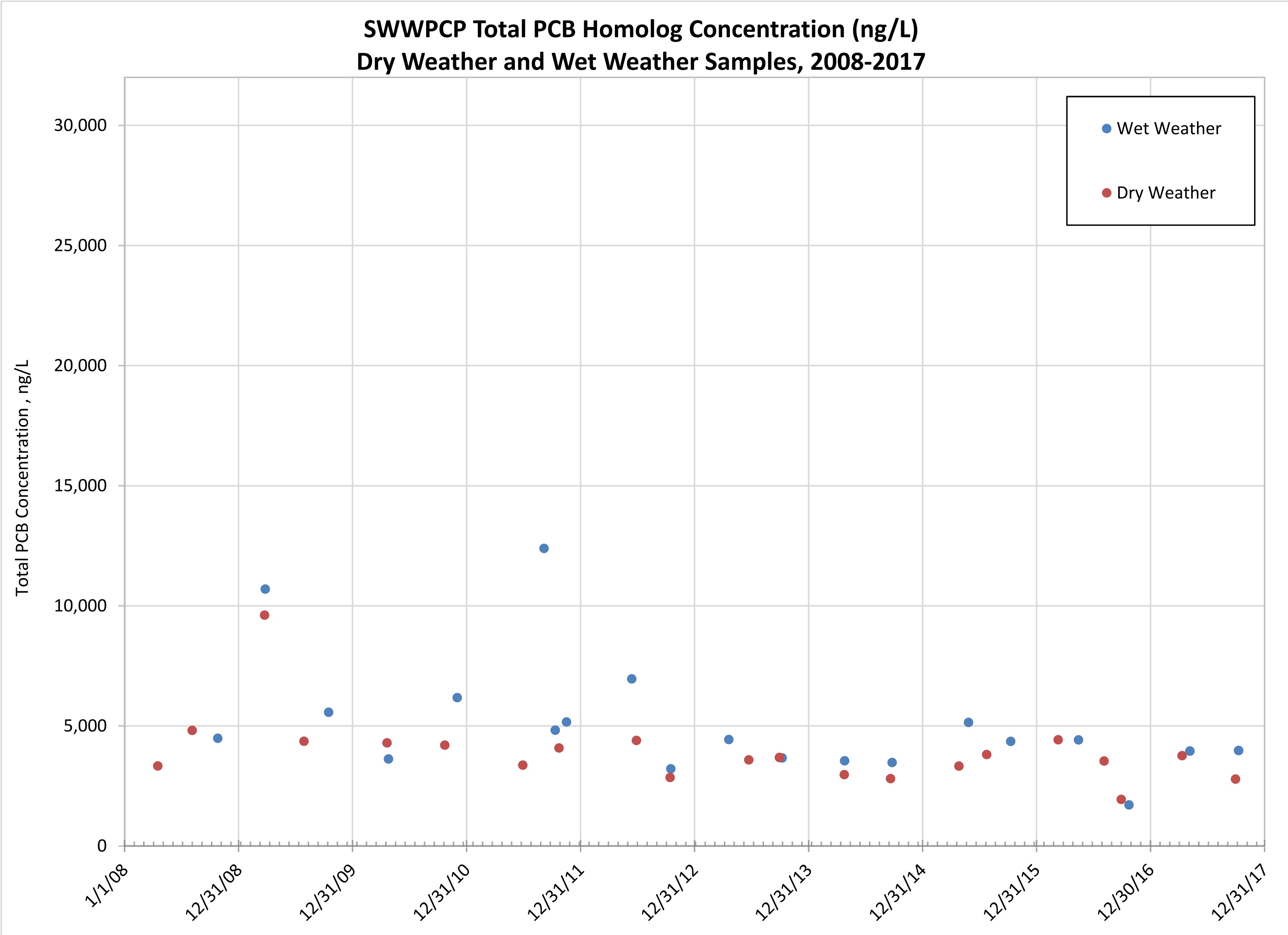
5/6/2017
10/9/2017

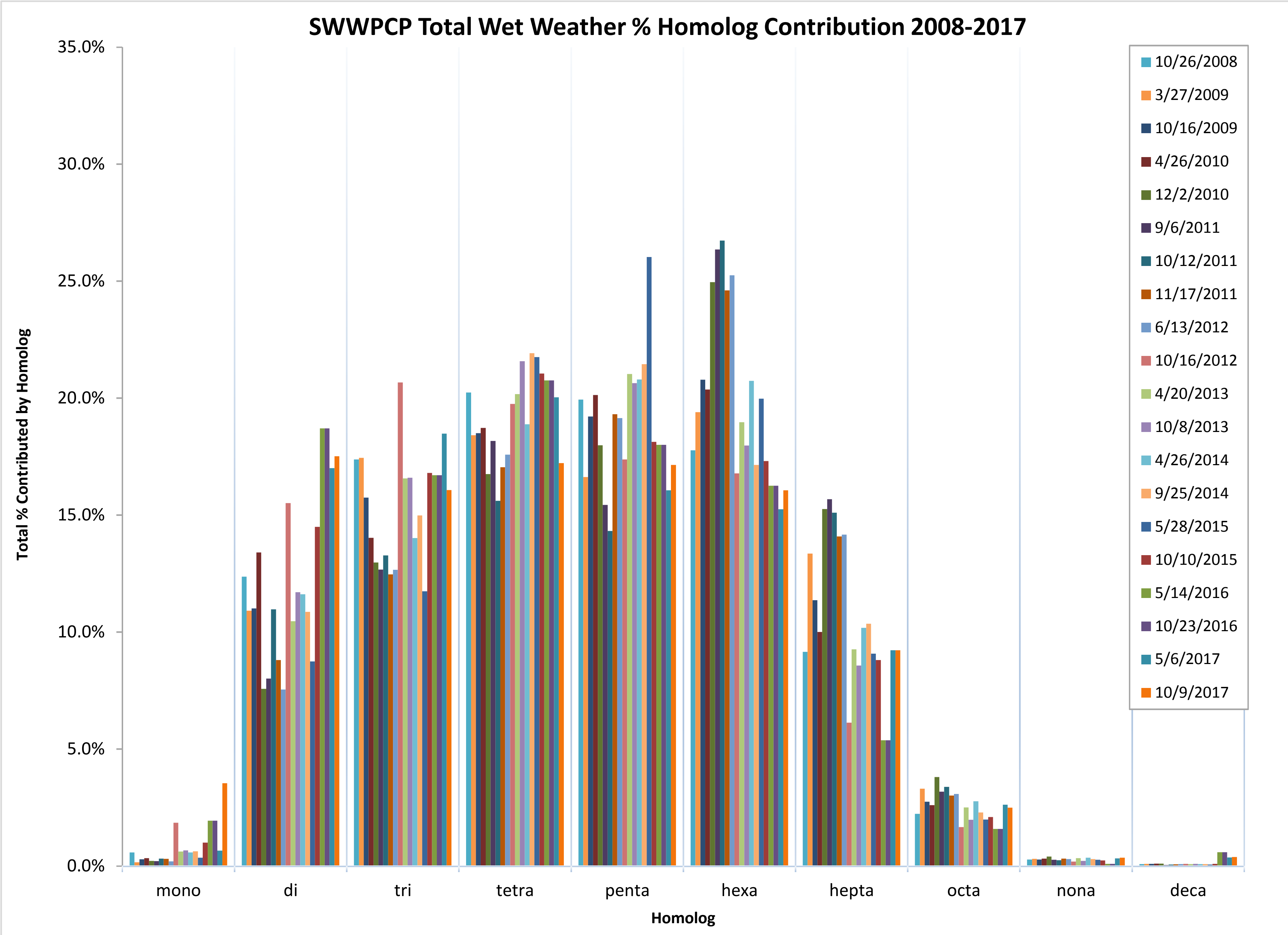

NEWPCP Median PCB Homolog % Contribution
Dry and Wet Weather Samples, 2008-2017
Dry Weather Samples
Wet Weather Samples
Median % Contributed
PCB Homolog
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
mono
di
tri
tetra
penta
hexa
hepta
octa
nona
deca
0.4%
0.2%
9.5%
6.1%
17.3%
13.4%
23.4%
22.6%
21.3%
22.0%
17.8%
19.7%
7.5%
9.9%
1.8%
2.7%
0.3%
0.4%
0.1%
0.1%


SEWPCP Total PCB Homolog Concentration (ng/L)
Dry Weather and Wet Weather Samples, 2008-2017
Total PCB Concentration, ng/L
30000
25000
20000
15000
10000
5000
0
1/1/2008
12/31/2008
12/31/2009
12/31/2010
12/31/2011
12/31/2012
12/31/2013
12/31/2014
12/31/2015
12/30/2016
12/31/2017
Wet Weather
Dry Weather


SEWPCP Total Wet Weather % Homolog Contribution, 2008-2017
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Total % Contribution by Homolog
mono
di
tri
tetra
penta
hexa
hepta
octa
nona
deca
Homolog
10/26/2008
3/27/2009
10/16/2009
4/26/2010
12/2/2010
9/6/2011
11/17/2011
6/13/2012
10/16/2012
4/20/2013
11/27/2013
4/16/2014
9/25/2014
8/12/2015
10/10/2015
5/14/2016
10/28/2016
5/6/2017
10/9/2017

SEWPCP Median Weight % by PCB Homolog
DW and WW Samples, 2008-2017
Dry Weather Samples
Wet Weather Samples
Median % Contributed
PCB Homolog
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
mono
di
tri
tetra
penta
hexa
hepta
octa
nona
deca
1.7%
0.78%
22.3%
9.80%
20.1%
11.95%
19.2%
20.06%
14.8%
20.23%
12.7%
21.82%
5.9%
11.51%
1.4%
2.45%
0.2%
0.33%
0.1%
0.14%


SWWPCP Total PCB Homolog Concentration (ng/L)
Dry Weather and Wet Weather Samples, 2008-2017
Wet Weather
Dry Weather
Total PCB Concentration , ng/L
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/08
12/31/08
12/31/09
12/31/10
12/31/11
12/31/12
12/31/13
12/31/14
12/31/15
12/30/16
12/31/17


SWWPCP Total Wet Weather % Homolog Contribution 2008-2017
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Total % Contributed by Homolog
mono
di
tri
tetra
penta
hexa
hepta
octa
nona
deca
Homolog
10/26/2008
3/27/2009
10/16/2009
4/26/2010
12/2/2010
9/6/2011
10/12/2011
11/17/2011
6/13/2012
10/16/2012
4/20/2013
10/8/2013
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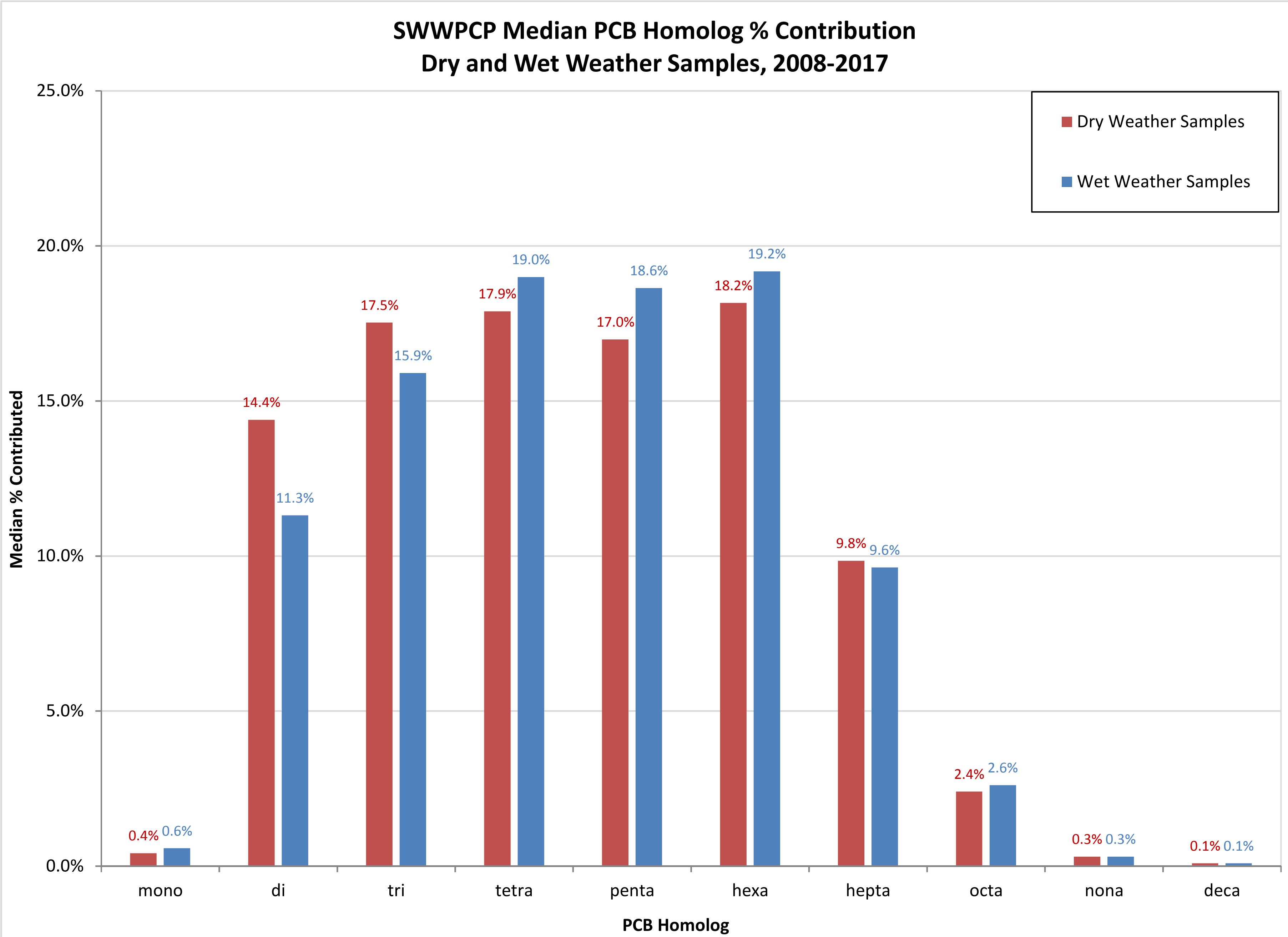
10/23/2016
5/6/2017
10/9/2017


SWWPCP Median PCB Homolog % Contribution
Dry and Wet Weather Samples, 2008-2017
Dry Weather Samples
Wet Weather Samples
Median % Contributed
PCB Homolog
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
mono
di
tri
tetra
penta
hexa
hepta
octa
nona
deca
0.4%
0.6%
14.4%
11.3%
17.5%
15.9%
17.9%
19.0%
17.0%
18.6%
18.2%
19.2%
9.8%
9.6%
2.4%
2.6%
0.3%
0.3%
0.1%
0.1%

Attachment B

Potential Sources and Inspection Findings

Table 1 - Known, Probable and Potential Sources and Measures to Address Sources

Source	Source Type			Measure to Address Source
	Known	*Probable*	*Potential*	
Water Supply (Delaware and Schuylkill Rivers)	X			PCB PMP and action by others
Ferric Chloride used in Water Treatment	X			Switched ferric chloride suppliers
Sludge Lagoons (NEWPCP and SWWPCP)		X		Trackdown for each WPCP calls for sampling and analysis
PCB Device sites in sewershed of each WPCP (see Attachment B, "Inspections of Potential Source Sites")			X	Site inspections, evaluation and followup
Significant Industrial Users			X	Modify permits as warranted
Electric Company (PECO) customers			X	Undetermined. PECO will not share customer information.
Township Connections			X	Sample points of connections for PCBs
Groundwater Discharges			X	Require PCB monitoring

Philadelphia Water Department

Inspections by Treatment Plant

01/1/2017 - 12/31/2017

Receiving Plant: NEWPCP

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
PCB-NE010	AdvanSix Resins & Chemicals, LLC	2501 Margaret Street 19137-1193	Cooling Tower 4	Paul Persing	Transformer	2	Mineral oil		265	11/01/17	In Use
PCB-NE017	Septa	1410 W. Loudon St 19141	Louden Substation	Rich Harris	Transformer	0				03/27/17	Removed From Site
PCB-NE022	GE International, Inc.	1040 E. Erie Avenue 19124	GE International, Inc.	Ana M. Adorno	Transformer	4			203	05/08/17	In Use
PCB-NE040	Wymex Beauty	3621 B Sreet 19134	TL Tan LLC	Lee Tan	Transformer	0				12/13/17	Removed From Site
PCB-NE063	Wymex Beauty	3621 B Sreet 19134	Transformer room	Lee Tan	Transformer	5				12/13/17	In Use
PCB-NE072	Septa	Windrim & Germantown 19140	Maintenance Building	Rich Harris	Transformer	0				03/30/17	Removed From Site
PCB-NE117	Septa	Broad St. & Allgehney Ave. 19140	Pump Room	Rich Harris	Transformer	0				03/30/17	Removed From Site
PCB-NE146	Septa	Broad & Grange Streets 19141	Substation	Rich Harris	Transformer	0				03/30/17	Removed From Site
PCB-NE207	Domestic Uniform Rental	4100 Frankford Avenue 19124	Transformer Room	Philip G. Tannian	Transformer	2				05/01/17	In Use
PCB-NE213	Frontida BioPharm	1100 Orthodox Street 19124	Building rear	Michael D'Ippolito	Transformer	4				10/31/17	In Use
PCB-NE260	Michel's Bakery, Inc.	5698 Rising Sun Avenue 19120	Electrical Room	Stan Walulek	Capacitor & Transformer	12				06/01/17	In Use
PCB-NE274	Stockwell Elastomerics, Inc.	4749 Tolbut Street 19136	Building 4749	Jay Hough	Capacitor	7	Dykanol			05/31/17	In Use
PCB-NE276	James Abbott	2105-11 E.Wishart Street 19134	Outside	James Abbott	Transformer	1				04/19/17	In Use
PCB-NE278	J.P. Cerini Technologies, Inc.	4600 N. Fairhill Street 19140	Electrical Room in Basement	John Dietzel	Transformer	2		5.9		07/19/17	Out of Use

Receiving Plant: NEWPCP

Drainage Area: COMBINED **Total Number of Inspections completed: 14**

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
Receiving Plant: NEWPCP											
PCB-NE036	Baxter Water Treatment Plant	9001 State Road 19136	Outside Post Bld.	Mike Keough	Transformer	1				04/26/17	In Use
PCB-NE062	Septa	8301 Castor Ave 19111	Substation	Rich Harris	Transformer	1				03/27/17	In Use
PCB-NE073	Delaware Ave, LLC	4301 Delaware Ave 19137	#1 Crusher	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE074	Delaware Ave, LLC	4301 Delaware Ave 19137	Factory Office	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE076	Delaware Ave, LLC	4301 Delaware Ave 19137	Pebble Bldg.	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE104	Delaware Ave, LLC	4301 Delaware Ave 19137	New Shed	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE106	Delaware Ave, LLC	4301 Delaware Ave 19137	Pole #9	Tony Feola	Capacitor	0				05/02/17	Removed From Site
PCB-NE135	Delaware Ave, LLC	4301 Delaware Ave 19137	TK	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE145	Delaware Ave, LLC	4301 Delaware Ave 19137	River Vault	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE169	Delaware Ave, LLC	4301 Delaware Ave 19137	#3 Ball Mill	Tony Feola	Capacitor	0				12/01/17	Removed From Site
PCB-NE208	HP Hood, LLC	10975 Dutton Rd. 19154	outside cage	James Hawkinson	Transformer	1	Mineral oil		185	10/03/17	In Use
PCB-NE210	Cintas Corporation	10080 Sandmeyer Lane 19116	Rear Parking Lot	Shawn Bettens	Transformer	1				03/08/17	In Use
PCB-NE211	Delavau, LLC	10101 Roosevelt Blvd. 19154	Building Rear	Jack Walter	Transformer	1			284	09/19/17	In Use
PCB-NE212	Frontida Biopharm	7722 Dungan Road 19111	Transformer Vault	Greg Kovar	Transformer	2				12/08/17	In Use
PCB-NE259	Zentis North America, LLC	1741 Tomlinson Road 19116	Bld read by waste tank	Jennifer Fitzgerald	Transformer	1		0		07/06/17	In Use
PCB-NE261	Dietz & Watson, Inc.	5701 Tacony St. 19135	Boiler Room	Wes Sweany	Transformer	2				03/01/17	In Use
PCB-NE262	Dietz & Watson, Inc.	5701 Tacony St. 19135	Electrical Room	Wes Sweany	Capacitor	6				03/01/17	In Use
PCB-NE271	I. Rice	11500D Roosevelt Blvd. 19116	East Side of Bld	Ashly Marchese	Transformer	1				01/19/17	In Use
PCB-NE272	Septa	9187 Frankford Ave 19114	Gregg St. Sub	Rich Harris	Transformer	1			1252	03/27/17	In Use
PCB-NE275	Premier Medical	10090 Sandymeyer La. 19116	Bld. Rear	Joe Rutherford	Transformer	3				06/29/17	In Use
PCB-NE277	Computer Components	2751 Southampton Rd. 19154	Loading Dock	Frank Cetina	Transformer	1				06/21/17	In Use
PCB-NE279	Cintas Corporation	10080 Sandmeyer Lane 19116	By Tempered Water Tank	Dennis Kelley	Capacitor	12				03/08/17	In Use
PCB-NE280	Agusta	3050-3076 Red Lion Road 19114	IFO Building 3050	Cole Abrams	Transformer	2				10/27/17	In Use
PCB-NE281	Agusta	3076 Red Lion Rd. 19114	IFO Bld. 3076	Cole Abrams	Transformer	2				10/27/17	In Use
PCB-NE283	Custom Powder Coating	8451 Hegerman Street 19136	Behind Admin. Bld.	William O'Sullivan	Transformer	1				06/27/17	In Use

Receiving Plant: NEWPCP

Drainage Area: MS4 **Total Number of Inspections completed:** 25

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
Receiving Plant: NEWPCP											
PCB-NE209	C. Lever Colors, Inc.	736 Dunks Ferry Road 19020	Outside	Kila Estes	Transformer	1				04/27/17	In Use
PCB-NE216	Thermacore, Inc.	2000 Cabot Blvd. West,	By loading docks	Dave O'Conner	Transformer	2				07/07/17	In Use
PCB-NE282	Gill	1384 Byberry Road 19020	Telephone Pole in Parking lot	Jerry Shinn	Transformer	1				03/27/17	In Use

Receiving Plant: NEWPCP

Drainage Area: Township **Total Number of Inspections completed: 3**

Receiving Plant: NEWPCP **Total Number of Inspections completed: 42**

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
Receiving Plant: SEWPCP											
PCB-SE001	Septa	816 Sansom St 19107	Sansom Substation	Rich Harris	Transformer	2				03/27/17	In Use
PCB-SE002	Septa	1327 Mount Vernon St 19123	Broad Substation	Rich Harris	Transformer	3		50		03/27/17	In Use
PCB-SE029	Septa	Broad St. & Girard Ave. 19130	North Bound Mezzanine	Rich Harris	Transformer	1				03/30/17	Out of Use
PCB-SE056	Septa	Broad & Manning Streets 19102	W. Side Concourse	Rich Harris	Transformer	3				03/30/17	Out of Use
PCB-SE200	Septa	Front & Ellen Sts. 19123	Ellen Sub	Rich Harris	Transformer	4				03/27/17	In Use
PCB-SE201	Columbia Silk Dyeing Co., Inc.	1726 N. Howard Street 19122	Vault	Craig Garton	Transformer	2				05/31/17	In Use
PCB-SE202	PECO Oregon	2610 Christopher Columbus Blvd. 19148	Parking Lot	George Horvat	Transformer	10				05/25/17	Out of Use
PCB-SE203	Simons Brothers Co.	2438 Sergeant Street 19125	By front door	Nelson Kaiser	Capacitor	1				07/20/17	In Use
PCB-SE204	Inolex Chemical Company	2101 South Swanson Street 19148	Jackson St.	Marc Brown	Transformer	3				11/30/17	In Use
PCB-SE205	Ashland Chemical Company	2801 Christopher Columbus Blvd. 19148	By Nitrogen	Herschel Craven	Transformer	1			238	08/03/17	In Use
PCB-SE206	Ashland Chemical Company	2801 Christopher Columbus Blvd. 19148	Front Gate	Hershel Craven	Transformer	1				08/03/17	In Use
PCB-SE207	Ashland Chemical Company	2801 Christopher Columbus Blvd. 19148	Roof of Bld. 10	Hershel Craven	Transformer	1			238	08/03/17	In Use
PCB-SE208	Inolex Chemical Company	2101 South Swanson Street 19148	Reactor Dock	Marc Brown	Transformer	3				11/30/17	In Use
PCB-SE209	Inolex Chemical Company	2101 South Swanson Street 19148	Waccocoe Street	Marc Brown	Transformer	1				11/30/17	In Use
PCB-SE210	Inolex Chemical Company	2101 South Swanson Street 19148	Railroad/Swanson Street	Marc Brown	Transformer	1				11/30/17	In Use
PCB-SE211	Inolex Chemical Company	2101 South Swanson Street 19148	A Warehouse	Marc Brown	Transformer	3				11/30/17	Out of Use
PCB-SE240	Septa	Market & 5th Sts 19106	5th St. Pump Room	Rick Harris	Transformer	2				03/30/17	Out of Use
PCB-SE241	Septa	Filbert & 11th Sts. 19107	Transformer Room	Rick Harris	Transformer	2				03/30/17	Out of Use
PCB-SE243	National Chemical Laboratories, Inc.	401 N. 10th Street 19123	Transformer Room	Harry Pollack	Transformer	4			136	08/23/17	In Use

Receiving Plant: SEWPCP

Drainage Area: COMBINED **Total Number of Inspections completed: 19**

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
Receiving Plant: SEWPCP											
PCB-SE005	Septa	Broad & Pattison Streets 19145	Pattison Substation	Rich Harris	Transformer	0				03/27/17	Removed From Site
PCB-SE244	Septa	7639 Germantown Ave 19118	Mermaid Sub	Rich Harris	Transformer	2		50		03/27/17	In Use

Receiving Plant: SEWPCP

Drainage Area: MS4 **Total Number of Inspections completed: 2**

Receiving Plant: SEWPCP **Total Number of Inspections completed: 21**

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS

Receiving Plant: SWWPCP

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
PCB-SW001	Septa	33rd & Market St. 19104	Market Substation	Rick Harris	Transformer	3			757	03/27/17	In Use
PCB-SW004	Septa	2034 Ranstead Street 19103	Ranstead Substation	Rick Harris	Transformer	2			919	03/27/17	In Use
PCB-SW090	Septa	Broad St. & Snyder Ave. 19145	West Side Mezzanine	Rick Harris	Transformer	0				03/30/17	Removed From Site
PCB-SW091	Septa	Broad & Tasker Sts. 19146	Pump Room, 50' North of North Bound Platform	Rick Harris	Transformer	0				03/30/17	Removed From Site
PCB-SW201	Septa	5517 Market Street 19139	Allison Substation	Rich Harris	Transformer	4				03/27/17	In Use

Receiving Plant: SWWPCP
Drainage Area: COMBINED **Total Number of Inspections completed: 5**

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
PCB-SW203	LSG Sky Chefs	8401 Escort Avenue 19153	Admin. Bld.	Peter Klabunde	Transformer	2				07/13/17	In Use
PCB-SW230	Atlantic City Linen Supply, LLC	7831 Bartram Avenue 19153	Parking Lot	Michael Greico	Transformer	1				10/30/17	In Use
PCB-SW231	Penn Fishing Tackle Mfg. Co	3028 W. Hunting Park Avenue 19132	Anodizing Room	David Shanks	Capacitor	2			1.23	07/26/17	In Use
PCB-SW232	Penn Fishing Tackle Mfg. Co	3028 W. Hunting Park Avenue 19132	Waste Treatment Area	David Shanks	Capacitor	1			1.03	07/26/17	In Use
PCB-SW233	Penn Fishing Tac kle Mfg. Co.	3028 W. Hunting Park Avenue 19132	Lube Pack Area	David Shanks	Capacitor	1			1.03	07/26/17	In Use
PCB-SW234	Penn Fishing Tac kle Mfg. Co.	3028 W. Hunting Park Avenue 19132	Light Machine Area	David Shanks	Capacitor	7			1.39	07/26/17	In Use
PCB-SW235	Penn Fishing Tac kle Mfg. Co.	3028 W. Hunting Park Avenue 19132	Basement Electrical	David Shanks	Capacitor & Transformer	4			1.46	07/26/17	In Use
PCB-SW236	Penn Fishing Tac kle Mfg. Co.	3028 W. Hunting Park Avenue 19132	Outside Fenced Area	David Shanks	Transformer	3			530	07/26/17	In Use

Receiving Plant: SWWPCP
Drainage Area: MS4 **Total Number of Inspections completed: 8**

LocID	NAME:	ADDRESS:	LOCATION	CONTACT	EQUIPMENT	NUMBER	TYPE	CONC (PPM)	GALLONS	INSP DATE	STATUS
Receiving Plant: SWWPCP											
PCB-SW207	Johnson & Johnson Consumer Inc.	7050 Camp Hill Road 19034	By Child Care Center	Deborah Heuckeroth	Transformer	1			221	09/14/17	In Use
PCB-SW208	Johnson & Johnson Consumer Inc.	7050 Camp Hill Road 19034	WWTP	Deborah Heuckenrut	Transformer	1			135	09/14/17	In Use
PCB-SW213	Astra Foods, Inc.	6430 Market St. 19082	Boiler Room T1	Dimitry Poulimenos	Transformer	1				07/17/17	In Use
PCB-SW214	Astra Foods, Inc.	6430 Market St. 19082	South Building T4	Demitri Poulmentous	Transformer	2				07/17/17	In Use
PCB-SW215	Astra Foods, Inc.	6430 Market St. 19082	East Building T5	Demitri Poulmentous	Transformer	1				07/17/17	In Use

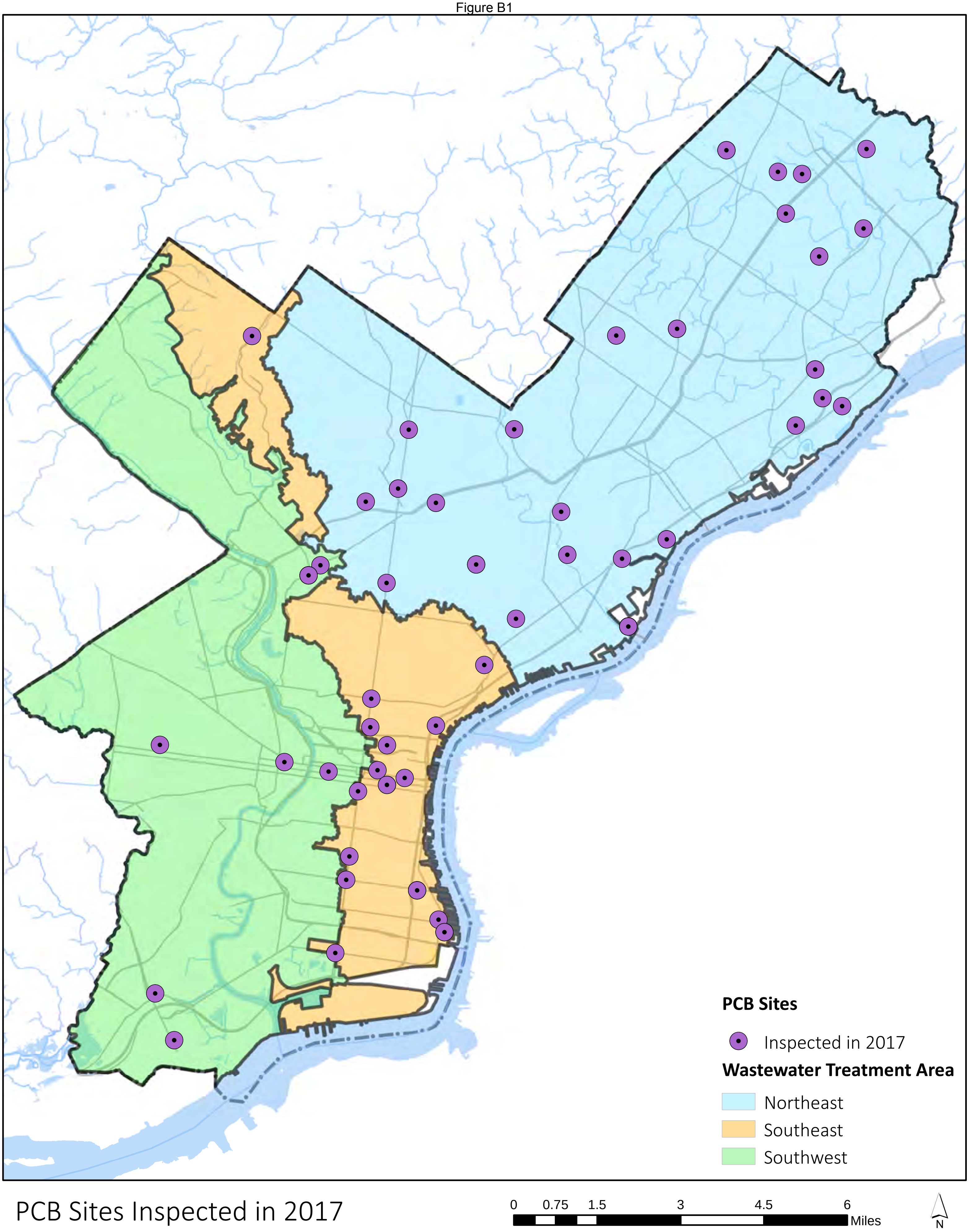
Receiving Plant: SWWPCP

Drainage Area: Township **Total Number of Inspections completed: 5**

Receiving Plant: SWWPCP **Total Number of Inspections completed: 18**

Total Inspections: 81

Figure B1



PCB Sites Inspected in 2017

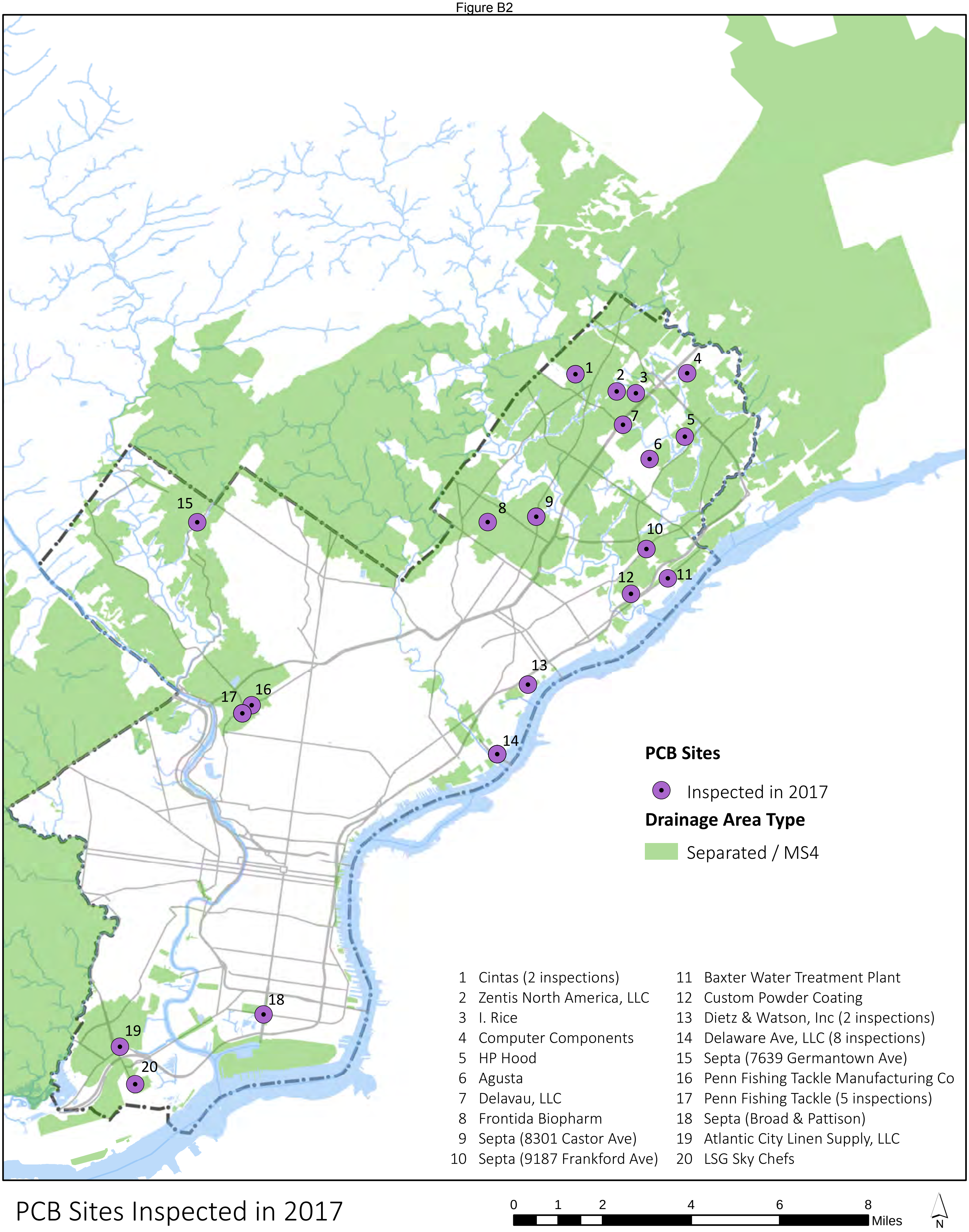
By Wastewater Treatment Area

PHILADELPHIA, PA

Source: Philadelphia Water Department, 2018.

Created By: PWD GIS Unit, Feb 5, 2018.

Figure B2



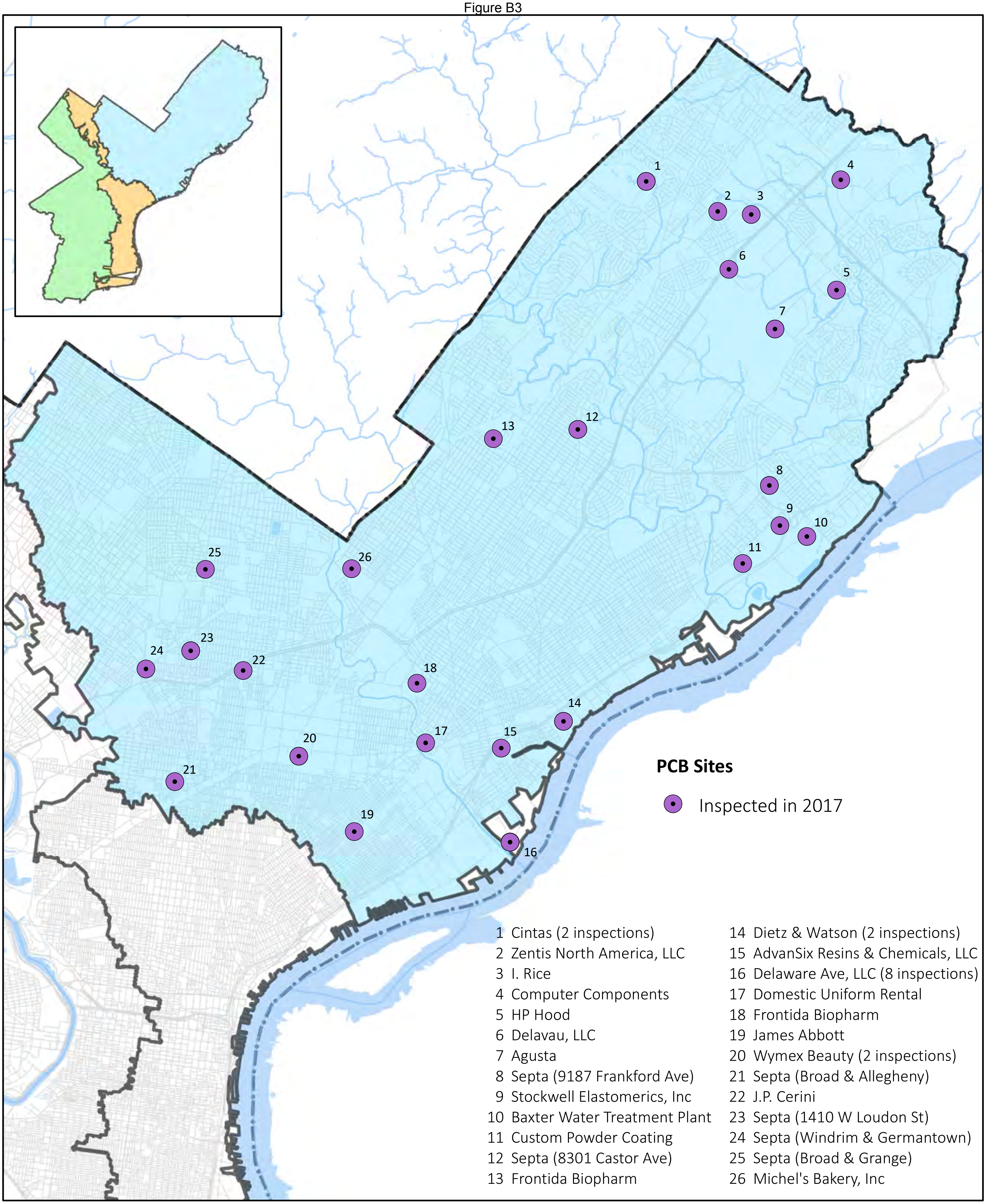
PCB Sites Inspected in 2017

In MS4 Areas

PHILADELPHIA, PA

Source: Philadelphia Water Department, 2018.
Created By: PWD GIS Unit, Feb 5, 2018.

Figure B3



PCB Sites Inspected in 2017

Northeast Treatment Area

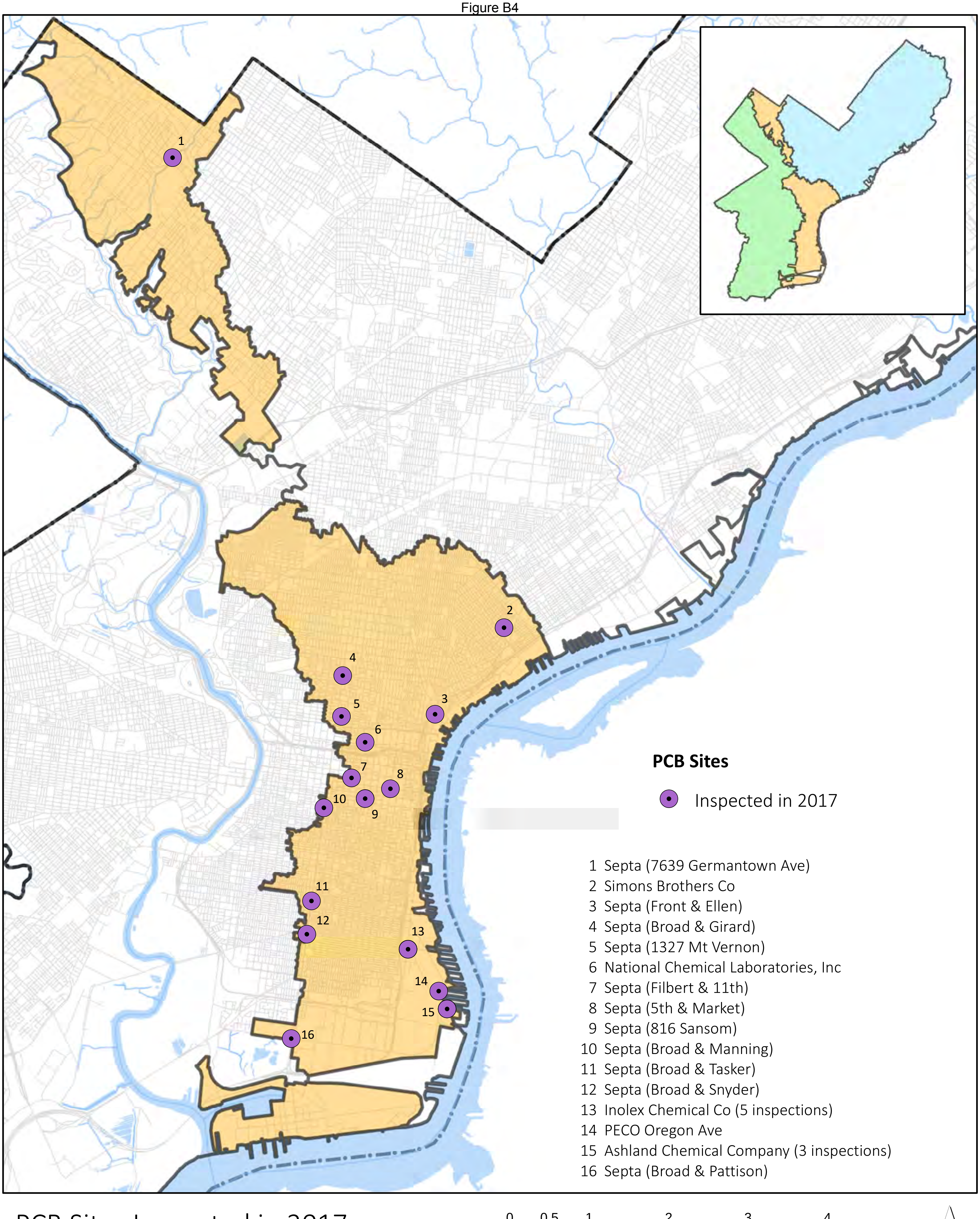
PHILADELPHIA, PA

0 0.5 1 2 3 4 Miles

N

Source: Philadelphia Water Department, 2018.
Created By: PWD GIS Unit, Feb 5, 2018.

Figure B4

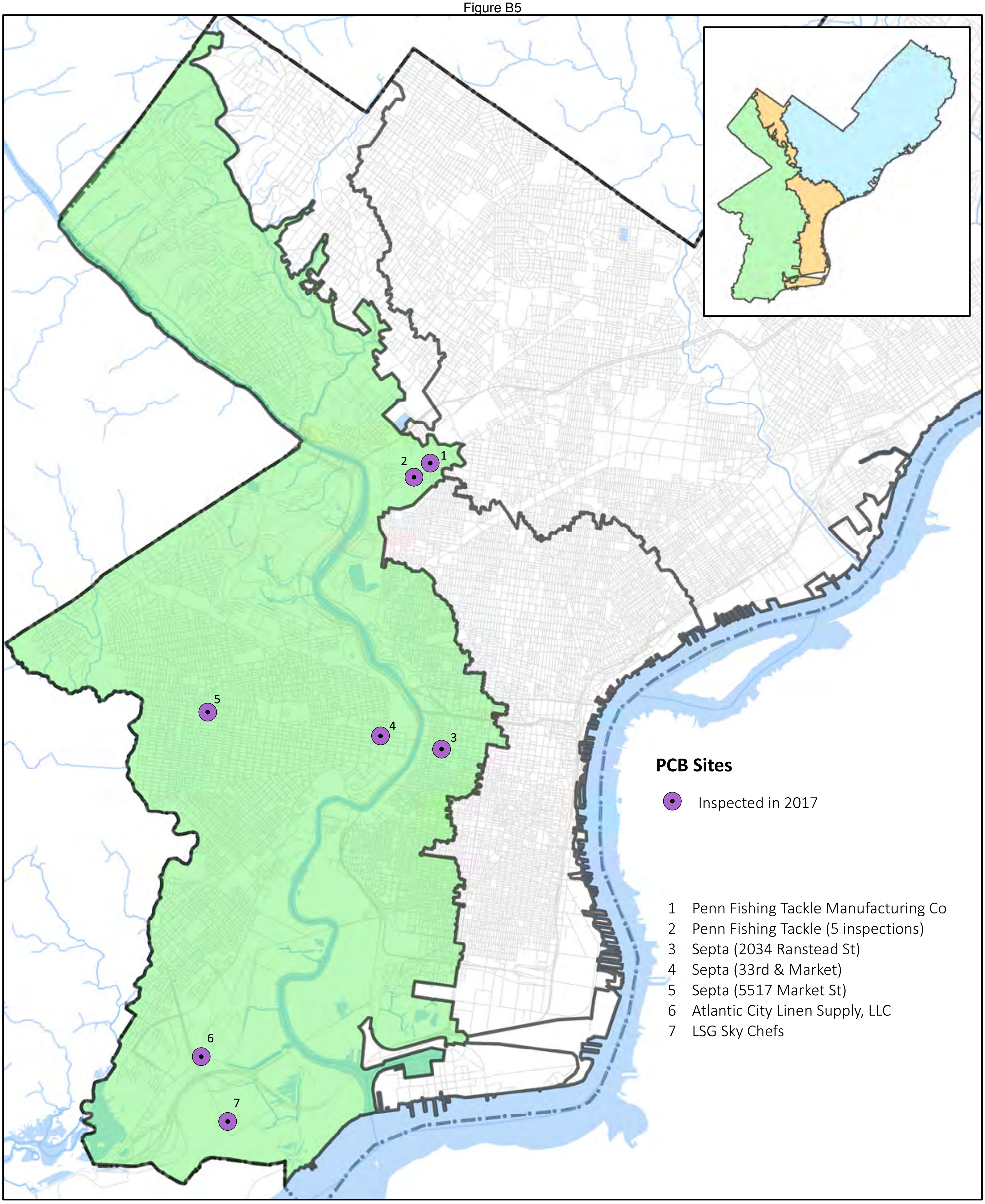


PCB Sites Inspected in 2017

Southeast Treatment Area

PHILADELPHIA, PA

Source: Philadelphia Water Department, 2018.
Created By: PWD GIS Unit, Feb 5, 2018.



PCB Sites Inspected in 2017

Southwest Treatment Area

PHILADELPHIA, PA

Source: Philadelphia Water Department, 2018.
Created By: PWD GIS Unit, Feb 5, 2018.

Attachment C

Township Connection PCB Summary

Table C1: 2017 Township Connection PCB Summary

Township Location ID	Sample Date	Parameter	"< >"	Data Value	Units	Sample Type
Grant	05/12/2017	Chlorobiphenyls Total	<	0.1	µg/L	24 Hr Comp
Grant	05/12/2017	Decachlorobiphenyls	<	0.51	µg/L	24 Hr Comp
Grant	05/12/2017	Dichlorobiphenyls	<	0.1	µg/L	24 Hr Comp
Grant	05/12/2017	Heptachlorobiphenyls	<	0.3	µg/L	24 Hr Comp
Grant	05/12/2017	Hexachlorobiphenyls	<	0.2	µg/L	24 Hr Comp
Grant	05/12/2017	Monochlorobiphenyls	<	0.1	µg/L	24 Hr Comp
Grant	05/12/2017	Nonachlorobiphenyls	<	0.51	µg/L	24 Hr Comp
Grant	05/12/2017	Octachlorobiphenyls	<	0.3	µg/L	24 Hr Comp
Grant	05/12/2017	Pentachlorobiphenyls	<	0.2	µg/L	24 Hr Comp
Grant	05/12/2017	Tetrachlorobiphenyls	<	0.2	µg/L	24 Hr Comp
Grant	05/12/2017	Trichlorobiphenyls	<	0.1	µg/L	24 Hr Comp
Northwest	05/12/2017	Chlorobiphenyls Total	<	0.097	µg/L	24 Hr Comp
Northwest	05/12/2017	Decachlorobiphenyls	<	0.48	µg/L	24 Hr Comp
Northwest	05/12/2017	Dichlorobiphenyls	<	0.097	µg/L	24 Hr Comp
Northwest	05/12/2017	Heptachlorobiphenyls	<	0.29	µg/L	24 Hr Comp
Northwest	05/12/2017	Hexachlorobiphenyls	<	0.19	µg/L	24 Hr Comp
Northwest	05/12/2017	Monochlorobiphenyls	<	0.097	µg/L	24 Hr Comp
Northwest	05/12/2017	Nonachlorobiphenyls	<	0.48	µg/L	24 Hr Comp
Northwest	05/12/2017	Octachlorobiphenyls	<	0.29	µg/L	24 Hr Comp
Northwest	05/12/2017	Pentachlorobiphenyls	<	0.19	µg/L	24 Hr Comp
Northwest	05/12/2017	Tetrachlorobiphenyls	<	0.19	µg/L	24 Hr Comp
Northwest	05/12/2017	Trichlorobiphenyls	<	0.097	µg/L	24 Hr Comp

Appendix F – Monitoring Locations

APPENDIX F –

MONITORING LOCATIONS

Page

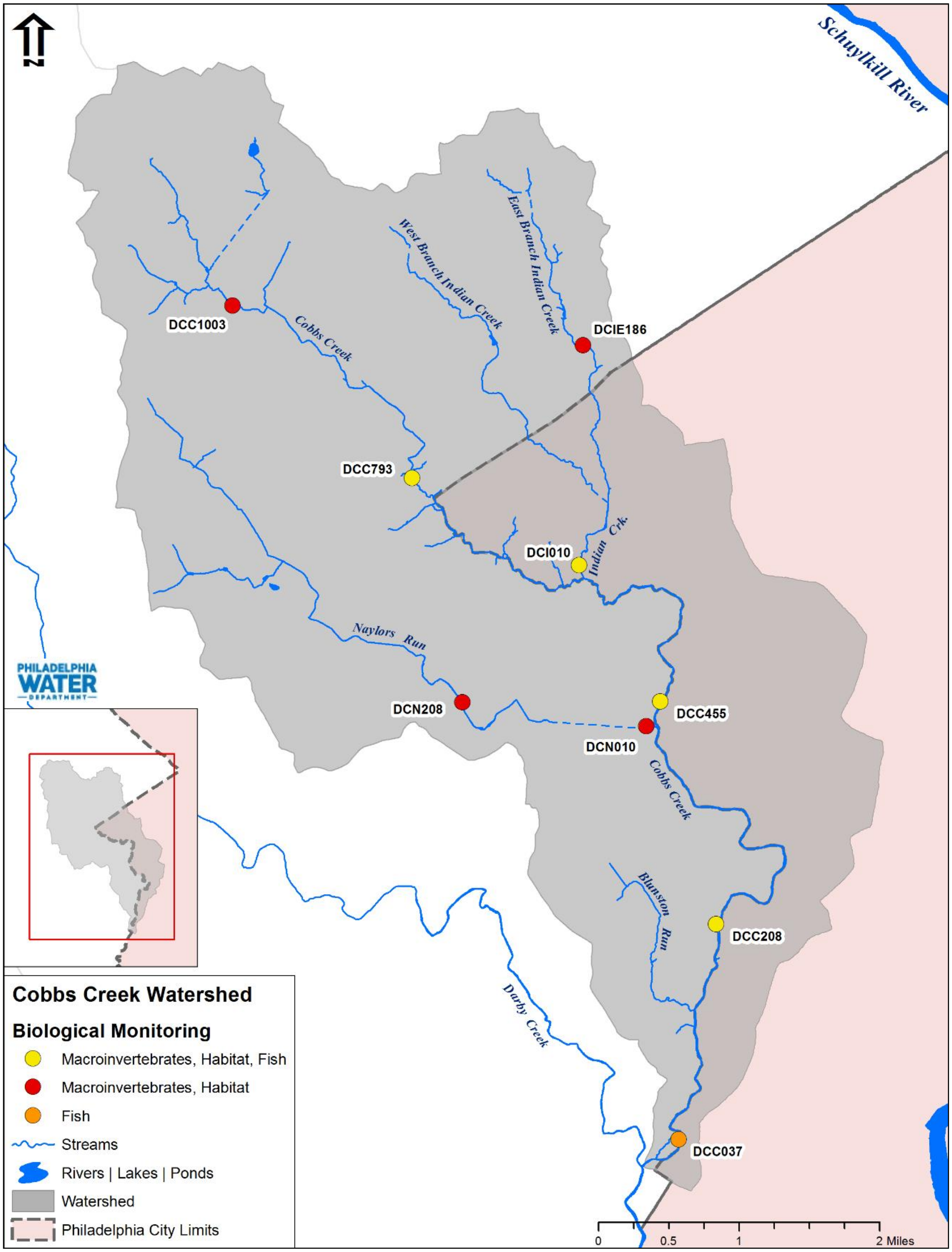


Figure - 1 Biological and Physical assessment locations in Cobbs Creek Watershed

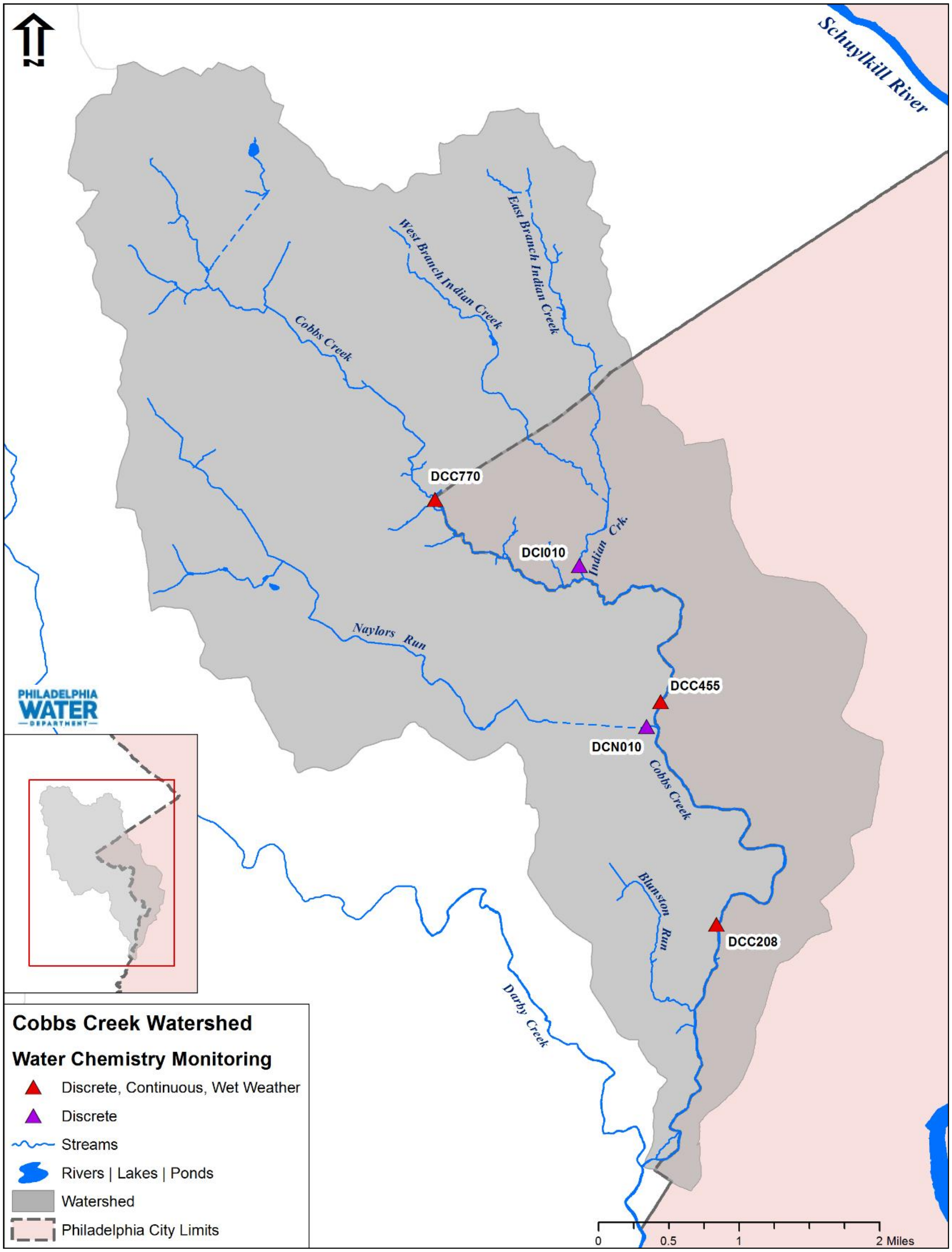


Figure - 2 Chemical monitoring locations in Cobbs Creek Watershed

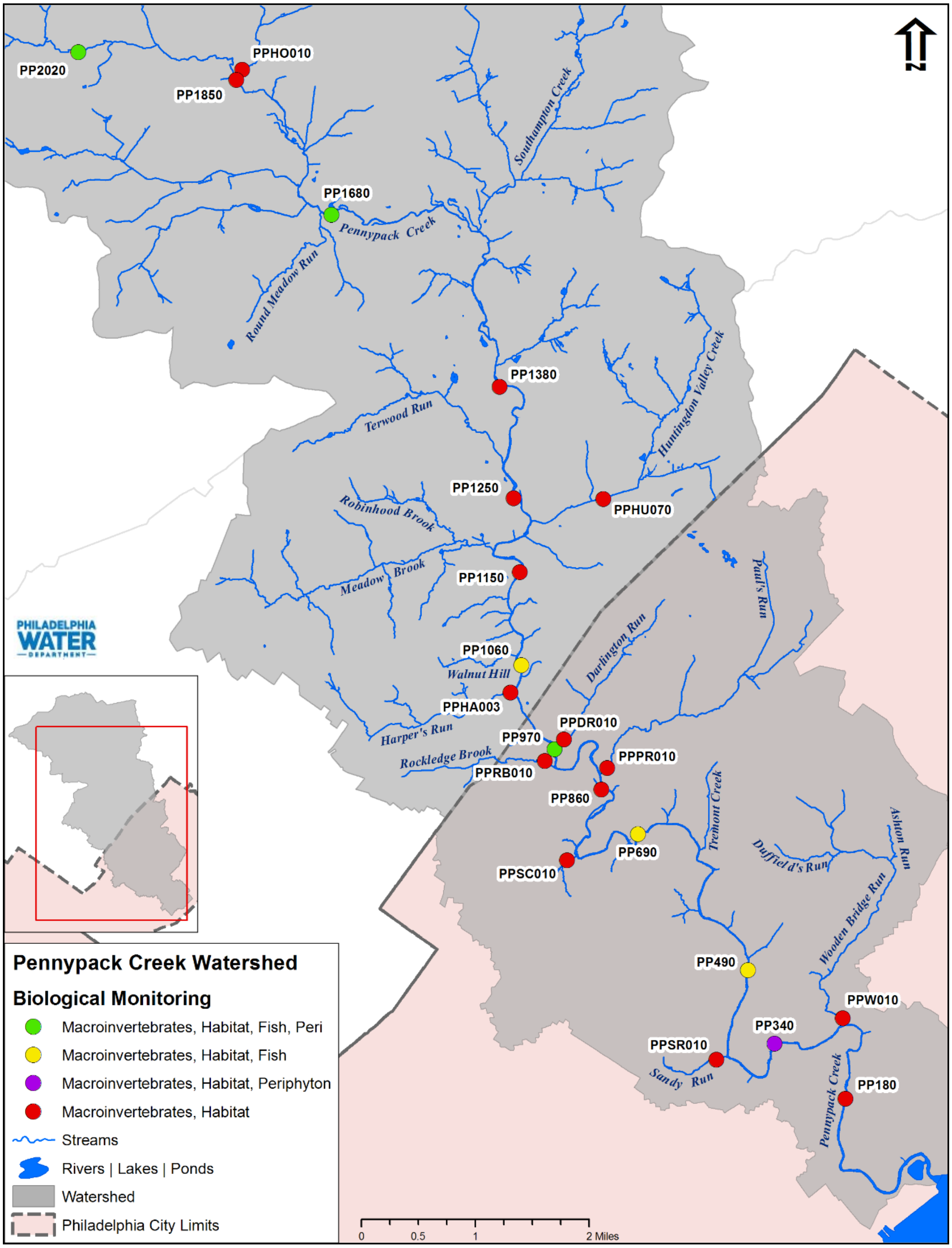


Figure - 3 Biological and Physical assessment locations in Pennypack Watershed

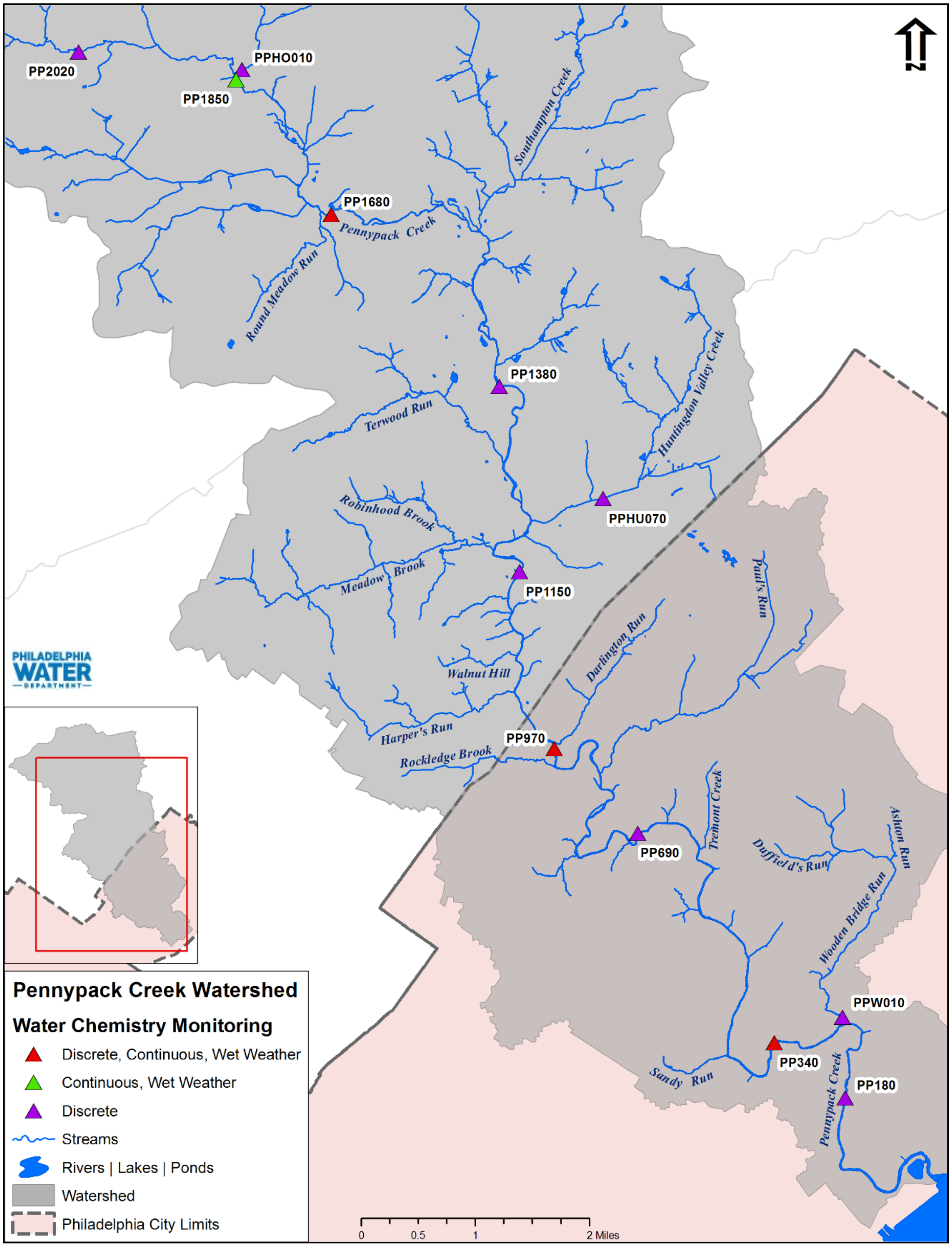


Figure - 4 Chemical monitoring locations in Pennypack Watershed

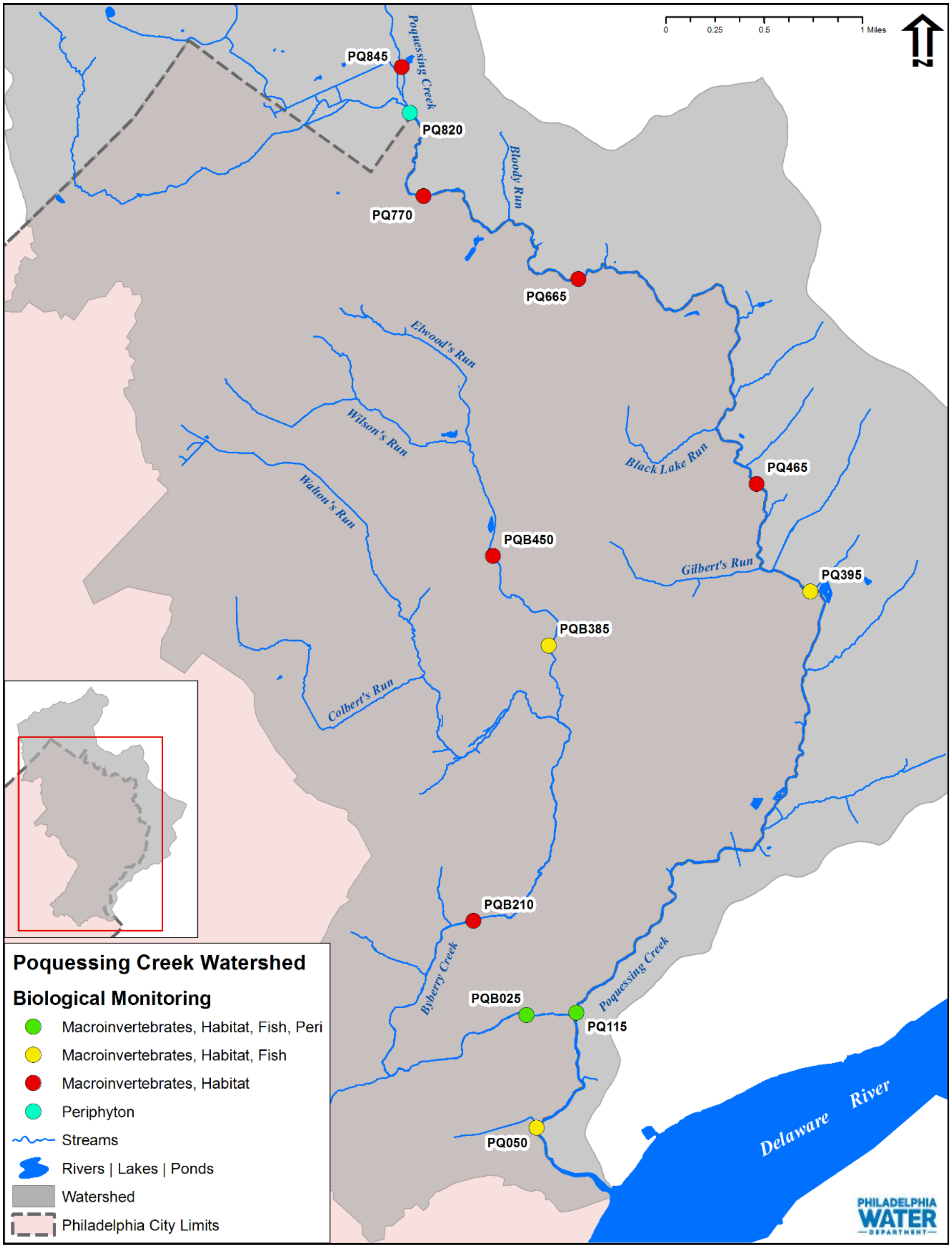


Figure - 5 Biological and Physical assessment locations in Poquessing-Byberry Watershed

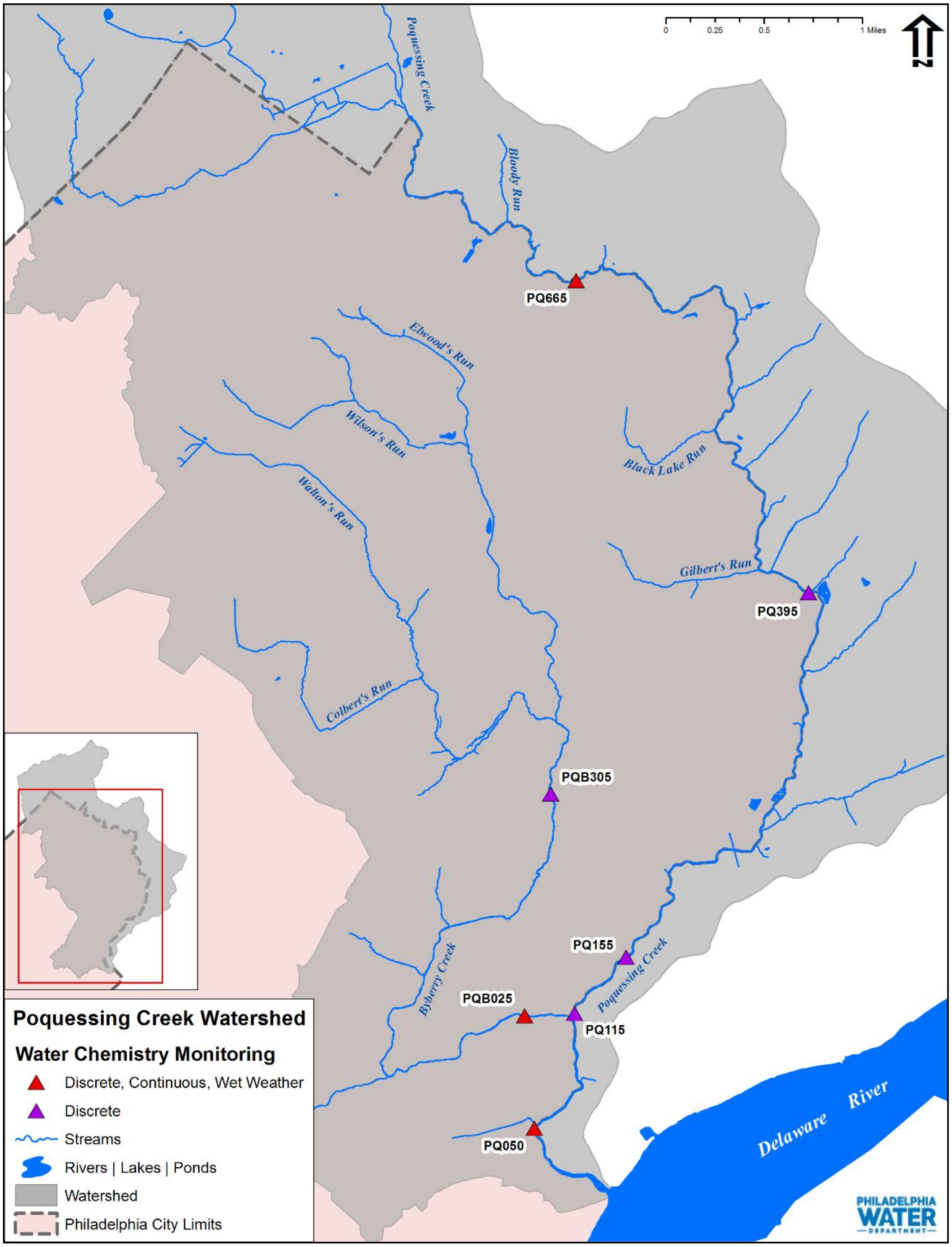


Figure - 6 Chemical monitoring locations in Poquessing-Byberry Watershed

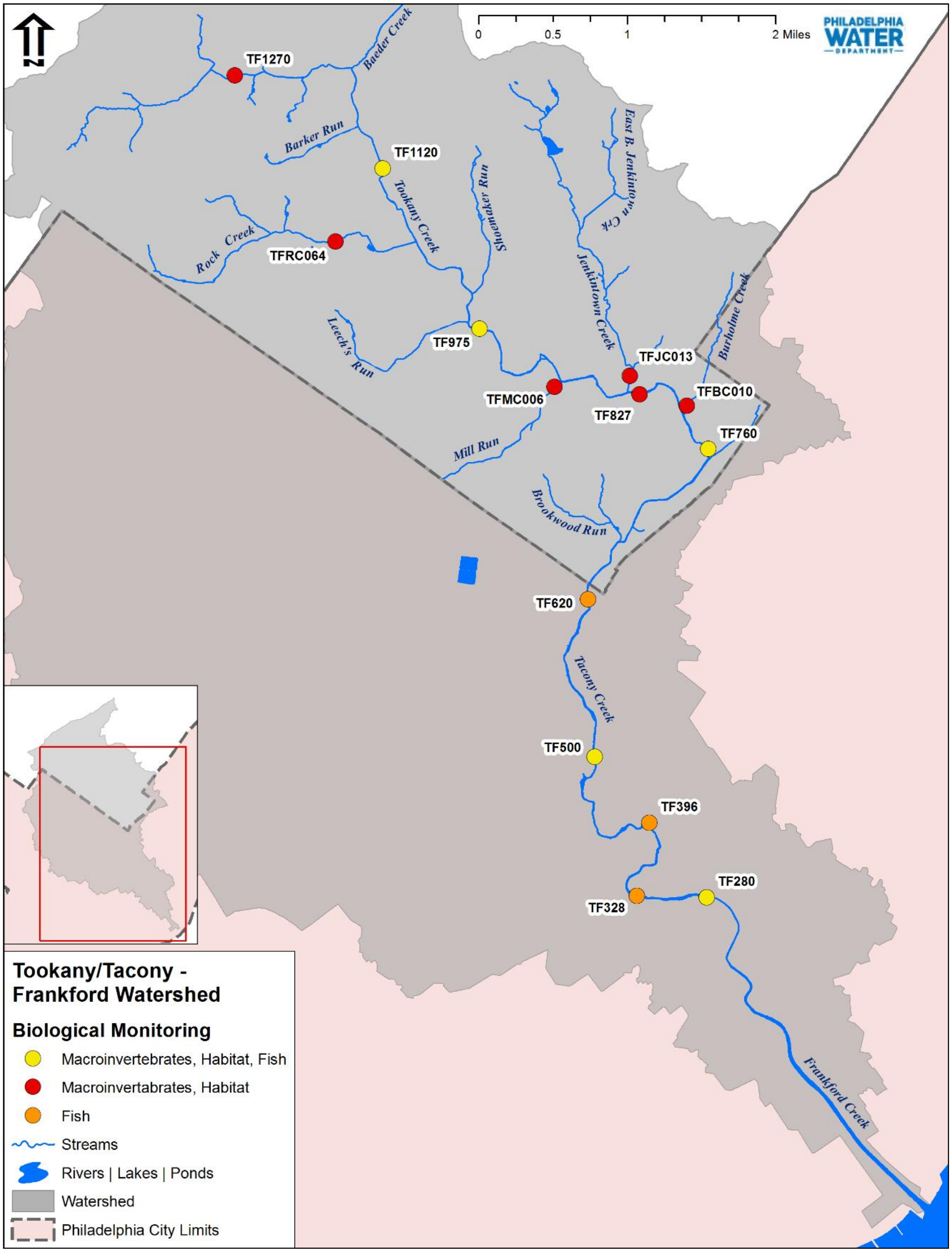


Figure - 7 Biological and Physical assessment locations in Tacony-Frankford Watershed

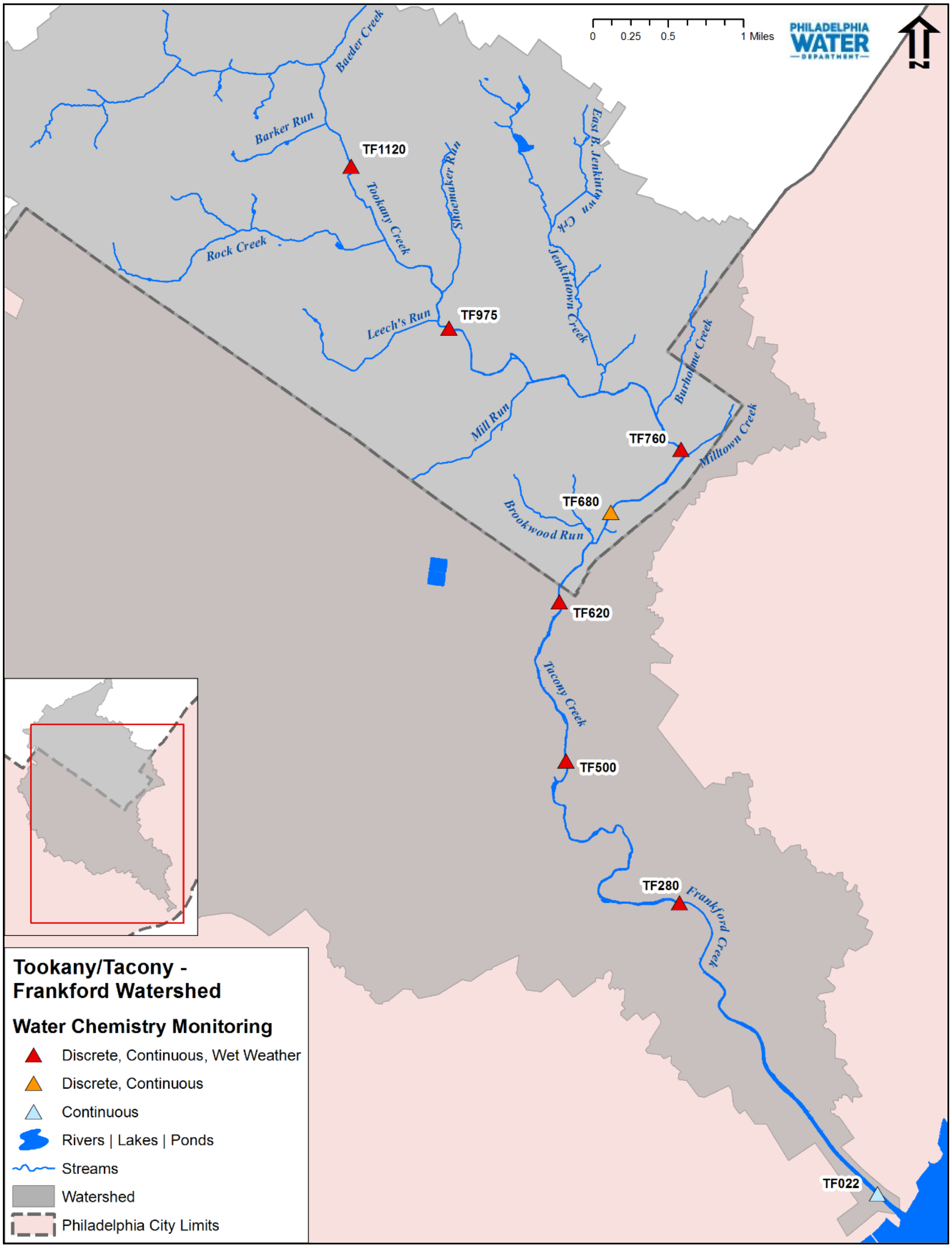


Figure - 8 Chemical monitoring locations in Tacony-Frankford Watershed

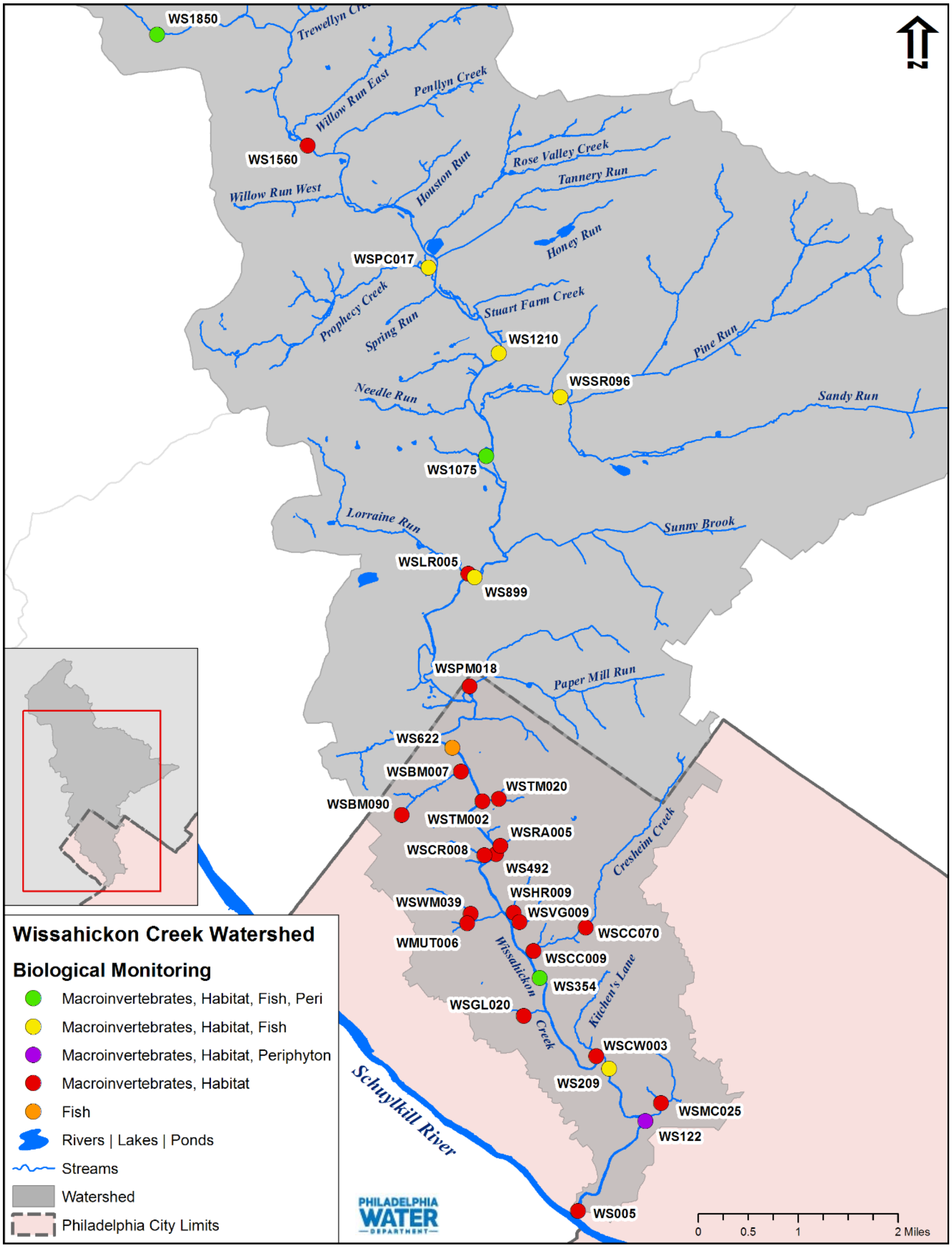


Figure - 9 Biological and Physical assessment locations in Wissahickon Watershed

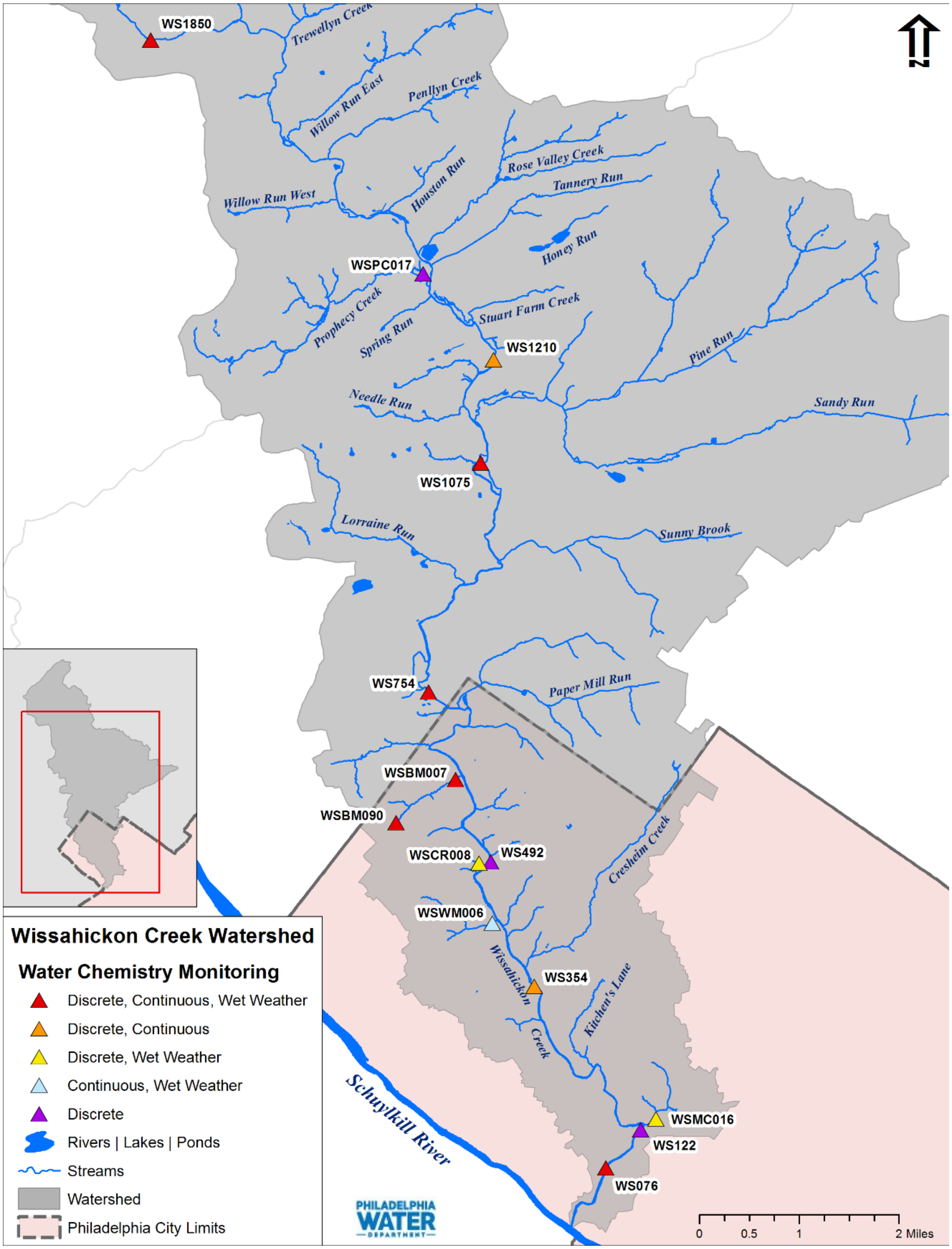


Figure - 10 Chemical monitoring locations in Wissahickon Watershed

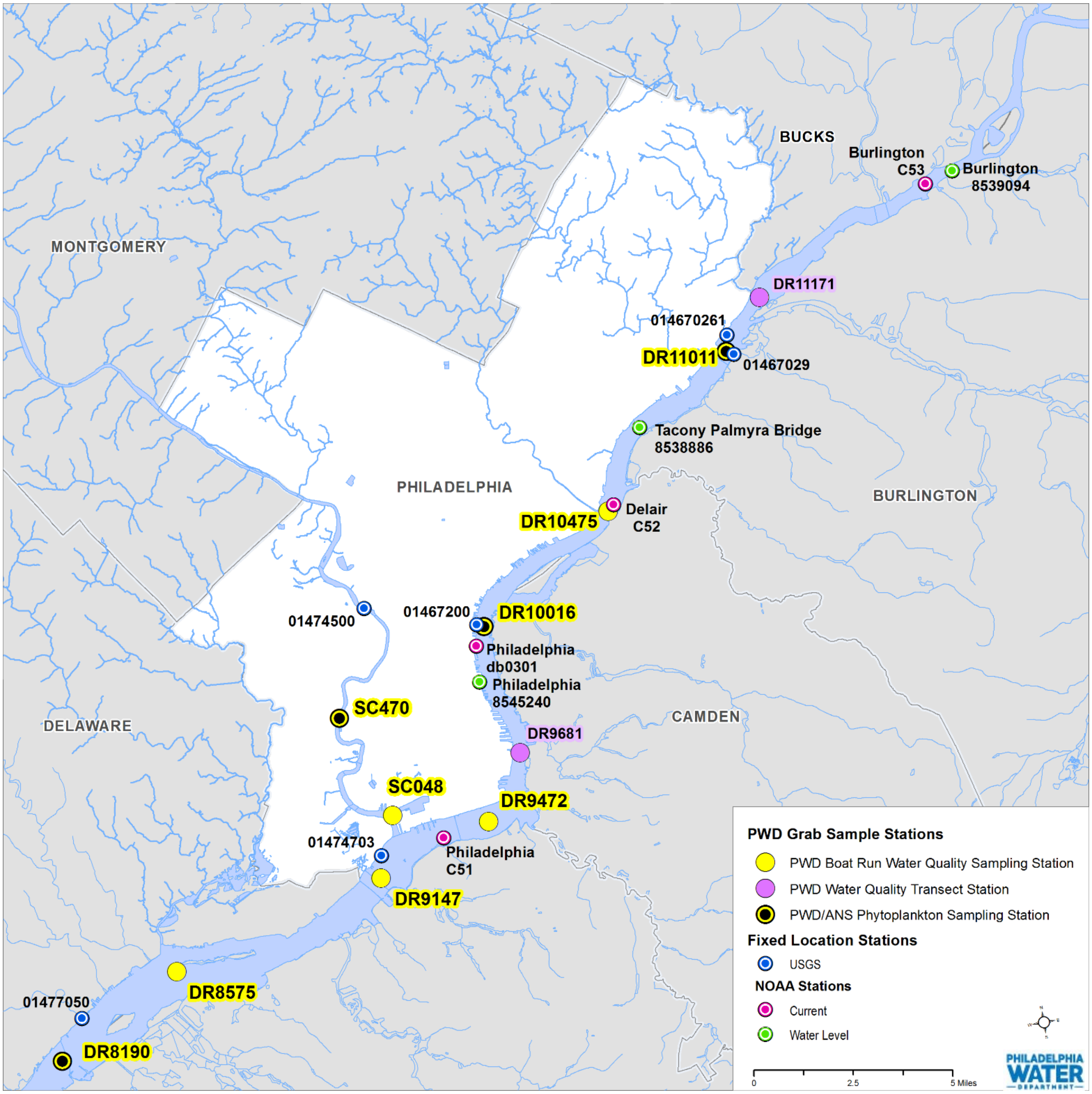


Figure - 11 Chemical monitoring locations in Delaware Estuary and Lower Schuylkill River Watershed

Appendix G – PWD Quarterly Dry Weather Water Quality Monitoring Program

Background

In 2009, the Philadelphia Water Department (PWD) initiated a dry weather water quality sampling program designed to work in tandem with the continuous data collection efforts of the PWD/USGS Cooperative Continuous Water Quality Monitoring Program. Grab samples are collected from 10 sites covering all six of Philadelphia County's watersheds on a quarterly basis by the staff of PWD's Bureau of Laboratory Services (BLS). Data collected through this program are most pertinent to Target A (Dry Weather Water Quality & Aesthetics) of PWD's Integrated Watershed Management Plan (IWMP) Strategy, as outlined in the following section.

The IWMP Target Strategy

IWMPs are designed to meet the goals and objectives of numerous water resources-related regulations and programs. Each IWMP results in a series of implementation recommendations that utilize adaptive management approaches to achieve measurable, watershed-wide benefits. By working with stakeholder groups to prioritize goals and evaluate options, PWD has learned that stakeholder priorities can at times differ from those identified by the data-driven problem identification process. This can present challenges in development and approval of a management alternative for watershed implementation. PWD has developed an approach that addresses what often emerges as a set of high-priority stakeholder concerns while simultaneously addressing the scientifically defined priorities.

By defining three distinct targets to meet the overall plan objectives, priorities identified by stakeholders can be addressed simultaneously with those identified through scientific data. Two of the targets were defined so they could be fully met through implementation of a limited set of options, while the third target would be best addressed through an adaptive management approach. In addition to the three targets, a fourth category has been developed to capture the more programmatic implementation options related to planning, outreach, reporting and continuation of the Watershed Partnership.

Targets are defined here as groups of objectives that each focus on a different problem related to the urban stream system. They can be thought of as different parts of the ultimate goal of fishable and swimmable waters through improved water quality, more natural flow patterns and restored aquatic and riparian habitat. Targets are specifically designed to help focus plan implementation. By defining these targets, and designing alternatives and an implementation plan to address the targets simultaneously, the plan will have a greater likelihood of success. It also achieves some of the objectives within a relatively short time frame, providing incentives to the communities and agencies involved in the restoration, as well as immediate benefits to the people living in the watershed. PWD's IWMP planning targets are defined below:

3 Targets of the IWMP

- Aesthetically appealing, accessible streams during dry weather
- Improved stream habitat for fish and macroinvertebrates
- Wet weather water quality that meets fishable and swimmable criteria

Program Support

A number of implementation options deemed appropriate for a given watershed are "programmatic" in nature. While these options may support achievement of Targets A, B, and/or C, implementation of these options alone would not result in achievement of a particular target. These "Program Support" associated options include items such as monitoring, reporting, feasibility studies, outreach/education, and continuation of the Watershed Partnership.

Target A: Dry Weather Water Quality and Aesthetics

Streams should be aesthetically appealing (look and smell good), accessible to the public, and an amenity to the community. Target A was defined with a focus on eliminating sources of sewage discharge and other pollution during dry weather, along with trash removal and litter prevention. Access and interaction with the stream during dry weather has the highest priority, because dry weather flows occur about 60-65% of the time during the course of a year. These are also the times when the public is most likely to be near or in contact with the stream. In dry weather, stream water quality should be similar to background concentrations in groundwater, particularly with respect to bacteria.

Figure 1. Eroded stream bank at Poquessing Creek

Target B: Healthy Living Resources

Improvements to the number, health, and diversity of benthic macroinvertebrate and fish species need to focus on habitat improvement and the creation of refuges for organisms to avoid high velocities during storms. Fluvial geomorphological studies, wetland and streambank restoration/creation projects, and stream modeling should be combined with continued biological monitoring to ensure that correct procedures are implemented to increase habitat heterogeneity within the aquatic ecosystem.

Improving the ability of an urban stream to support viable habitat and fish populations focuses primarily on the elimination or remediation of the more obvious impacts of urbanization on the stream. These include loss of riparian habitat, eroding and undercut banks, scoured streambed or excessive sediment deposits, channelized and armored stream sections, trash buildup, and invasive species. Thus, the primary tool to accomplish Target B is stream restoration.

Target C: Wet Weather Water Quality and Quantity

The third target is to restore water quality to meet fishable and swimmable criteria during wet weather. Improving water quality and flow conditions during and after storms is the most difficult target to meet in the urban environment. During wet weather, extreme increases in streamflow are common, accompanied by short-term changes in water quality. Where water quality and quantity problems exist, options may be identified that address both. Any stormwater management practice that increases infiltration or detains flow will help decrease the frequency of damaging floods; however, the size of such structures may need to be increased in areas where flooding is a major concern. (Reductions in the frequency of erosive flows and velocities will also help protect the investment in stream restoration made as part of Target B.)

Target C must be approached somewhat differently from Targets A and B. Full achievement of this target means meeting all water quality standards during wet weather, as well as elimination of flood-related issues.

Meeting these goals will be difficult. It will be expensive and requires a long-term effort. A rational approach to achieve this target includes stepped implementation with interim goals for reducing wet weather pollutant loads and stormwater flows, along with monitoring for the efficacy of control measures.

Monitoring Locations

Water quality samples are taken at 10 USGS gage sites in the USGS/PWD Cooperative Monitoring Program (Figure 2). Site identification codes used by PWD's Bureau of Laboratory Services (BLS)

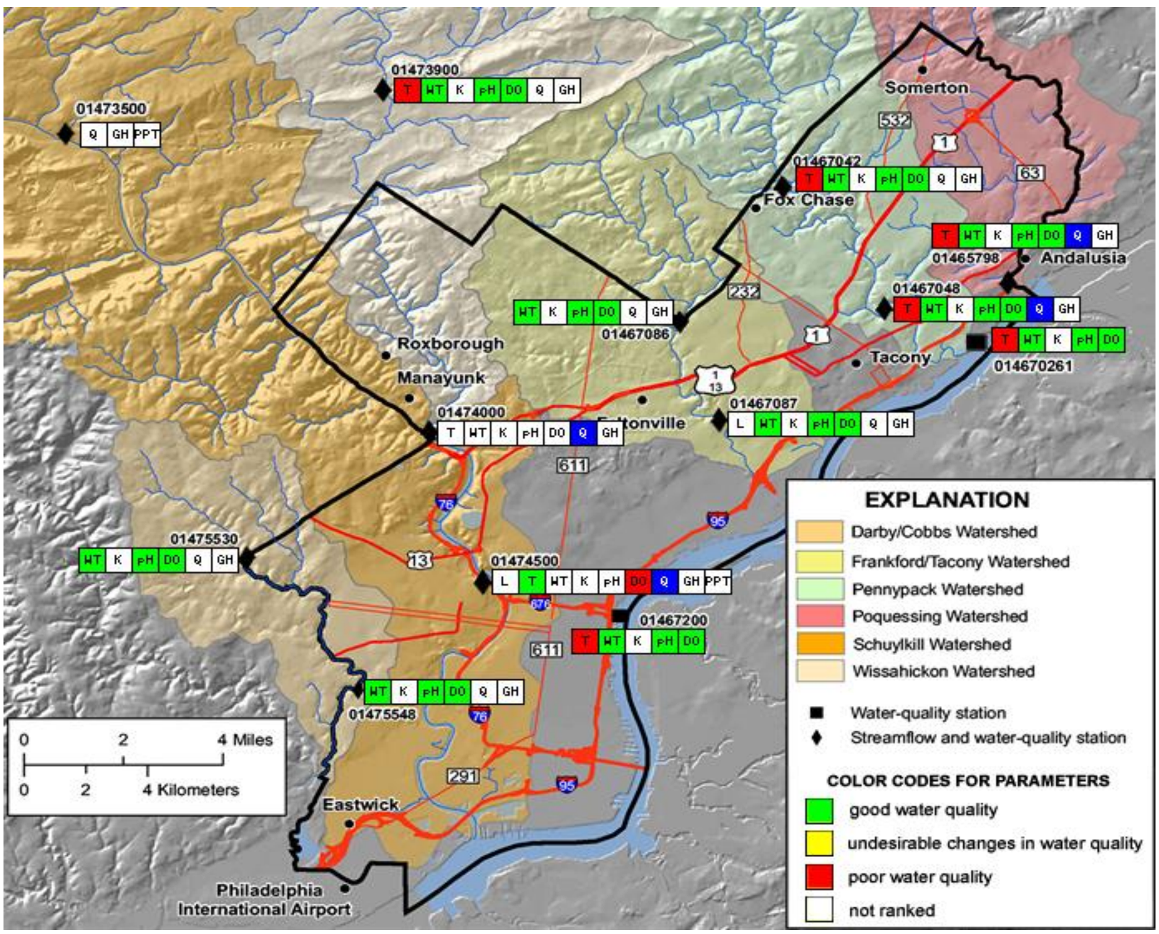


Figure 2. Philadelphia Water Quality Gage Stations as Viewed on Cooperative USGS-PWD Website (http://pa.water.usgs.gov/pwd/)

and rivermile-based site ID codes are presented alongside USGS gage station numbers in Table 1. USGS stream gaging stations are ideal monitoring points as they allow discrete sample data to be coupled with continuous discharge data being collected year-round at these sites for loading estimate purposes. Furthermore, grab sample results and field meter readings taken at the time of grab sampling may be invaluable when evaluating continuous water quality data from these USGS gages.

PWD is implementing a City-wide approach to dry weather water quality monitoring, rather than focusing on an individual watershed. Because a number of Green Stormwater Infrastructure (GSI) and other stormwater management projects are in the early stages of implementation, water quality benefits will only be observable over a period of several years.

Gauging the success of such projects on a more immediate scale is best accomplished solely by hydrological analysis. Therefore, the strategic value of the widespread sampling approach is that as more GSI projects are completed over the coming years, the water quality data should gradually begin to reflect their positive environmental impacts.

Table 1. Monitoring Locations in the PWD/USGS Cooperative Program with Location IDs used by PWD Bureau of Laboratory Services and River Mile-Based Site IDs

Description	USGS Gage #	BLS Location ID	Site ID
Cobbs Creek at US Rte. 1 (City Line Ave.)	01475530	COBB700	DCC770
Cobbs Creek at Mt. Moriah Cemetery	01475548	COBB355	DCC251
Schuylkill River at Fairmount Dam	01474500	SCHU154	SC825
Wissahickon Creek at Ft Washington (Rte. 73)	01473900	WISS500	WS1075
Wissahickon Creek at Ridge Ave.	01474000	WISS130	WS076
Tacony Creek at Castor Ave.	01467087	TACO250	TF280
Tacony Creek at Adams Ave.	01467086	TACO435	TF597
Pennypack Creek at Pine Rd.	01467042	PENN407	PP993
Pennypack Creek at Rhawn St.	01467048	PENN175	PP340
Poquessing Creek at Grant Ave.	01465798	POQU150	PQ050

Quarterly Dry Weather Monitoring July 2009 – June 2018

Sample Collection Dates

This report summarizes cumulative results from 36 sets of quarterly grab samples that were collected from June 2009 through June 2018. Samples were categorized by season (winter, spring, summer, fall) as well as according to PA DEP seasonal recreational use water quality criteria for interpretation of microbial sample results (Non-Swimming season or Swimming season) (Table 2). Weather conditions delayed the summer dry-weather sample normally collected during June 2018; the sampling event instead occurred in July and results will be included in next year's report.

Table 2. PWD/USGS Quarterly Dry Weather Grab Sample Dates

Sample Date	Season	Recreational Use Season
30-Jun-09	summer	Swimming
02-Oct-09	fall	Non-Swimming
17-Dec-09	winter	Non-Swimming
11-Mar-10	spring	Non-Swimming
22-Jun-10	summer	Swimming
15-Sep-10	fall	Swimming
20-Dec-10	winter	Non-Swimming
29-Mar-11	spring	Non-Swimming
27-Jun-11	summer	Swimming
15-Sep-11	fall	Swimming
13-Dec-11	winter	Non-Swimming
20-Mar-12	spring	Non-Swimming
18-Jun-12	summer	Swimming
26-Sep-12	fall	Swimming
02-Jan-13	winter	Non-Swimming
04-Apr-13	spring	Non-Swimming
17-Jul-13	summer	Swimming
26-Sep-13	fall	Swimming
17-Jan-14	winter	Non-Swimming
26-Mar-14	spring	Non-Swimming
17-Jun-14	summer	Swimming
23-Sep-14	fall	Swimming
19-Dec-14	winter	Non-Swimming
18-Mar-15	spring	Non-Swimming
23-Jun-15	summer	Swimming
6-Oct-15	fall	Non-Swimming
6-Jan-16	winter	Non-Swimming
20-Apr-16	spring	Non-Swimming
12-Jul-16	summer	Swimming
22-Sep-16	fall	Swimming
10-Jan-17	winter	Non-Swimming
20-Apr-17	spring	Non-Swimming
11-Jul-17	summer	Swimming
13/22-Sep-17	fall	Swimming
28-Feb-18	winter	Non-Swimming
02-May-18	spring	Swimming

Nutrient Analysis

The macronutrients phosphorus and nitrogen are essential to the growth and overall survival of all plants. However, when occurring in surplus they can be extremely detrimental to aquatic ecosystems, and in turn to the human population that utilizes these water bodies for drinking water and recreational activities such as fishing, boating, and swimming. Elevated nutrient concentrations in rivers and streams can most often be attributed to anthropogenic pollution sources. In these situations, the most common sources of both nutrients are runoff from fertilized lawns/farmland and wastewater discharge.

The most immediate result of excessive nutrient concentrations in any natural water body is excessive plant growth, seen in a variety of growth forms from suspended algae to aquatic macrophytes. As the first step in the process of eutrophication, this unnatural acceleration of aquatic plant growth can start a chain reaction leading to highly adverse effects to that ecosystem. For example, in small shallow streams, unnaturally high densities of algal periphyton can cause pronounced fluctuations in dissolved oxygen and pH and also adversely affect aquatic habitat by forming thick mats of filamentous algae or algal scums on stream substrates. Moreover, alteration of the algal community structure can lead to the proliferation of nuisance taxa, taste and odor problems in the drinking water supply, increased water treatment costs and, in rare cases, production of toxins (*e.g.*, from cyanobacteria blooms). As a result of these direct and indirect responses, streams and rivers can suffer severe impacts to both aquatic biodiversity and human recreational use.

It should be noted that several phosphorus-containing compounds, known as polyphosphates, can be found in the region's waterways, but they are naturally occurring and are present due to the geologic composition of the area. Furthermore, these polyphosphates pose little ecological threat as they are not present in a biologically available form. Only over long periods of time can these compounds be broken down into orthophosphates, which plants and algae can absorb and utilize for growth. Therefore, aside from the relatively minor contributions of the region's geology, the most significant source of orthophosphates in rivers and streams is human-generated pollution. It is for this reason that orthophosphates, along with nitrates, are included as components of this water quality monitoring program. These forms of N and P are readily available to stream producers.

Ammonia, present in surface waters as un-ionized ammonia gas (NH_3) or as ammonium ion (NH_4^+), is produced by deamination of organic nitrogen-containing compounds such as proteins, and also by hydrolysis of urea. In the presence of oxygen, ammonia is converted to nitrate (NO_3^-) by a pair of bacteria-mediated reactions, together known as the process of nitrification. Nitrification occurs quickly in oxygenated waters with sufficient densities of nitrifying bacteria, effectively reducing ammonia concentration, although at the expense of increased NO_3^- concentration. Ammonia is a primary form of nitrogen produced from excretory waste products and other organic material in sewage. Thus, presence of ammonia can be an indicator of sewage pollution. As ammonia is converted to nitrate in oxygenated streams, ammonia is a non-conservative pollution indicator that tends to decrease in concentration with increasing distance from the source of pollution. PA DEP water quality criteria for NH_3 reflect the relationship between stream pH, temperature, and ammonia dissociation. Ammonia toxicity is inversely related to hydrogen ion $[H^+]$ concentration (*e.g.*, an increase in pH from 7 to 8 increases NH_3 toxicity by approximately an order of magnitude). At pH 9.5 and above, even background concentrations of NH_3 may be considered potentially toxic.

Ammonia may be introduced to streams through fertilizers, breakdown of natural organic material, stables and livestock operations, stormwater runoff, and in some cases from more serious anthropogenic sources of untreated sewage such as defective laterals, crossed/illicit connections, and sanitary sewer overflows (SSOs). PWD has established intensive field infrastructure trackdown, infrared photography, sewer camera monitoring, and dye testing programs to identify and correct these problems where and when they occur.

Nutrient Results

Nutrient data collected thus far at each of the sites are generally consistent with the data collected for Comprehensive Characterization Reports (CCRs) prepared for each of the respective watersheds. Five of 10 sites are not affected by treated wastewater discharges and usually had orthophosphate concentration less than the reporting limit. The reporting limit for the majority of samples was 0.05 mg/L, but limits of 0.1 mg/L and 0.09 mg/L were also in effect at various times during the quarterly grab sampling program (Table 3). Conversely, Pennypack and Wissahickon creeks had multiple instances of elevated orthophosphate concentration, which is likely attributable to point source discharge of treated wastewater. Dilution effects were seen between upstream and downstream gages, particularly in the cases of Pennypack and Wissahickon creeks.

Though the Schuylkill River sampling station is downstream from several discharges of treated wastewater, nutrient concentrations are generally smaller than those observed from the Pennypack and Wissahickon creeks, perhaps reflecting the Schuylkill station's much larger overall watershed size and dilution capacity.

Summary statistics for the orthophosphate samples, including results from the application of the PA DEP Chemistry Statistical Assessments protocol (PA DEP, 2007), are shown in Table 3. Exceedances were evaluated relative to the US EPA (2000) Subecoregion 64 guideline for orthophosphate of 0.02625 mg/L, *i.e.*, the median of the 25th percentile seasonal concentrations. Since the detection limit is greater than the guideline, all non-detected samples were considered "possible exceedances." The nonparametric statistical assessment results show that the locations at Pennypack and Wissahickon creeks, and the Schuylkill River, failed to attain water quality consistent with this guideline. The other locations are classified as needing further evaluation due to the predominance of samples below the detection limit that are all possible exceedances.

Similar examples of wastewater discharge impacts and upstream/downstream dilution have also begun to emerge with regard to the nitrate data that have been collected. The data seem to

Table 3. Orthophosphate Summary Statistics and Assessments. (Concentrations in mg/L)

Gage	Mean	Median	Std. dev.	Min.	Max.	n	n, non-detects	Exceedances	Possible Exceedances	Assessment
1465798	0.058	0.050	0.020	0.014	0.100	36	34	1	34	Needs more evaluation
1467042	0.358	0.278	0.233	0.099	0.953	34	0	31	0	Non-attaining
1467048	0.247	0.184	0.178	0.053	0.852	36	0	32	0	Non-attaining
1467086	0.066	0.050	0.057	0.000	0.363	35	31	2	31	Needs more evaluation
1467087	0.059	0.050	0.023	0.011	0.117	36	29	4	29	Needs more evaluation
1473900	0.282	0.256	0.130	0.050	0.723	36	1	32	1	Non-attaining
1474000	0.165	0.157	0.064	0.050	0.414	35	3	29	3	Non-attaining
1474500	0.146	0.118	0.086	0.050	0.367	36	5	28	5	Non-attaining
1475530	0.058	0.050	0.021	0.019	0.100	36	33	0	33	Needs more evaluation
1475548	0.060	0.050	0.028	0.000	0.152	36	33	1	33	Needs more evaluation

indicate a trend toward decreased nitrate concentrations during warmer months, which would correspond to the increased uptake of nutrients by plant life during those growing seasons (Table 4 and Figure 4). The only exceptions are the Pennypack and Wissahickon Creek gage sites, which as previously stated are directly impacted by treated wastewater discharge. It should be noted, however, that these statements and observations are in no way conclusive given that the dataset is still relatively limited in size. As this dataset grows in subsequent years, further statistical analysis can be carried out and any apparent patterns or phenomena can be explored.

Summary statistics for the nitrate samples, including results from application of the PA DEP Chemistry Statistical Assessment protocol (PA DEP, 2007), are shown in Table 4. Exceedances were evaluated relative to a) the PA DEP water quality standard for nitrite and nitrate of 10 mg/L, and b) the US EPA (2000) subecoregion 64 guideline for nitrite and nitrate of 0.995 mg/L, *i.e.*, the median of the 25th percentile seasonal concentrations. The nonparametric statistical assessment results show that with respect to the PA DEP standard, all locations were in attainment except the upstream Wissahickon gage. One exceedance at 12 mg/L was observed at that site, and more data is needed to make an evaluation. All sites failed to attain water quality consistent with the US EPA subecoregion-based guideline.

Quarterly dry-weather analysis of ammonia began in the fall of 2011, limiting the size of the current dataset to 27 results per location. PWD laboratory reporting limits for ammonia fluctuated based on the performance of lab analytical equipment with spiked and blank samples. Ammonia concentration detection limits were 0.5 mg/L for the fall 2011 sample set, and the subsequent sample set results had detection limits of 0.1 mg/L. Ammonia concentration exceeded the detection limit in only 30 of the 270 samples: The downstream Tacony site (01467087) most often exceeded the detection limit, where a maximum concentration of 0.4 mg/L was observed in both fall 2014 and summer 2015. Results are shown in Table 5 and Figure 5.

There were no observed violations of ammonia water quality criteria at any site during this period of dry-weather monitoring. With 217 of the 270 sample results characterized as non-detects due to laboratory reporting limits, ammonia criteria was calculated with corresponding temperature and pH values to determine if possible exceedances existed (i.e., the criteria fell below the detection limit). None of the non-detect samples had the potential to violate water quality criteria.

Table 4. Nitrate Summary Statistics and Assessments. Concentrations are in mg/L.

Gage	Mean	Median	Std. dev.	Min.	Max.	n	n, non-detects	Exceedances, PADEP	Exceedances, Subecoregion	PADEP Assessment	EPA Subecoregion Assessment
1465798	1.720	1.640	0.569	0.797	3.750	34	0	0	34	Attaining	Non-attaining
1467042	4.542	4.125	1.034	3.200	7.943	32	0	0	32	Attaining	Non-attaining
1467048	3.525	3.318	1.088	1.209	6.326	34	0	0	34	Attaining	Non-attaining
1467086	2.499	2.230	1.356	1.510	9.740	33	0	0	33	Attaining	Non-attaining
1467087	1.786	1.746	0.716	0.505	3.373	35	0	0	33	Attaining	Non-attaining
1473900	5.908	5.280	2.075	2.690	12.039	33	0	1	34	Needs more evaluation	Non-attaining
1474000	3.920	3.892	0.978	1.288	6.180	34	0	0	34	Attaining	Non-attaining
1474500	2.943	2.820	0.442	2.141	3.960	35	0	0	35	Attaining	Non-attaining
1475530	2.965	2.971	0.322	2.489	3.521	35	0	0	35	Attaining	Non-attaining
1475548	2.458	2.438	0.507	1.395	3.280	35	0	0	35	Attaining	Non-attaining

Table 5. Ammonia Summary Statistics and Assessments. Concentrations are in mg/L.

Gage	Mean	Median	Std. dev.	Min.	Max.	n	n, non-detects	Exceedances
1465798	0.116	0.100	0.080	0.041	0.500	27	20	0
1467042	0.121	0.100	0.088	0.027	0.500	27	23	0
1467048	0.119	0.100	0.088	0.043	0.500	27	22	0
1467086	0.111	0.100	0.080	0.020	0.500	27	24	0
1467087	0.168	0.113	0.114	0.028	0.500	27	11	0
1473900	0.111	0.100	0.079	0.023	0.500	27	25	0
1474000	0.110	0.100	0.080	0.024	0.500	27	25	0
1474500	0.127	0.100	0.081	0.075	0.500	27	19	0
1475530	0.110	0.100	0.080	0.030	0.500	27	25	0
1475548	0.111	0.100	0.079	0.040	0.500	27	23	0

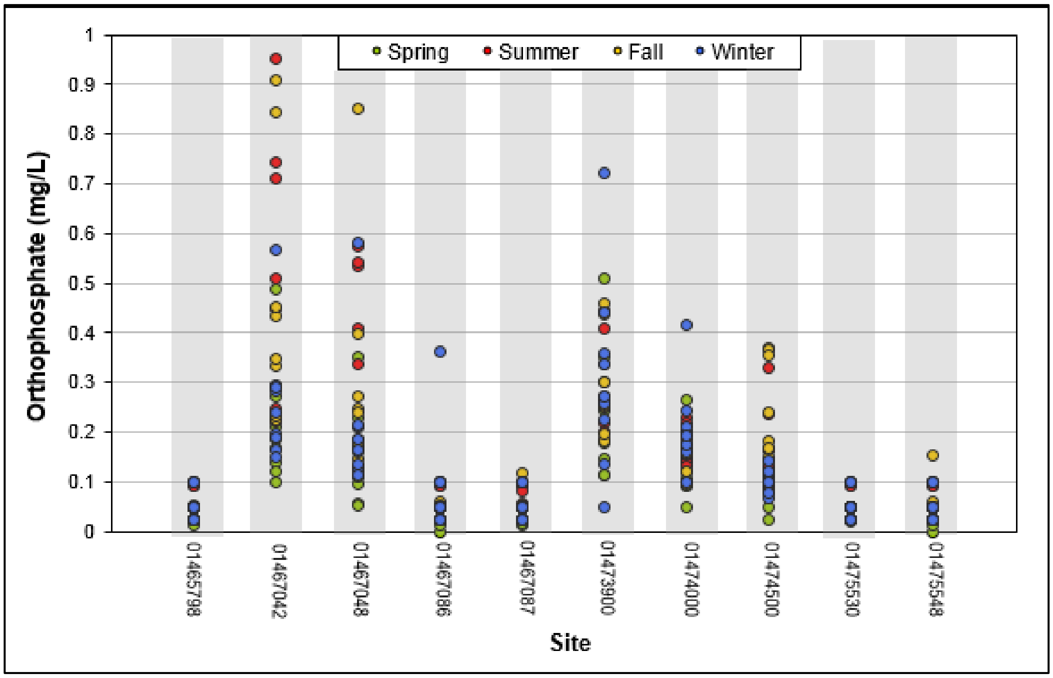


Figure 3. Orthophosphate concentration at 10 USGS gage stations, July 2009-June 2018

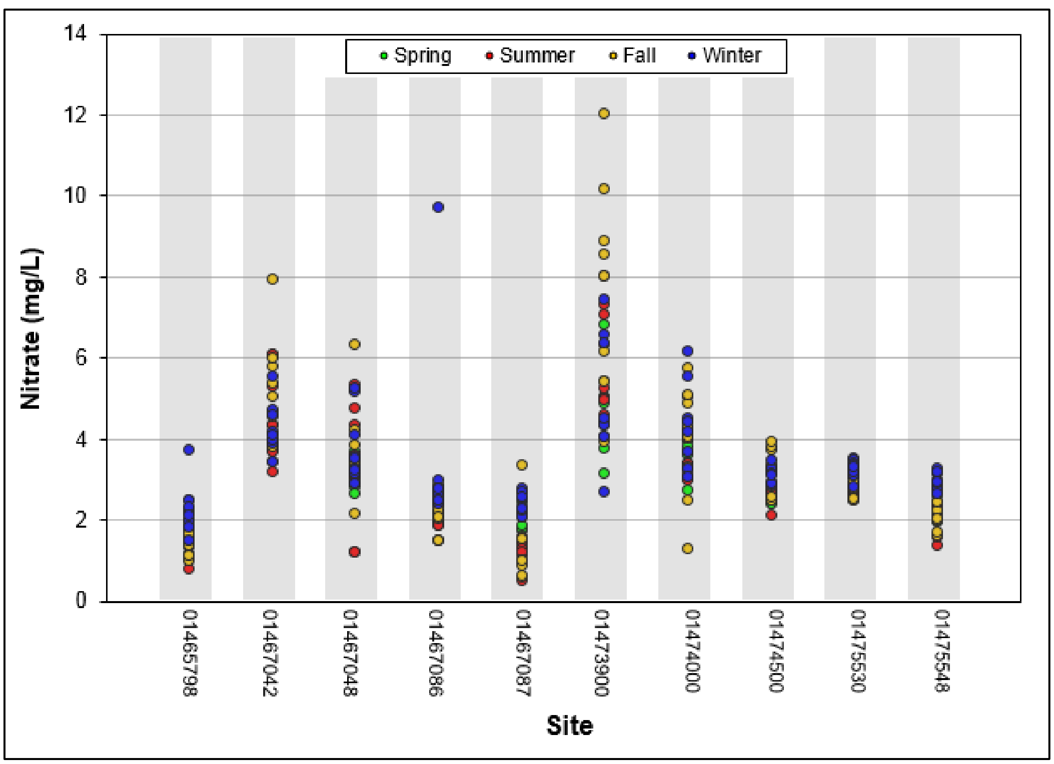


Figure 4. Nitrate concentration at 10 USGS gage stations, July 2009-June 2018

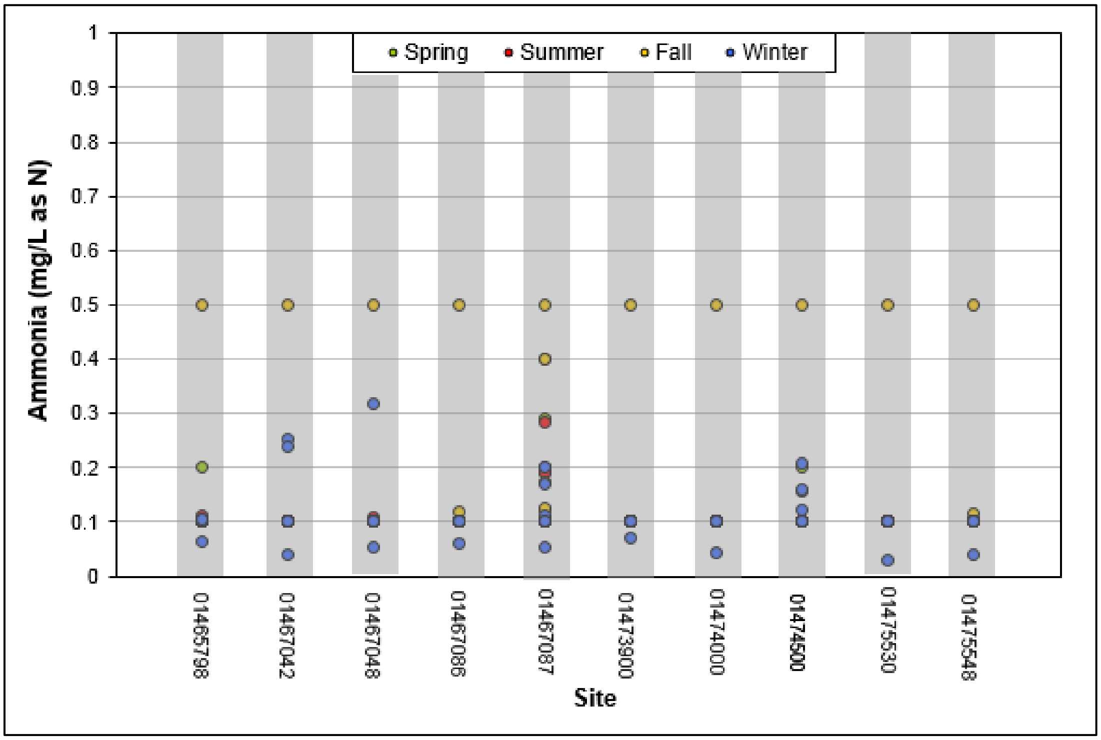


Figure 5. Ammonia concentration at 10 USGS gage stations, September 2011-June 2018

Microbial Analysis

Fecal indicator bacteria, found naturally in the gut of warm-blooded animals, can be used in the detection of human or animal waste contamination in a body of water. While these bacteria themselves are generally harmless to humans, they are considered to be very reliable indicators of the presence of other, more serious fecal-borne pathogens such as viruses, protozoa and other bacteria. The extent to which a water body is contaminated with fecal indicator bacteria can indicate the likelihood that the water has been contaminated by human or animal wastes. In urban environments, the most likely dry weather pollution sources are domestic animals, wildlife and untreated sewage from improperly connected or leaking sanitary sewers.

PWD performs three fecal indicator bacteria tests, including fecal coliform, *Escherichia coli (E. coli.),* and enterococci. The fecal coliform test covers a relatively wide subgroup of fecal-specific bacteria; however, it does include some species that are not necessarily fecal in origin. *E. coli*, on the other hand, is a single coliform species that is noteworthy due to the fact that it occurs only in the fecal matter of humans and other warm-blooded animals. This qualifies *E. coli* as an excellent indicator of human waste. The final coliform group tested, the enterococci, are significant in that they tend to mimic many enteric pathogens with their ability to thrive in saline conditions over a wide range of temperatures. This makes the enterococci test very useful in waterways that may have a marine influence, or in any river or stream that may have above normal salinity due to geology.

Microbial Analysis Results

PA DEP has established seasonal bacteria water quality criteria that are more stringent in warmer months, or the "swimming season." For the period May 1 through September 30, water quality standards require that the geometric mean of a group of at least five samples collected on non-consecutive days over a 30-day period not exceed 200 fecal coliform CFU (colony forming unit) per 100mL. During the non-swimming season, this value increases to 2000 CFU/100mL.

While samples were collected on a quarterly basis and not within a 30-day period as required by PA DEP water quality criteria, results of microbial analyses from the seven swimming season samples generally indicate fecal coliform geometric means greater than 200CFU/100mL (Table 6). The only exceptions were the downstream Wissahickon Creek and Schuylkill River gage sites, which each had fecal coliform geometric means less than 200 CFU/100mL, based on 14 samples each. The 2000 CFU/100mL geometric mean standard for non-swimming season samples was not exceeded at any of the 10 sites, based on 18 samples at each site.

US EPA recommended water quality criteria (1986) were used as guidelines for evaluation of sample results for other microbial parameters, as PA DEP does not have recreational use water quality criteria for *E. coli* or enterococci. Guidelines used for *E. coli* and enterococci were geometric means of 126 and 33 CFU/100mL, respectively. The *E. coli* geometric mean guideline was exceeded at eight of the 10 sites. The enterococci geometric mean guideline was also exceeded at eight of the 10 sites (Table 7).

Table 6. Fecal Coliform Geometric Mean Results and PA DEP Water Quality Recreational Use Criteria Achievement Status by Season

Gage	n	n, non-detects	Geometric mean (CFU/100 mL)	Season	Attaining Standard
1465798	19	1	69	non-swimming	Yes
1465798	17	0	452	swimming	No
1467042	19	1	48	non-swimming	Yes
1467042	17	0	298	swimming	No
1467048	19	0	304	non-swimming	Yes
1467048	17	1	1004	swimming	No
1467086	19	0	217	non-swimming	Yes
1467086	17	0	972	swimming	No
1467087	19	0	277	non-swimming	Yes
1467087	17	0	533	swimming	No
1473900	19	0	59	non-swimming	Yes
1473900	17	0	268	swimming	No
1474000	19	1	32	non-swimming	Yes
1474000	17	0	111	swimming	Yes
1474500	19	1	29	non-swimming	Yes
1474500	17	2	48	swimming	Yes
1475530	19	1	73	non-swimming	Yes
1475530	17	0	314	swimming	No
1475548	19	0	137	non-swimming	Yes
1475548	17	0	774	swimming	No

Table 7. *E. Coli* and Enterococci Geometric Mean Results and US EPA Recreational Use Water Quality Guideline Achievement

	n, non-detects		Geometric mean (CFU/100 mL)		Attaining Guideline	
Gage	**E. coli**	**Enterococci**	**E. coli**	**Enterococci**	**E. coli**	**Enterococci**
01465798	1	0	195	76	No	No
01467042	1	0	129	42	No	No
01467048	0	0	595	83	No	No
01467086	1	0	459	92	No	No
01467087	1	1	368	62	No	No
01473900	0	0	141	70	No	No
01474000	1	1	60	21	Yes	Yes
01474500	4	3	36	6	Yes	Yes
01475530	1	0	147	79	No	No
01475548	1	0	288	93	No	No

Results for all three microbial parameters exhibited similar seasonal patterns, with samples collected during spring and winter generally having smaller concentrations than fall and summer samples (Figures 6 through 8). Bacteria samples collected from 2009-2018 indicate a fair correlation between fecal coliform and *E. coli* (r = 0.80), and weaker correlations between fecal coliform and enterococci (r = 0.25), and *E. coli* and enterococci (r = 0.29) (Figures 9-11).

In 2018, PWD ceased collection of Enterococci samples as the scientific consensus has built toward examining *E. coli* as a primary indicator of pollution.

The number of samples limits further conclusive statements for microbial parameters at this time, particularly in the case of fecal coliform where the number of results is further reduced by categorization according to swimming vs. non-swimming season. Furthermore, US EPA is currently revising recommended recreational use water quality criteria for microbial parameters.

As the quarterly dry weather monitoring program continues, more samples will be obtained, allowing for more rigorous statistical analyses in the future.

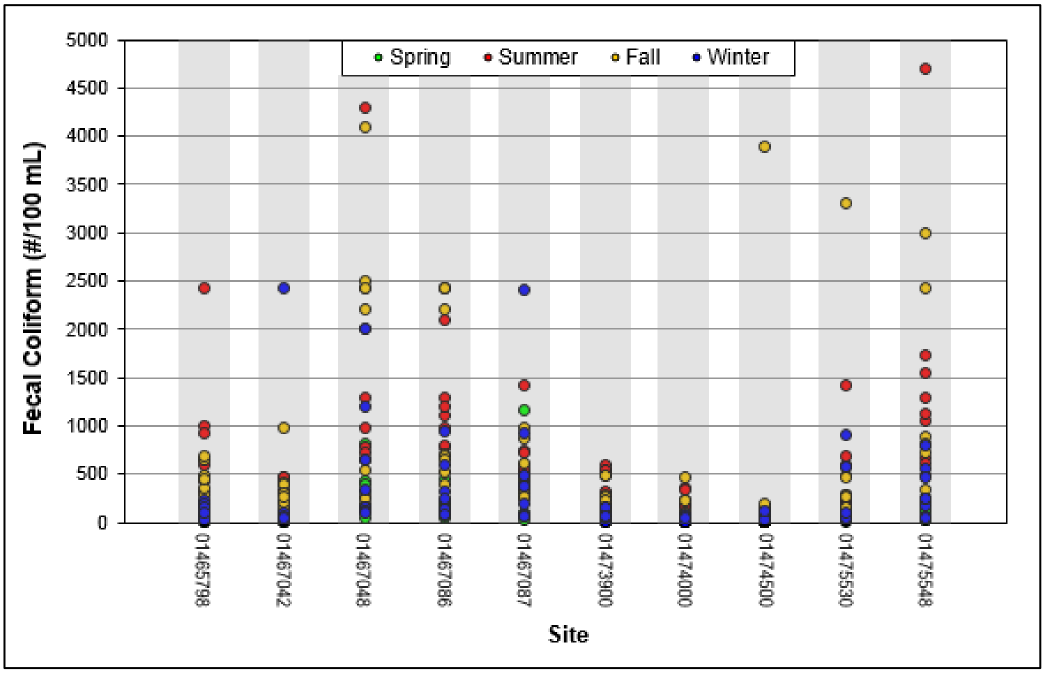


Figure 6. Fecal Coliform results at 10 USGS gage stations, July 2009-June 2018

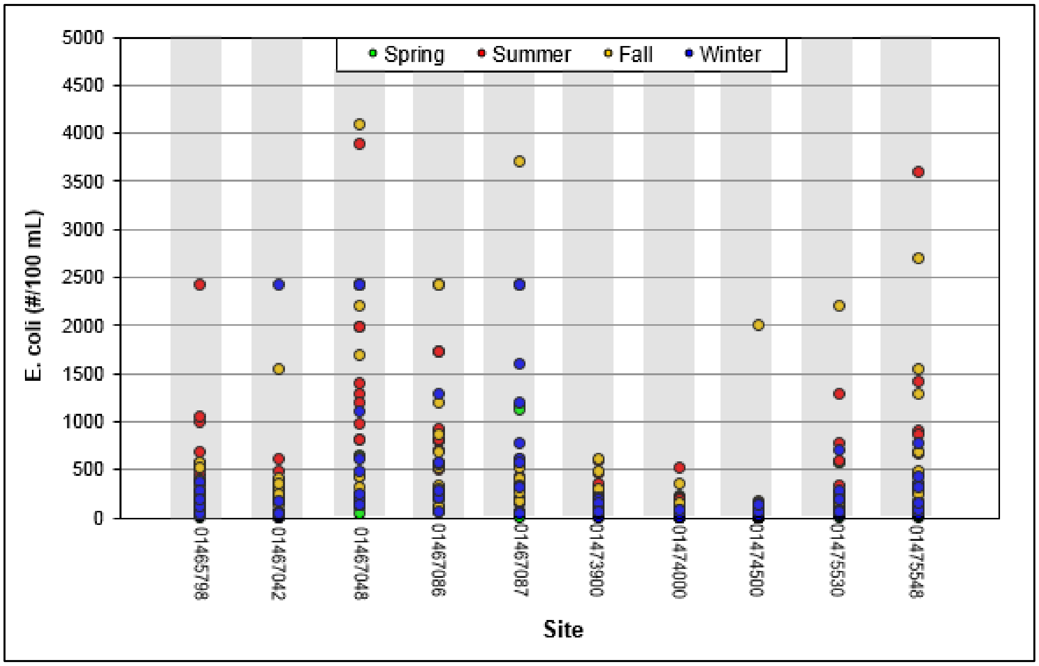


Figure 7. E. coli results at 10 USGS gage stations, July 2009-June 2018

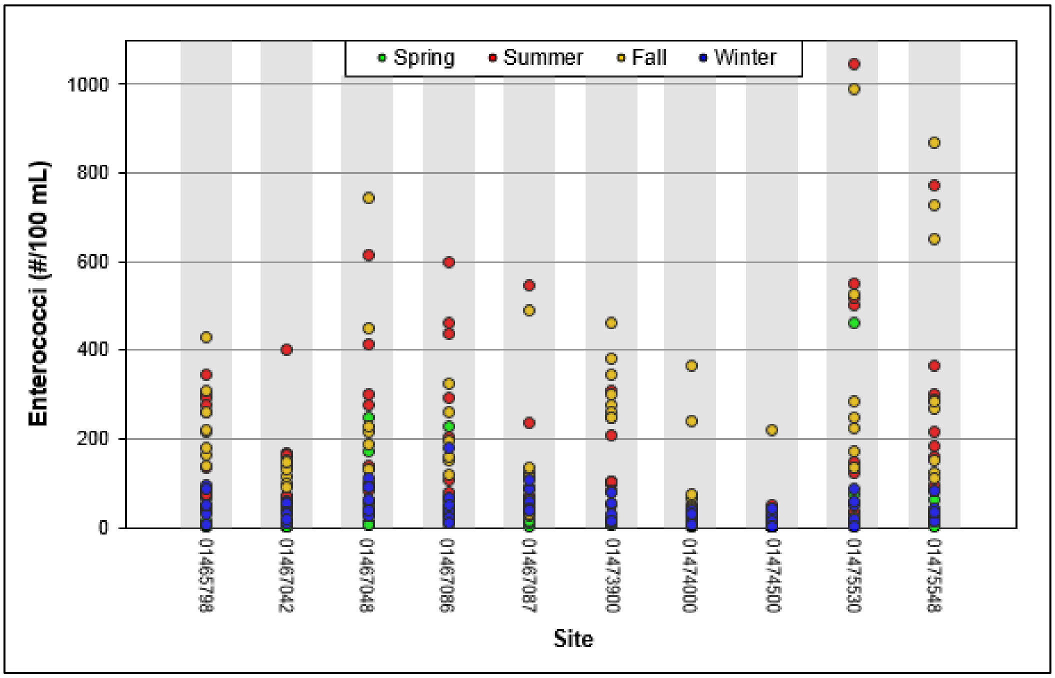


Figure 8. Enterococci results at 10 USGS gage stations, July 2009-June 2018

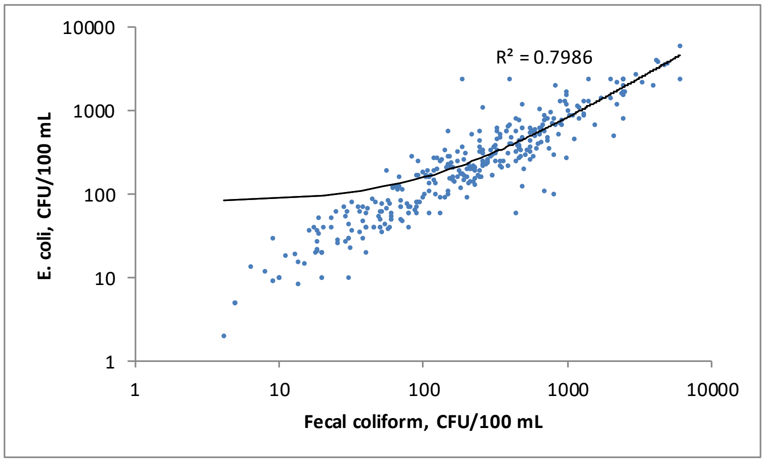


Figure 9. Scatterplot of 2009-2018 Correlating E. coli and Fecal coliform (x-y axes plotted in log10 scale)

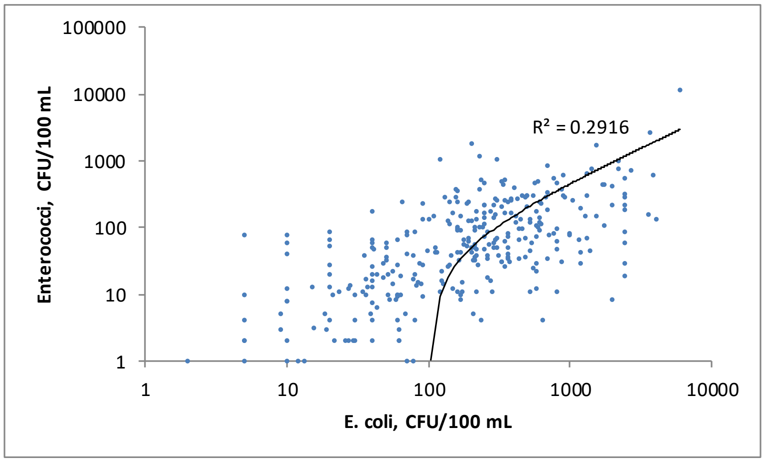


Figure 10. Scatterplot of 2009-2018 Correlating Enterococci and E. coli (x-y axes plotted in log10 scale)

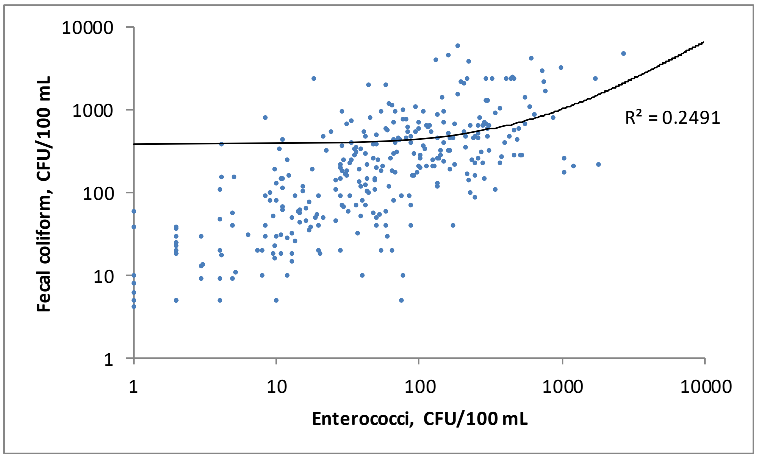


Figure 11. Scatterplot of 2009-2018 Correlating Fecal coliform and Entercocci (x-y axes plotted in log10 scale)

Physicochemical Analysis

In addition to nutrient and microbial analyses, a basic set of physicochemical parameters were also monitored as part of the discrete quarterly sampling program. These parameters (dissolved oxygen, pH, temperature, and specific conductance) were specifically chosen to coincide with those being measured by the USGS continuous water quality monitoring gages. These data can then be utilized as valuable field checks when analyzing continuous water quality data from USGS gages. The physicochemical data are summarized by parameter in Figures 12-15.

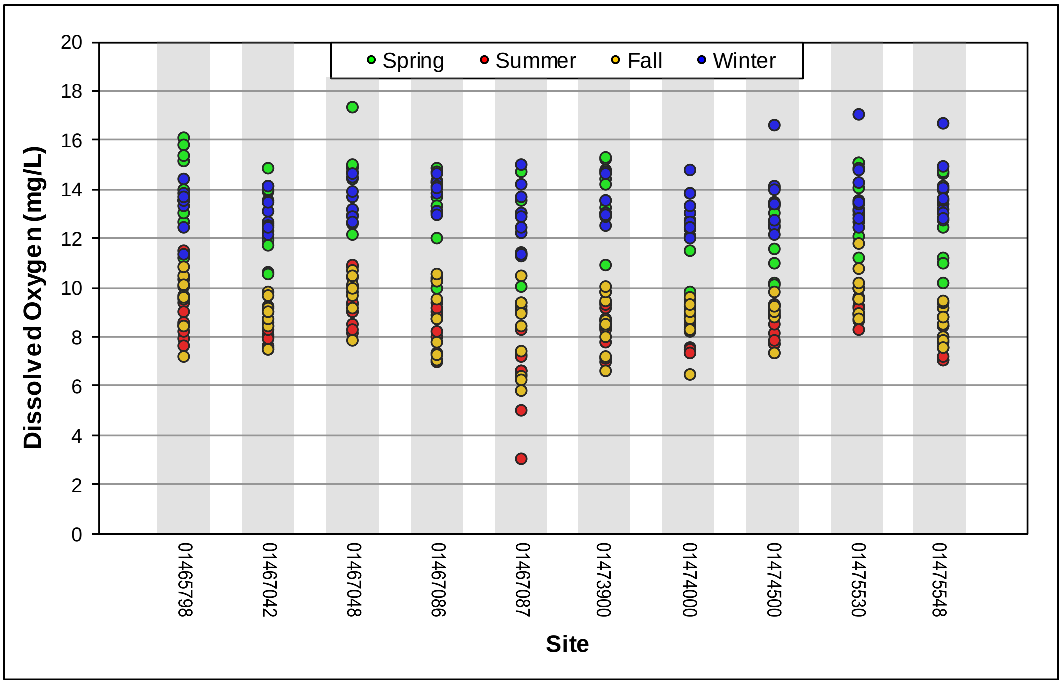


Figure 12. Dissolved oxygen results at 10 USGS gage stations, July 2009-June 2018

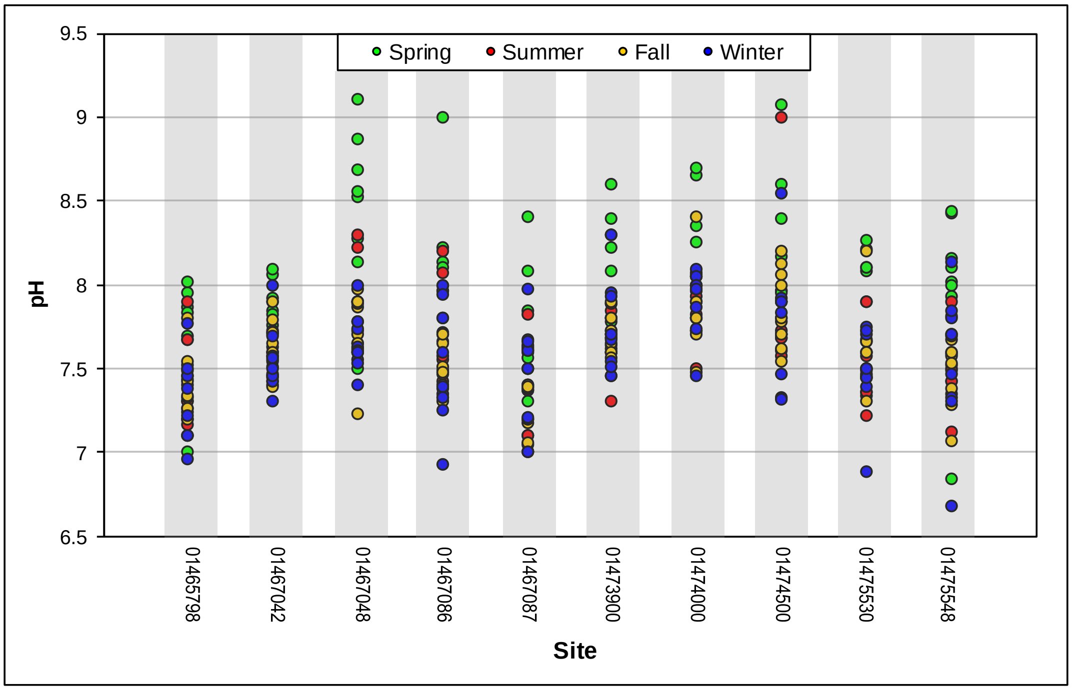


Figure 13. pH results at 10 USGS gage stations, July 2009-June 2018

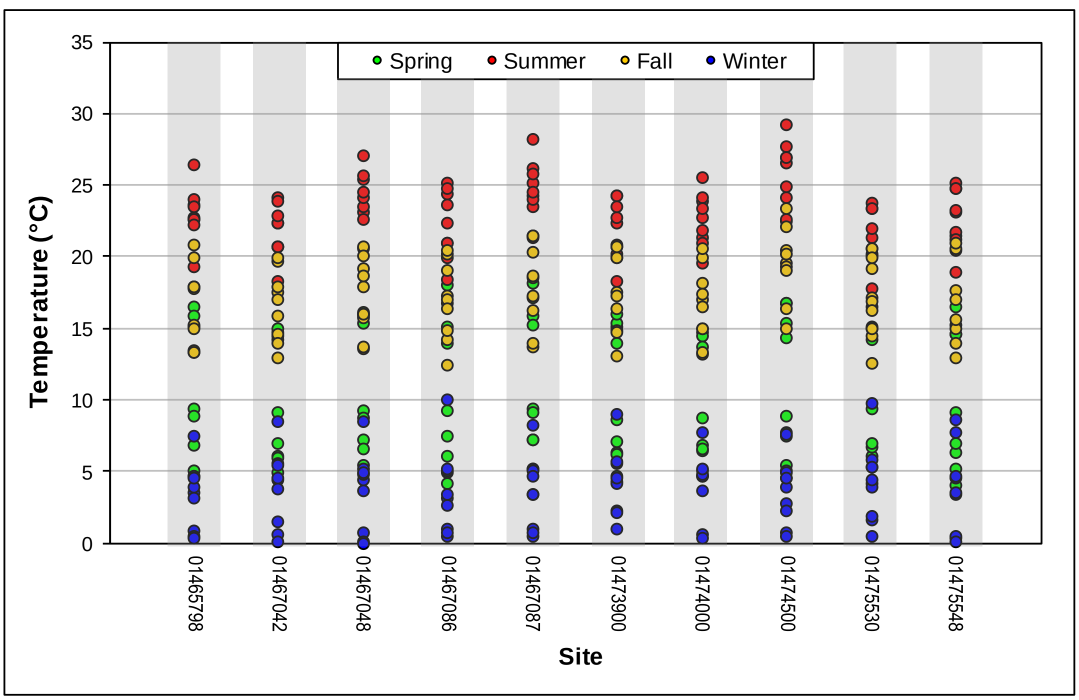


Figure 14. Temperature results at 10 USGS gage stations, July 2009-June 2018

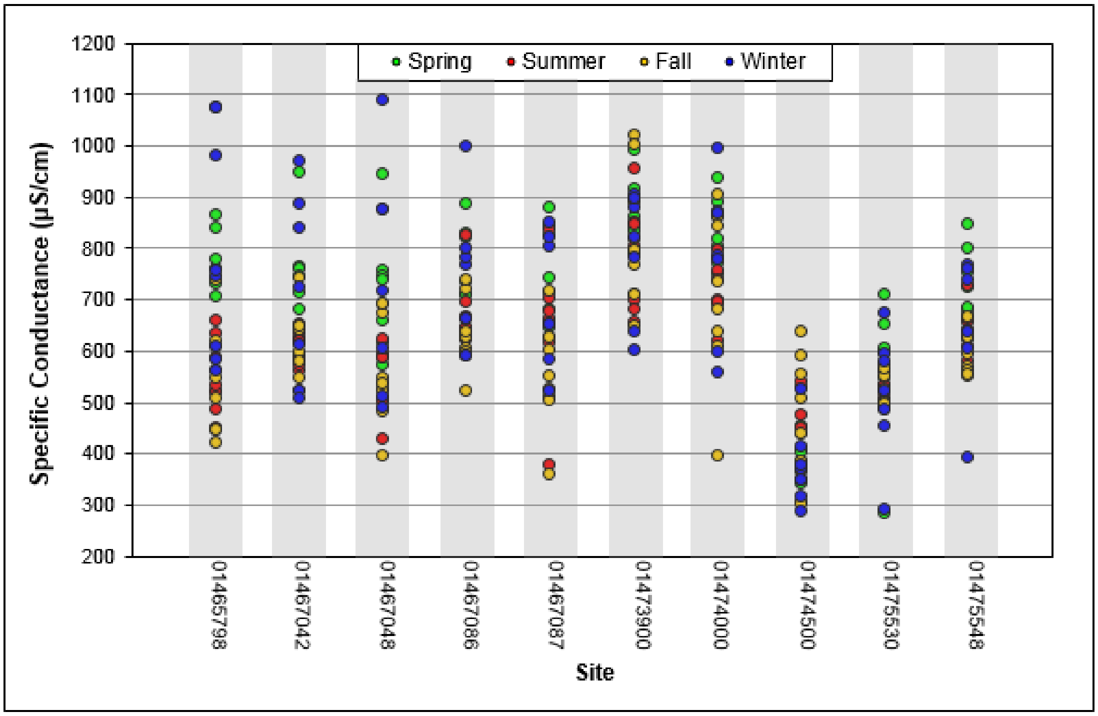


Figure 15. Specific conductance results at 10 USGS gage stations July 2009-June 2018

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United States Environmental Protection Agency (US EPA). (1986). Quality Criteria for Water. EPA 440/5/86/001. Washington, D.C. 447 p.

United States Environmental Protection Agency (US EPA). (2000). Ambient Water Quality Criteria Recommendations: Rivers and Streams in Nutrient Ecoregion IX. EPA 822/B/00/019. Office of Water, U.S. Environmental Protection Agency, Washington D.C.

Appendix H – PWD-USGS Cooperative Water Quality Monitoring Program Annual Summary

Background

PWD and the United States Geological Survey (USGS) have constructed and/or refurbished gaging stations in 10 locations throughout Philadelphia's watersheds. USGS staff is responsible for construction and maintenance of the gage structure, stream stage monitoring instruments, data communications, maintaining and verifying stage-discharge rating curves and pumping apparatus. PWD staff is responsible for installation and maintenance of continuous water quality instrumentation. Data collected through the PWD/USGS cooperative water quality monitoring program are disseminated through the USGS National Water Information System (NWIS) Web Interface (http://waterdata.usgs.gov/pa/nwis/nwis), as well as a website specifically dedicated to Philadelphia's watersheds (Figure 1).

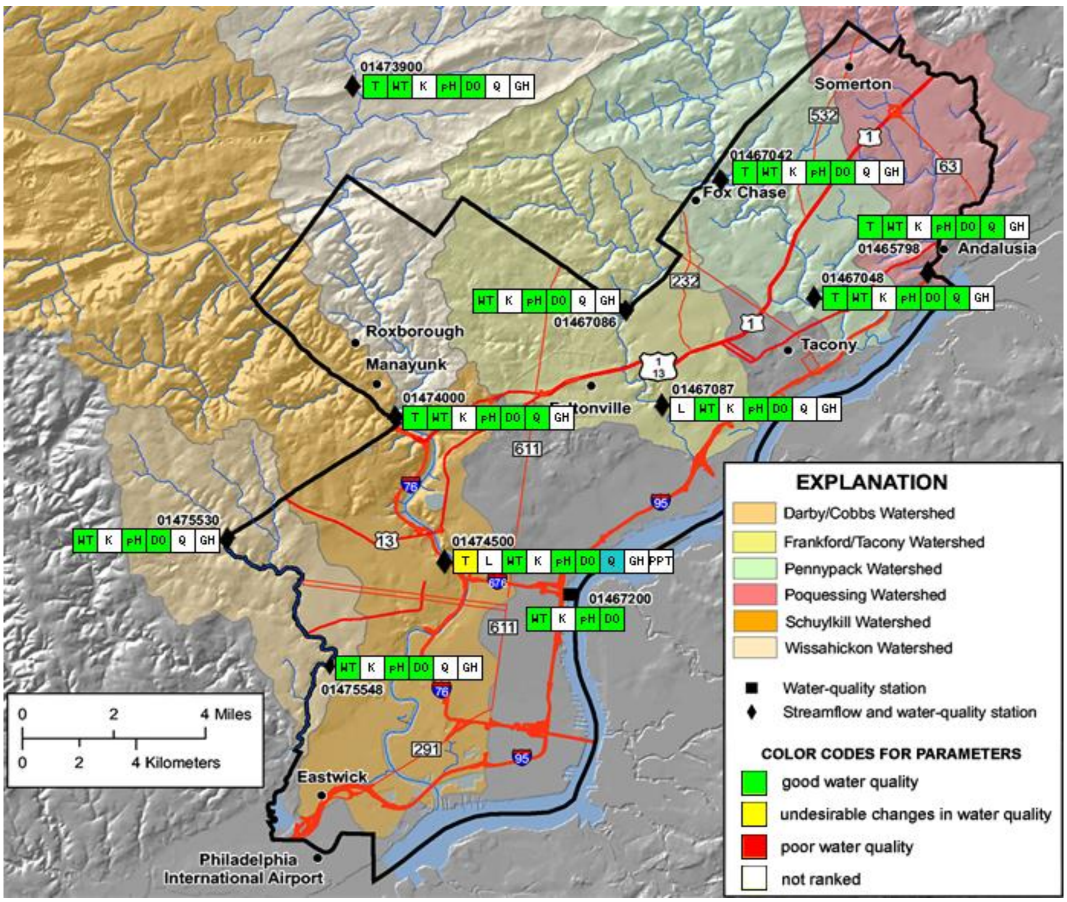


Figure 1. Philadelphia Water Quality Gauge Stations as Viewed on Cooperative USGS-PWD Website (http://pa.water.usgs.gov/pwd/).

Monitoring Locations

The PWD/USGS Cooperative Monitoring Program builds upon the widespread network of USGS gages that were formerly operated throughout Philadelphia. These gages are logically situated and/or have a continuous period of record, making them ideal for water quality monitoring purposes. Within a given watershed, downstream-most historic stations were chosen to represent water quality, as these streams flow through Philadelphia into the receiving waters (*i.e.*, the Schuylkill and Delaware rivers).

Regarding upstream stations, three gages (Pennypack Creek at Pine Rd, Tacony Creek at Adams Ave, and Cobbs Creek at US Rte. 1) are strategically located to monitor water quality of the streams as they enter Philadelphia (Figure 1). The upstream Wissahickon Creek monitoring station is located at Rte. 73 in Fort Washington, which is approximately 3.7 river miles upstream of the City. This location was chosen due to its extensive period of record (Table 1). Upstream water quality is not measured in the Poquessing-Byberry Creek Watershed. The Schuylkill River gage is in an ideal location to provide data related to the Schuylkill River Fairmount Dam Fish Ladder Renovation Project and was equipped with water quality monitoring instrumentation upon project completion in early 2009.

This annual report summarizes water quality data from July 1, 2017 – June 30, 2018, excluding the period of December 2017 through February 2018, during which time monitoring probes were not deployed in order to protect the equipment from cold temperatures. Per agreement with USGS, water quality data at the Delaware River gage 01467200 was not available for an additional month, from December 2017 through March 2018. Water quality data at the Delaware River gage 014670261 was collected year-round. Due to routine maintenance such as cleaning and calibration, gages are periodically taken offline, usually for no more than the span of two hours, and do not collect data. Significant gaps in data collection due to gage malfunction, repair, vandalism, etc. are noted in the Monthly Results section.

In order to summarize hydrologic conditions during the monitoring period, daily mean discharge was plotted along with the median of all daily flows for USGS gage 01474000 (Wissahickon Creek at Ridge Ave.). The period of record for this gage is 52 years. The influence of severe storms can be observed in Figure 2; approved daily mean discharge data was available only until May 10, 2018 at the time of this writing.

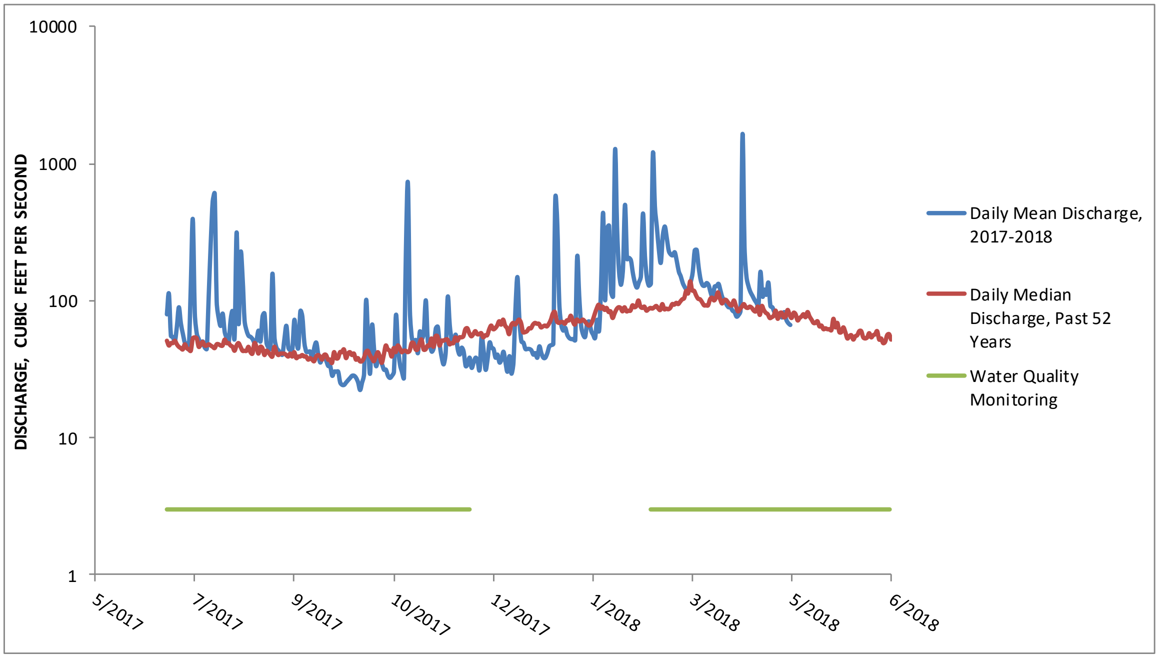


Figure 2. Daily mean flow July 1, 2017 - May 10, 2018 and daily median flow for 52 years of record at USGS gage 01474000 (Wissahickon Creek at Ridge Ave.).

Table 1. PWD/USGS Cooperative Water Quality Monitoring Program Gages

Gage Number	Gage name	Flow Data Record
01465798	Poquessing Creek at Grant Avenue, Philadelphia, PA	July 1965 to Present
01467042	Pennypack Creek at Pine Road, Philadelphia, PA	August 1964 to September 1974; September 2007 to Present
01467048	Pennypack Creek at Lower Rhawn St Br., Philadelphia, PA	June 1965 to Present
01467086	Tacony Creek at County Line, Philadelphia, PA	October 1965 to September 1986; September 2005 to Present
01467087	Frankford Creek at Castor Ave, Philadelphia, PA	July 1982 to Present
014670261	Delaware River near Pennypack Woods, PA	February 2011 to Present
01467200*	Delaware River at Ben Franklin Bridge, Philadelphia, PA	August 1949 to Present
01473900**	Wissahickon Creek at Ft. Washington, PA	September 1961 to September 1968; June 2000 to Present
01474000	Wissahickon Creek at Mouth, Philadelphia, PA	June 1897 to September 1903; January 1905 to July 1906; October 1965 to Present
01474500	Schuylkill River at Philadelphia, PA	October 1931 to Present
01475530	Cobbs Creek at U.S. Highway No. 1, Philadelphia, PA	October 1964 to September 1981; September 2004 to Present
01475548	Cobbs Creek at Mt. Moriah Cemetery, Philadelphia, PA	October 2005 to Present

*Funding for the operation of this gage is provided by USGS and the Delaware River Basin Commission (DRBC)
**Funding for the operation of this gage is provided by DRBC

USGS Gage Data Processing & Analysis Procedures

With 10 USGS gages collecting data for multiple water quality parameters at half-hour or 15-minute intervals, a large amount of data are produced. PWD Office of Watersheds (OOW) staff have developed procedures for the processing and analysis of these data using Microsoft Excel and Access software, as well as R, a free software environment for statistical computing and graphics. Most aspects of the data processing and analysis have been automated with custom Visual Basic and R code.

OOW independently maintains databases of water quality and streamflow via automated regular retrievals of these data from USGS NWIS. On a monthly basis, the databases are queried and results for each gage are imported into MS Excel workbooks. If available, any field data collected during that period (*e.g.*, hand meter readings from field maintenance checks, water quality grab samples, etc.) are also imported. Once all required data have been entered, separate plots are produced for each parameter (dissolved oxygen, turbidity, pH, specific conductance, and temperature) to enable a subjective review of data quality.

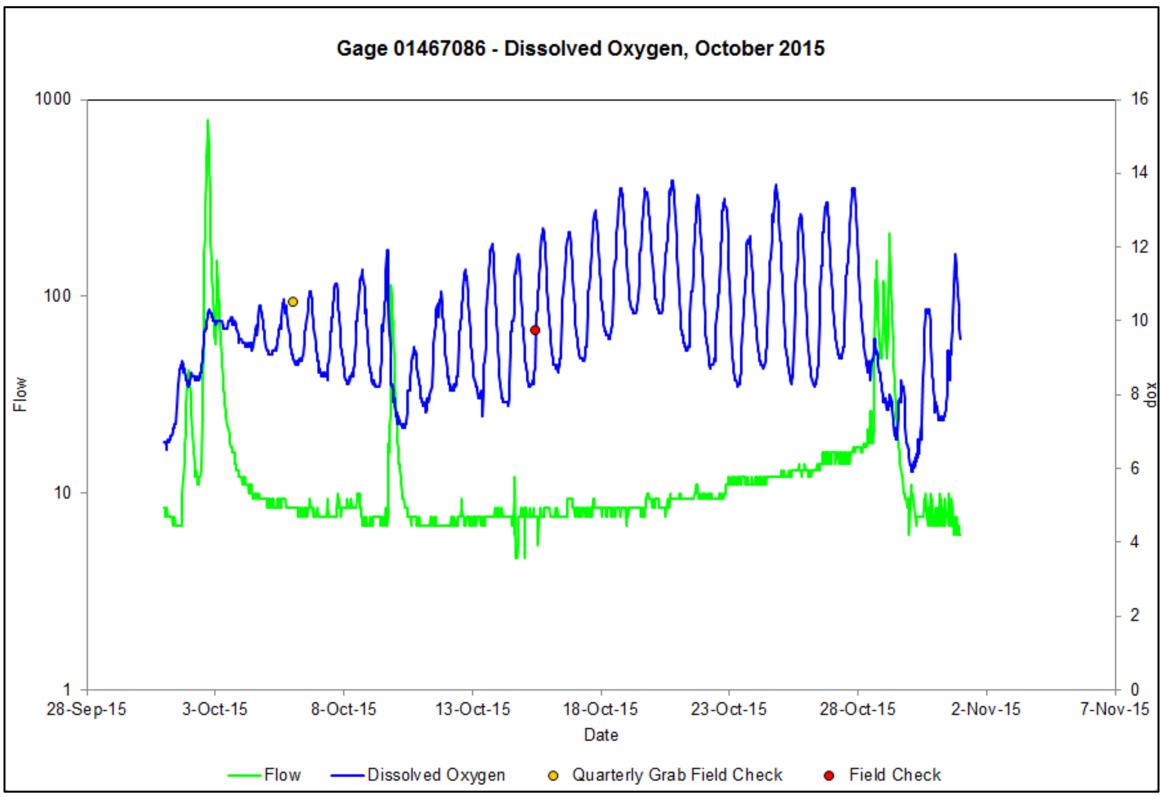


Figure 3. Example of an Excel-generated data processing/analysis plot; Gage 0146786, Dissolved Oxygen, October 2015.

These plots are examined and are the primary basis for the selection of good vs. questionable data for a given month. Intervals of questionable data are located and added to a table of "flagged" data for that particular parameter, which is then used to update the water quality database. Logs of field meter readings taken by PWD staff inform the flagging process, along with email records containing field notes and observations whenever water quality instrumentation is cleaned, calibrated, or otherwise maintained.

The final step of the procedure utilizes R, a statistical programming language and software environment. The R software code developed by OOW staff analyzes all of the water quality data in a database, as well as the good and questionable flags, and generates statistical and graphic results in a variety of forms. These include monthly plots for all data parameters for each site, showing accepted and questionable data, water quality criteria, grab sample data, and streamflow (Figure 4); assorted statistics including accepted and questionable data comparisons, monthly attainment percentages, and comparisons of wet and dry weather periods; and additional plots, including average dissolved oxygen (DO), percent DO saturation, and pH/percent DO saturation.

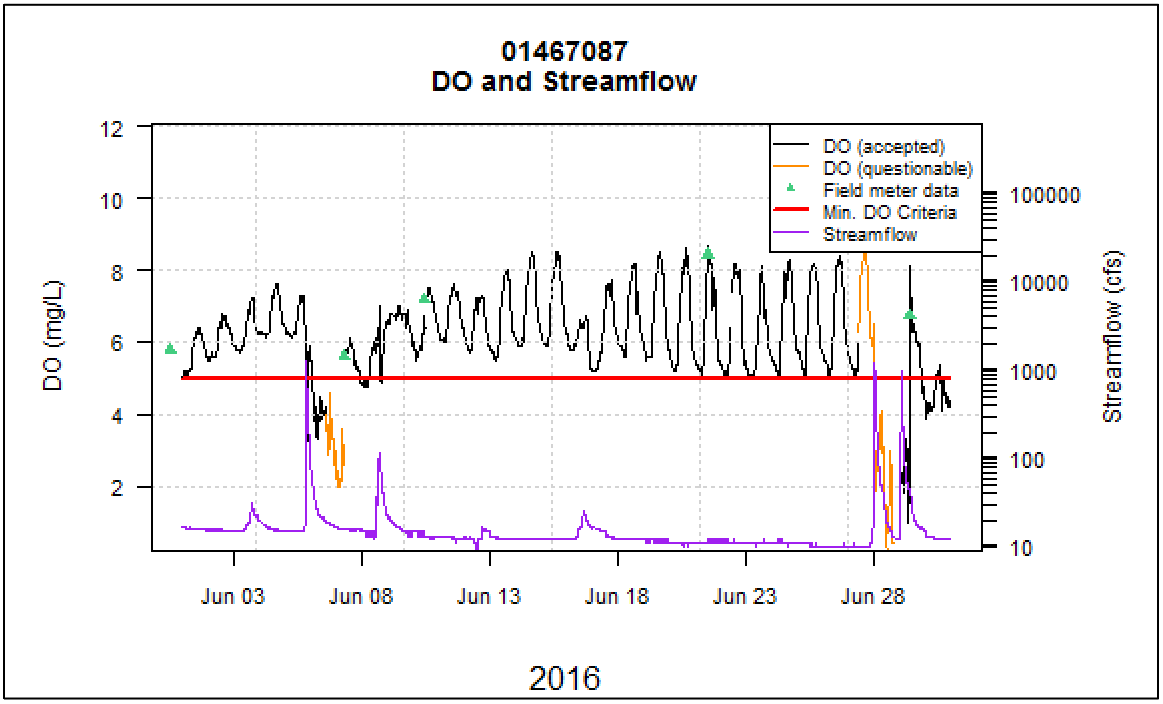


Figure 4. Example of an R-generated plot showing accepted and questionable data, and minimum water quality criteria; Gage 01467087, Dissolved Oxygen, June 2016.

Continuous Water Quality Monitoring Results Annual Summary, July 2017 - June 2018

Dissolved Oxygen

Background

Dissolved oxygen concentrations are a concern in several of Philadelphia's watersheds. Dissolved oxygen concentration is suppressed by high temperatures, respiratory activity of stream organisms, and nitrification and other oxidation reactions. Streams generally develop problems with dissolved oxygen due to water column BOD, sediment oxygen demand (SOD) and eutrophication due to increased nutrient concentration. These processes are inter-related, and physical conditions can also affect dissolved oxygen concentrations.

Designated Uses

Streams in the Philadelphia region are affected by ambient temperatures, which can be quite warm in the spring and summer months. For this reason, these streams cannot support natural self-sustaining populations of cold water fish. Different water quality criteria for dissolved oxygen and temperature are applied to different stream segments. Of the sites that were instrumented for water quality, the Wissahickon and Pennypack Creek gages (*i.e.*, 01473900, 01474000, 01467042, and 01467048) are each designated as a Trout Stocking Fishery (TSF) with conditions appropriate for maintenance of stocked trout over the period February 15 to July 31. Water quality criteria for dissolved oxygen are more stringent for these sites, with a daily instantaneous minimum criterion of 5 mg/L and a 7-day average of 6 mg/L from February 15 to July 31 and 5.5 mg/L the remainder of the year. Dissolved oxygen criteria for Warm Water Fisheries (WWF) are an instantaneous minimum of 5 mg/L and a 7-day average of 5.5 mg/L.

The 7-day average criteria was introduced in 2014 by PA DEP. Prior to 2014, DEP specified a daily average criteria for dissolved oxygen (5.0 mg/L for WWF waters; 6.0 mg/L for TSF waters from February 15 to July 31, 5.0 mg/L the remainder of the year). For informational and comparative purposes, this report continues to calculate a daily average as well as the 7-day average. It is also noted that the instantaneous minimum DO criterion for WWF waters became more stringent in 2014; it was previously 4.0 mg/L.

The Delaware River gage 01467200 dissolved oxygen criteria are defined by the Delaware River Basin Commission (DRBC) criteria for Zone 3 (DRBC, 2007) with a daily mean of 3.5 mg/L and a seasonal mean (April 1 to June 15, and September 16 to December 31) of 6.5 mg/L. The same seasonal criteria applies to Delaware River gage 014670261 (Zone 2), but there is a more stringent daily mean guideline of 5.0 mg/L (Table 2).

Table 2. PADEP Dissolved Oxygen Water Quality Criteria

Gage number	Designated Use	Minimum Criterion	7-Day Average Criterion	Daily Average Criterion
01465798	WWF	5.0 mg/L	5.5 mg/L	None
014670261	DRBC**	None	None	5.0 mg/L
01467042	TSF*	5.0 mg/L	6.0 mg/L	None
01467048	TSF*	5.0 mg/L	6.0 mg/L	None
01467086	WWF	5.0 mg/L	5.5 mg/L	None
01467087	WWF	5.0 mg/L	5.5 mg/L	None
01467200	DRBC**	None	None	3.5 mg/L
01473900	TSF*	5.0 mg/L	6.0 mg/L	None
01474000	TSF*	5.0 mg/L	6.0 mg/L	None
01474500	WWF	5.0 mg/L	5.5 mg/L	None
01475530	WWF	5.0 mg/L	5.5 mg/L	None
01475548	WWF	5.0 mg/L	5.5 mg/L	None

*TSF criteria for DO only apply from February 15 - July 31. WWF criteria are applicable from August 1 – January 31.
**A seasonal mean criterion of 6.5 mg/L also applies from April 1 - June 15 and September 16 - December 31.

Results

Results were processed as follows for Table 3. The "total hours accepted data" are the total hours of data that were not flagged; that quantity divided by 24 yields the "total days accepted data." The remainder of the table lists the percent of total hours of data that was flagged, and the percentages of accepted data that attained or failed to attain water quality standards were calculated.

Results were processed as follows for Table 4. If a single day contained at least one flagged measurement, the entire day was considered flagged for calculating the daily mean. Thus the "percent days flagged data" corresponds to the percentage of total days of data that contained at least one flag in a single day. Conversely, if none of the measurements in a single day were flagged, that day was considered one day of accepted data, and the total amount of accepted days was calculated. Finally, the percentages of accepted data that attained or failed to attain water quality standards were calculated.

Results were processed as follows for Tables 5 and 6. If more than 25% of the data in the 7-day window was flagged as questionable, the data point was considered questionable. The 7-day average was calculated as a two-sided moving average. During data processing and analysis, output files are split by calendar year; thus, statistics for 2016 and 2017 appear in separate tables.

Water quality at the downstream Tacony Creek site (gage 01467087) was most likely to exceed DO minimum and 7-day average criteria. A more in-depth discussion of potential causes of DO problems at gage 01467087 is presented in the Monthly Results section. A notable portion of flagged data at 01467087 and other sites is related to the fouling of sonde pipes due to sediment and debris that inhibit data collection. The DO probes are particularly susceptible to the effects of trapped sediment; when routine cleaning of the sonde pipes show that low DO readings were affected by fouling, the questionable data prior to cleaning is flagged.

Table 3. USGS Gage July 2017 - June 2018 Dissolved Oxygen Minimum Criterion Summary Results

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining
01465798	WWF	6332.3	263.8	2.1	0.4	99.6
014670261*	DRBC	NA	NA	NA	NA	NA
01467042	TSF	6315.5	263.1	0.1	0.0	100.0
01467048	TSF	6271.5	261.3	6.4	0.2	99.8
01467086	WWF	6317.0	263.2	1.2	0.5	99.5
01467087	WWF	5357.5	223.2	15.3	12.7	87.3
01467200*	DRBC	NA	NA	NA	NA	NA
01473900	TSF	6274.5	261.4	0.8	0.4	99.6
01474000	TSF	6243.5	260.1	0.1	0.0	100.0
01474500	WWF	6445.0	268.5	0.3	0.0	100.0
01475530	WWF	6405.5	266.9	1.3	0.0	100.0
01475548	WWF	6120.8	255.0	5.7	4.3	95.7

*No minimum DO criterion applies at gages 01467200 and 014670261

Table 4. USGS Gage July 2017 - June 2018 Dissolved Oxygen Daily Mean Summary Results

Gage number	Designated Use	Total days accepted data	% days flagged data*
01465798	WWF	246.0	8.7
014670261	DRBC	319.0	12.6
01467042	TSF	249.0	5.5
01467048	TSF	217.0	18.5
01467086	WWF	247.0	7.3
01467087	WWF	199.0	24.5
01467200	DRBC	236.0	3.9
01473900	TSF	249.0	5.5
01474000	TSF	254.0	2.5
01474500	WWF	259.0	3.9
01475530	WWF	253.0	6.4

01475548	WWF	241.0	10.9

*Small data gaps prevent the calculation of a daily mean and are classified as flagged.

Table 5. USGS Gage July 2017 - December 2017 Dissolved Oxygen 7-Day Average Criterion Summary Results

Gage number	Designated Use	Total hours accepted data	% hours flagged data	% hours non-attaining	% hours attaining
01465798	WWF	3253.5	0	0	100
014670261	DRBC	NA	NA	NA	NA
01467042	TSF	3253.5	0	0	100
01467048	TSF	3004	7.7	0	100
01467086	WWF	3253.5	0	0	100
01467087	WWF	2919.5	10.3	15.8	84.2
01467200	DRBC	NA	NA	NA	NA
01473900	TSF	3253.5	0	0	100
01474000	TSF	3253.5	0	0	100
01474500	WWF	3253.5	0	0	100
01475530	WWF	3253.5	0	0	100
01475548	WWF	2640.5	18.8	0	100

Table 6. USGS Gage March 2018 - June 2018 Dissolved Oxygen 7-Day Average Criterion Summary Results

Gage number	Designated Use	Total hours accepted data	% hours flagged data	% hours non-attaining	% hours attaining
01465798	WWF	2509.5	0	0	100
014670261	DRBC	NA	NA	NA	NA
01467042	TSF	2509.5	0	0	100
01467048	TSF	2111	15.9	0	100
01467086	WWF	2509.5	0	0	100
01467087	WWF	2065.5	17.7	2.9	97.1
01467200	DRBC	NA	NA	NA	NA
01473900	TSF	2509.5	0	0	100
01474000	TSF	2453	2.3	0	100
01474500	WWF	2509.5	0	0	100
01475530	WWF	2509.5	0	0	100
01475548	WWF	2375.5	5.3	0	100

Table 7. USGS Gage 01467200 and 014670261 Dissolved Oxygen Seasonal Mean Criterion Summary Result

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Seasonal mean	Attained Standard?
01467200	DRBC	1819.0	75.8	0.3	9.1	Yes

014670261	DRBC	1822.5	75.9	0.1	9.3	Yes

pH

Background

pH has been identified as a parameter of potential concern for some of Philadelphia's watersheds, primarily because of algal effects on the dissolved inorganic carbon (DIC) composition of stream water. Algae take up CO_2 during photosynthesis and shift the composition of DIC toward the alkaline carbonates, resulting in occasional failure to attain maximum pH criteria at some sites (Table 8). pH fluctuations are typically observed concomitant with pronounced dissolved oxygen fluctuations, as detailed in the Monthly Results section.

At gages 01467200 and 014670261, pH criteria (regulated by DRBC) are bounded by 6.5 and 8.5. At all other gages, pH criteria are bounded by daily minima and maxima of 6.0 and 9.0, respectively, as defined by PA DEP water quality standards.

Results

Results were processed as follows for Table 8. The "total hours accepted data" are the total hours of data that were not flagged; that quantity divided by 24 yields the "total days accepted data." The remainder of the table lists the percentage of total hours of data that was flagged, the percentages of accepted hours that attained or failed to attain criteria, and the percentages of daily minima and maxima that attained or failed to attain criteria.

Minimum pH criteria were attained at all gages for the reporting time frame. Algal blooms may be responsible for daily maximum pH criterion exceedance at several sites during March and April. Significant (greater than 10%) daily exceedances occurred at the Schuylkill site and upstream Tacony site.

Table 8. USGS Gage July 2017 - June 2018 pH Criteria Summary Results

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining
01465798	6363.3	265.1	1.6	0.0	0.0	0.0	0.0	100.0	100.0
014670261	8017.5	334.1	8.5	0.0	0.0	0.0	0.0	100.0	100.0
01467042	6313.0	263.0	0.2	0.9	4.9	0.0	0.0	99.1	95.1
01467048	5857.0	244.0	12.9	2.3	5.9	0.0	0.0	97.7	94.1
01467086	6332.0	263.8	1.0	3.0	13.9	0.0	0.0	97.0	86.1
01467087	5845.0	243.5	7.6	0.0	0.0	0.0	0.0	100.0	100.0
01467200	5881.0	245.0	0.2	0.0	0.0	0.0	0.0	100.0	100.0
01473900	6209.0	258.7	1.8	3.4	13.4	0.0	0.0	96.6	86.6
01474000	6243.5	260.1	0.1	4.5	15.7	0.0	0.0	95.5	84.3
01474500	6457.5	269.1	0.1	0.1	0.4	0.0	0.0	99.9	99.6
01475530	6224.8	259.4	4.1	0.3	2.6	0.0	0.0	99.7	97.4
01475548	6128.0	255.3	5.6	2.0	10.3	0.0	0.0	98.0	89.7

Turbidity

Background

Turbidity in Philadelphia's streams increases with increased flow as inorganic sediment and additional constituents of stormwater runoff are introduced to the stream or scoured/eroded from the stream channel. There are no numeric PA DEP water quality criteria for turbidity, so PWD watershed management plans used a reference value for turbidity that was derived from EPA Guidance document EPA 822-B-00-023 (*i.e.*, 2.825 NTU). This value is surpassed more often in wet weather than in dry weather (Tables 84-85). Turbidity data has also been used to help investigate sediment loading and transport in the Wissahickon Creek Watershed for the Wissahickon Creek Sediment TMDL.

Results

Results were processed as follows for Table 9. The "total hours accepted data" are the total hours of data that were not flagged; that quantity divided by 24 yields the "total days accepted data." The remainder of the table lists the percentage of total hours of data that was flagged, and the percentages of accepted hours that either surpassed or fell below the maximum guideline.

Among the tributary sites, the maximum guideline was most frequently surpassed at the Schuylkill gage, and least frequently surpassed at the downstream Wissahickon gage.

Table 9. USGS Gage July 2017 - June 2018 Turbidity Summary Results

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline
01465798	6449.0	268.7	0.3	29.2	70.8
014670261	8055.5	335.6	8.0	95.5	4.5
01467042	6235.5	259.8	1.4	21.6	78.4
01467048	5879.0	245.0	12.5	37.6	62.4
01467086*	NA	NA	NA	NA	NA
01467087*	NA	NA	NA	NA	NA
01467200*	NA	NA	NA	NA	NA
01473900	5973.0	248.9	5.5	39.5	60.5
01474000	6241.5	260.1	0.1	15.8	84.2
01474500	6457.5	269.1	0.1	61.9	38.1
01475530*	NA	NA	NA	NA	NA
01475548*	NA	NA	NA	NA	NA

*Turbidity is not continuously monitored at these locations

Specific Conductance

Background

Specific conductance is a measure of the ability of water to conduct electricity over a given distance, expressed as microsiemens/cm (corrected to 25ºC). Conductivity in Philadelphia streams is extremely sensitive to changes in flow, as stormwater (diluent) usually contains smaller concentrations of dissolved ions than stream baseflow. Stormwater runoff typically lowers conductivity in streams; an exception sometimes occurs in winter and early spring, when road salt applied prior to snowstorms enters the stream in runoff or during snowmelt. Data collected in the report timeframe were generally consistent with earlier observations. When significant changes in conductivity are observed during dry weather, it can be an indicator of anthropogenic influence or pollution in the stream; stations receiving inputs of treated wastewater generally had greater conductivity.

Results

There is no water quality standard for specific conductance. Table 10 merely illustrates the total hours of data that was not flagged and considered "accepted," the equivalent quantity in day-units, and the percentage of total hours of data that was flagged. More detailed results at each site are described in the Monthly Results section.

Table 10. USGS Gage July 2017 - June 2018 Specific Conductance Summary Results

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data
01465798	6454.5	268.9	0.2
014670261	8051.5	335.5	8.1
01467042	6314.0	263.1	0.2
01467048	6450.0	268.8	3.6
01467086	6337.0	264.0	0.9
01467087	5836.8	243.2	7.7
01467200	5877.5	244.9	0.3
01473900	6271.5	261.3	0.8
01474000	6242.5	260.1	0.1
01474500	6456.0	269.0	0.2
01475530	6100.8	254.2	6.0
01475548	6267.5	261.1	3.4

Temperature

Background

Streams in the Philadelphia region are designated Warm Water Fisheries (WWF) or Trout Stocking Fisheries (TSF), with separate corresponding temperature criteria (Table 11). These criteria are "stepped" (remaining constant for 15- or 30-day intervals), while streams tend to warm up and cool down more gradually due primarily to changes in ambient temperature. (Gages 01467200 and 014670261 are the exceptions and are subject to a DRBC criterion of 30°C maximum). Stream temperatures were observed to exceed these criteria, somewhat frequently in springtime. These exceedances are generally natural, as there are no major sources of heated wastes. It is possible that baseflow diminution is partially responsible for a lack of buffering against temperature increases.

Table 11. PA DEP Temperature Water Quality Criteria

Date range start	Date range end	WWF maximum (°C)	WWF maximum (°F)	TSF maximum (°C)	TSF maximum (°F)
1/1	1/31	4	40	4	40
2/1	2/29	4	40	4	40
3/1	3/31	8	46	8	46
4/1	4/15	11	52	11	52
4/16	4/30	14	58	14	58
5/1	5/15	18	64	18	64
5/16	5/31	22	72	20	68
6/1	6/15	27	80	21	70
6/16	6/30	29	84	22	72
7/1	7/31	31	87	23	74
8/1	8/15	31	87	27	80
8/16	8/30	31	87	31	87
9/1	9/15	29	84	29	84
9/16	9/30	26	78	26	78
10/1	10/15	22	72	22	72
10/16	10/31	19	66	19	66
11/1	11/15	14	58	14	58
11/16	11/30	10	50	10	50
12/1	12/31	6	42	6	42

Results

Results were processed in the same manner as the parameters described above. The highest exceedance rate occurred at the downstream Pennypack Creek gage. Aside from the Delaware River gages, the lowest exceedance rates were observed at the Poquessing, both Cobbs, both Tacony Creek, and the Schuylkill River gages (Table 12). Those six gages are all designated as WWF and have less stringent criteria.

Table 12. USGS Gage July 2017 - June 2018 Temperature Maximum Criteria Summary Results

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. exceedance	% hrs. attaining
01465798	WWF	6455.0	269.0	0.2	10.2	89.8
014670261	DRBC	8055.5	335.6	8.0	0.0	100.0
01467042	TSF	6315.0	263.1	0.1	18.3	81.7
01467048	TSF	6450.0	268.8	3.6	23.0	77.0
01467086	WWF	6337.0	264.0	0.9	10.5	89.5
01467087	WWF	5847.3	243.6	7.5	12.7	87.3
01467200	DRBC	5883.0	245.1	0.2	0.0	100.0
01473900	TSF	6215.0	259.0	1.7	18.0	82.0
01474000	TSF	6176.0	257.3	1.2	18.4	81.6
01474500	WWF	6458.0	269.1	0.1	8.2	91.8
01475530	WWF	6405.8	266.9	1.3	8.7	91.3
01475548	WWF	6317.8	263.2	2.7	10.7	89.3

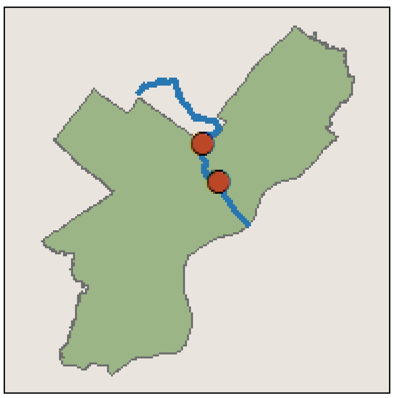
Monthly Results, July 2017 - June 2018

This section summarizes results at the monthly time scale. Results were processed in the same manner as in the previous section. Gages are grouped according to the type of sewer system that impacts water quality at the site.

Gages in Combined Sewer System Watersheds

The combined sewer system serves more than three-quarters of Philadelphia's residents and covers the oldest and densest parts of the city. Combined sewer outfalls affect the Tookany/Tacony-Frankford and Darby-Cobbs watersheds. (The Delaware and Schuylkill rivers also contain combined sewer outfalls but are detailed in a later section focused on large watersheds.) The gages in this section are subject to the deleterious effects of periodic combined sewer overflows during wet weather and snowmelt.

Tookany/Tacony-Frankford Creek (Gages 01467086 and 01467087)



Dissolved oxygen and pH

Dissolved oxygen concentrations were markedly worse between the upstream and downstream Tacony Creek gages. The monthly minima, percentage of hours the minimum criterion was not attained, exceedance of the 7-day average guideline, and percentage of days the daily mean criteria was not attained were typically much worse at the downstream gage (Tables 13-16, Figures 5-8). For example, DO was particularly poor at the downstream Tacony Creek gage during July 2017 (Figure 9). Minimum DO exceedances were also observed in the same month at the upstream gage. However, the minimum criterion was usually attained at gage 01467086 (Figure 10). This difference likely reflects the additional stormwater runoff and sewage overflows that entered the creek between the two gages.

The lowest DO concentrations are typically seen in the period after storm events, reflecting both the immediate and lingering, oxygen-depleting effects of stormwater runoff and biochemical oxygen demand (BOD) entering the stream. Diel DO fluctuations are suppressed for a few days following a storm event because the event either scours away algae or temporarily inhibits their growth. As dry weather continues, the algae recover and diel DO and pH fluctuations typically increase, sometimes resulting in non-attainment of pH maximum criteria, as observed at the upstream gage in April 2018 (Figure 11). Percent DO saturation of more than 150% in daylight were also observed at gage 01467086 in April 2018, indicating high levels of algal activity (Figure 12; PAR is defined as photosynthetically active radiation). Diel DO fluctuations tended to increase with prolonged periods of sunlight, further indicating high levels of algal activity.

A lower monthly mean pH was usually observed at gage 01467087, along with generally less pronounced diel pH fluctuations, probably due to an increased buffering capacity at the downstream gage and a lesser degree of algal growth (Tables 17-18).

Table 13. Gage 01467086 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	WWF	695.5	29.0	6.5	1.7	98.3	3.0	12.8	7.2
Aug-17	WWF	741.5	30.9	0.3	0.3	99.7	4.1	12.8	7.8
Sep-17	WWF	719.0	30.0	0.1	0.1	99.9	4.8	12.2	7.9
Oct-17	WWF	731.0	30.5	1.7	1.1	98.9	3.9	12.1	8.3
Nov-17	WWF	713.5	29.7	0.9	0.0	100.0	7.8	13.9	10.4
Mar-18	WWF	538.0	22.4	0.0	0.0	100.0	7.6	17.9	12.8
Apr-18	WWF	717.0	29.9	0.4	0.0	100.0	6.8	17.1	11.5
May-18	WWF	743.0	31.0	0.1	1.3	98.7	4.2	14.8	8.3
Jun-18	WWF	718.5	29.9	0.2	0.0	100.0	5.9	12.6	8.2

Table 14. Gage 01467087 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	WWF	643.5	26.8	0.0	40.3	59.7	0.3	9.0	5.3
Aug-17	WWF	725.0	30.2	0.0	13.4	86.6	1.3	10.2	6.4
Sep-17	WWF	449.0	18.7	0.0	30.6	69.4	2.3	8.4	5.5
Oct-17	WWF	728.0	30.3	0.0	4.9	95.1	2.8	10.0	7.2
Nov-17	WWF	718.5	29.9	0.0	0.0	100.0	7.0	12.2	9.8
Mar-18	WWF	608.3	25.3	0.0	0.0	100.0	6.7	16.7	12.4
Apr-18	WWF	705.0	29.4	0.0	0.0	100.0	6.4	13.9	10.7
May-18	WWF	676.8	28.2	0.0	15.8	84.2	1.2	11.6	7.0
Jun-18	WWF	244.3	10.2	0.0	17.1	82.9	1.4	10.3	6.9

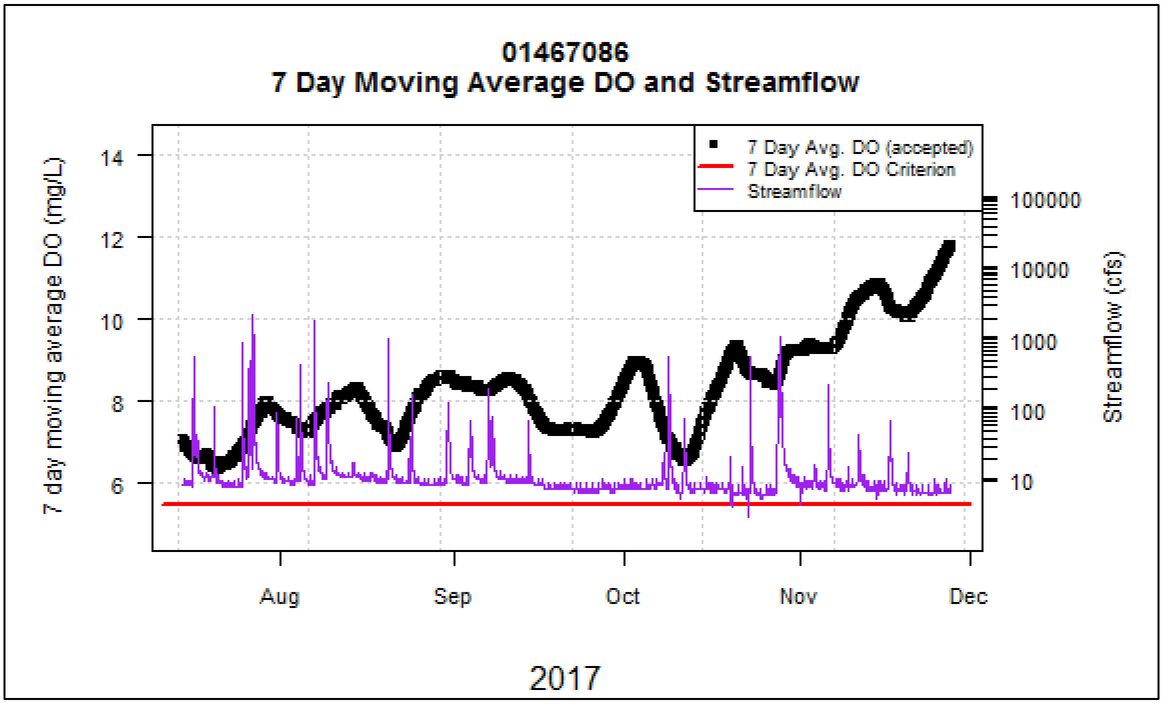


Figure 5. Gage 01467086, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

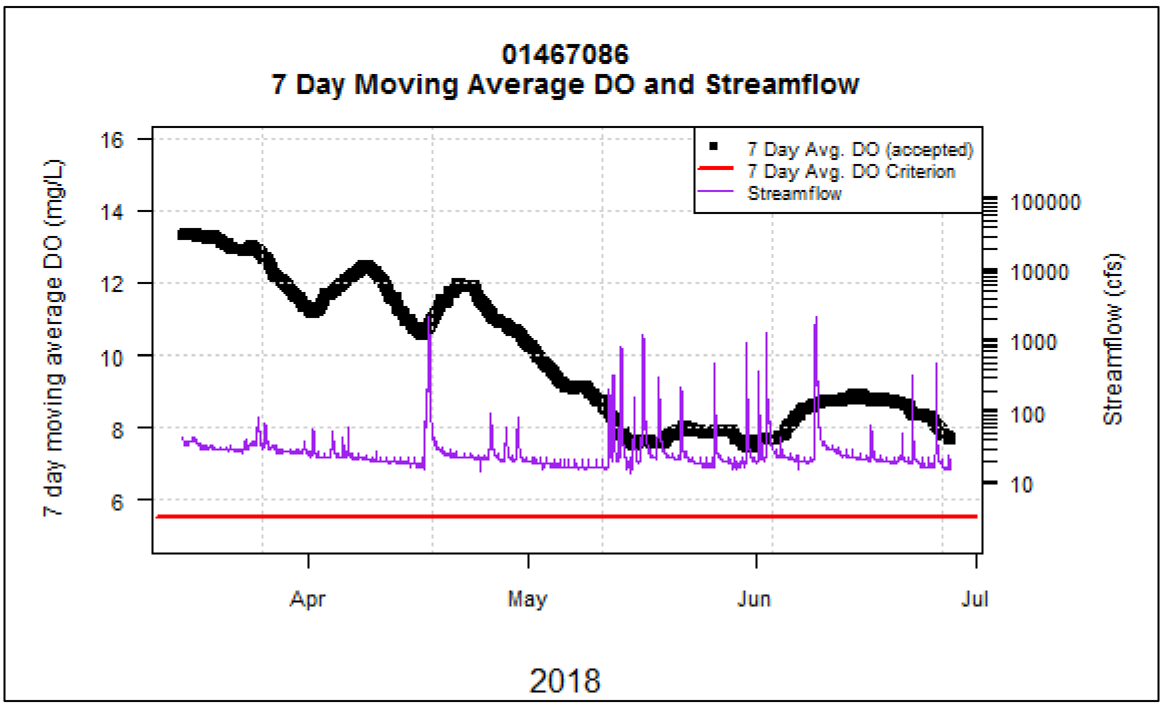


Figure 6. Gage 01467086, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

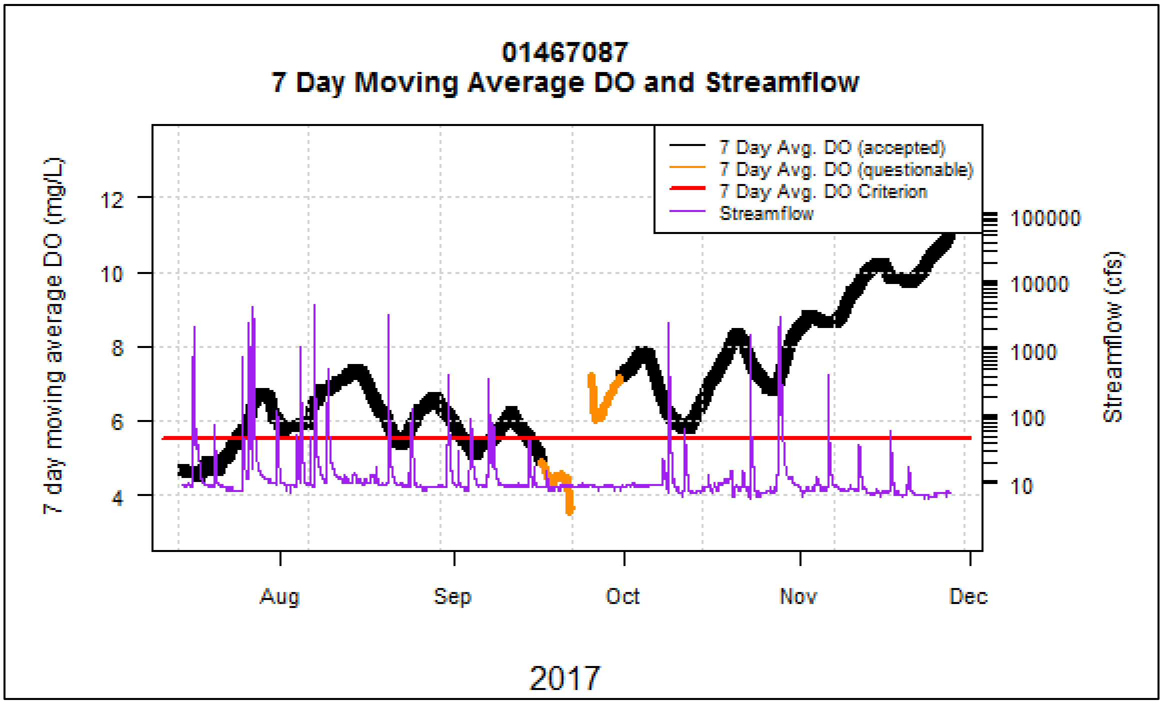


Figure 7. Gage 01467087, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

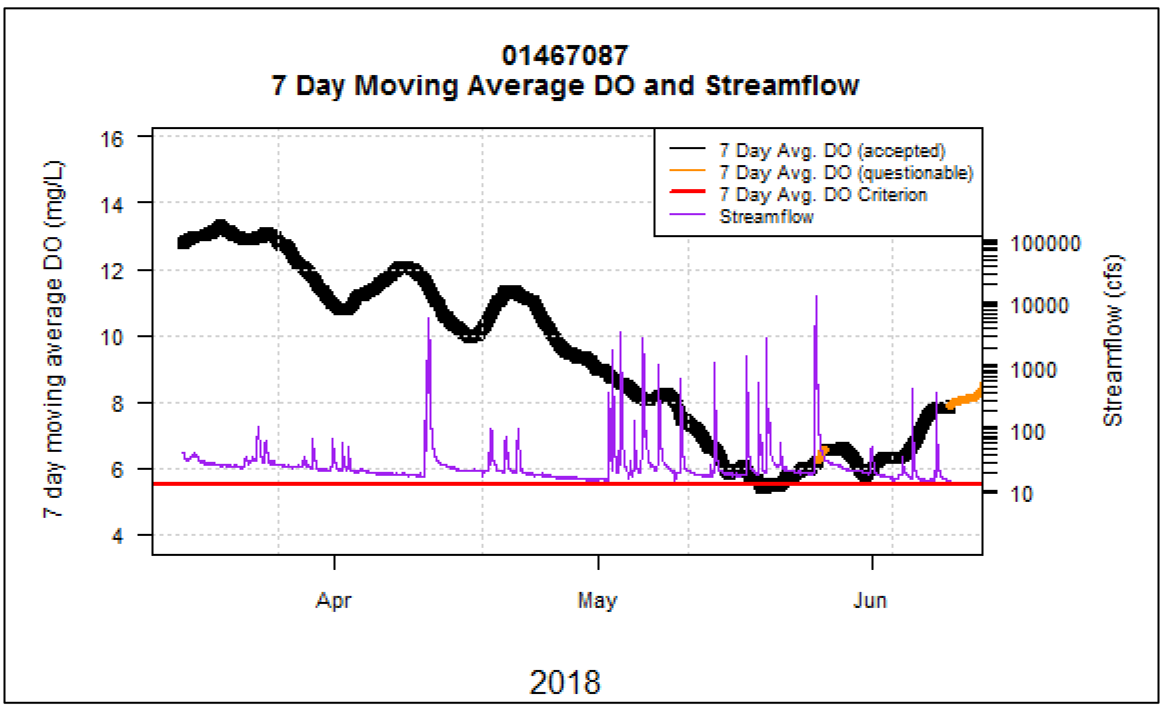


Figure 8. Gage 01467087, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

Table 15. Gage 01467086 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	WWF	26.0	16.1	5.2	8.4	7.2
Aug-17	WWF	29.0	6.5	6.2	9.3	7.8
Sep-17	WWF	29.0	3.3	6.8	9.1	7.9
Oct-17	WWF	28.0	9.7	5.7	9.6	8.3
Nov-17	WWF	28.0	6.7	8.8	12.0	10.4
Mar-18	WWF	21.0	6.3	9.7	13.6	12.8
Apr-18	WWF	27.0	10.0	9.5	12.8	11.4
May-18	WWF	30.0	3.2	5.8	11.1	8.3
Jun-18	WWF	29.0	3.3	6.9	9.2	8.2

Table 16. Gage 01467087 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	WWF	23.0	25.8	2.3	7.0	5.3
Aug-17	WWF	27.0	12.9	4.9	7.6	6.5
Sep-17	WWF	16.0	46.7	4.1	6.9	5.6
Oct-17	WWF	27.0	12.9	4.5	9.0	7.3
Nov-17	WWF	28.0	6.7	8.4	11.1	9.7
Mar-18	WWF	23.0	9.4	9.9	13.8	12.4
Apr-18	WWF	27.0	10.0	8.2	12.3	10.6
May-18	WWF	24.0	22.6	3.4	10.4	7.0
Jun-18	WWF	9.0	70.0	4.2	7.9	6.7

Table 17. Gage 01467086 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	701.0	29.2	5.8	0.0	0.0	0.0	0.0	100.0	100.0	6.3	8.8	7.6
Aug-17	741.5	30.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.8	7.7
Sep-17	719.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.6	7.7
Oct-17	740.5	30.9	0.5	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.1	7.5
Nov-17	713.5	29.7	0.9	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.1	7.4
Mar-18	538.0	22.4	0.0	16.9	82.6	0.0	0.0	83.1	17.4	7.4	9.5	8.2
Apr-18	717.0	29.9	0.4	14.0	60.0	0.0	0.0	86.0	40.0	7.2	9.5	8.1
May-18	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.1	9.0	7.6
Jun-18	718.5	29.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.4	7.6

Table 18. Gage 01467087 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	743.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.7	7.2
Aug-17	742.3	30.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.0	7.3
Sep-17	718.8	29.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	7.5	7.2
Oct-17	742.3	30.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.5	7.7	7.2
Nov-17	717.5	29.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.4	7.6	7.2
Mar-18	607.8	25.3	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.9	8.0
Apr-18	719.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.4	7.7
May-18	742.8	30.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.7	7.1
Jun-18	252.5	10.5	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.3	7.4	7.1

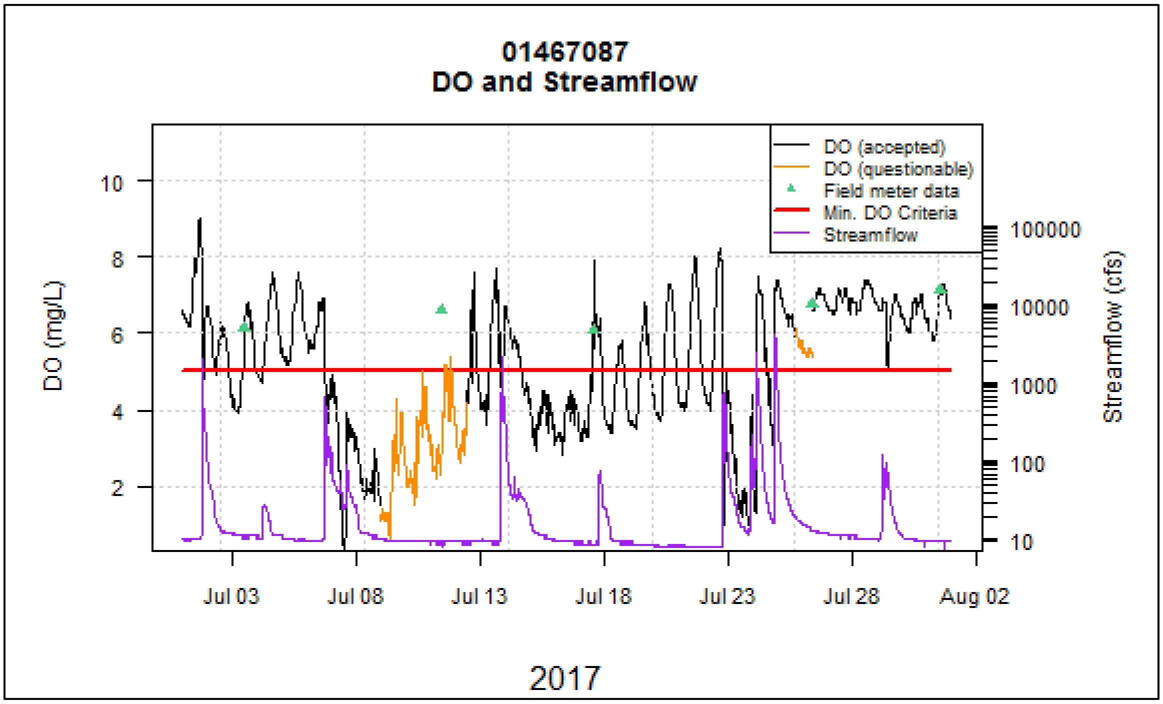


Figure 9. Gage 01467087, Dissolved Oxygen and Streamflow, July 2017.

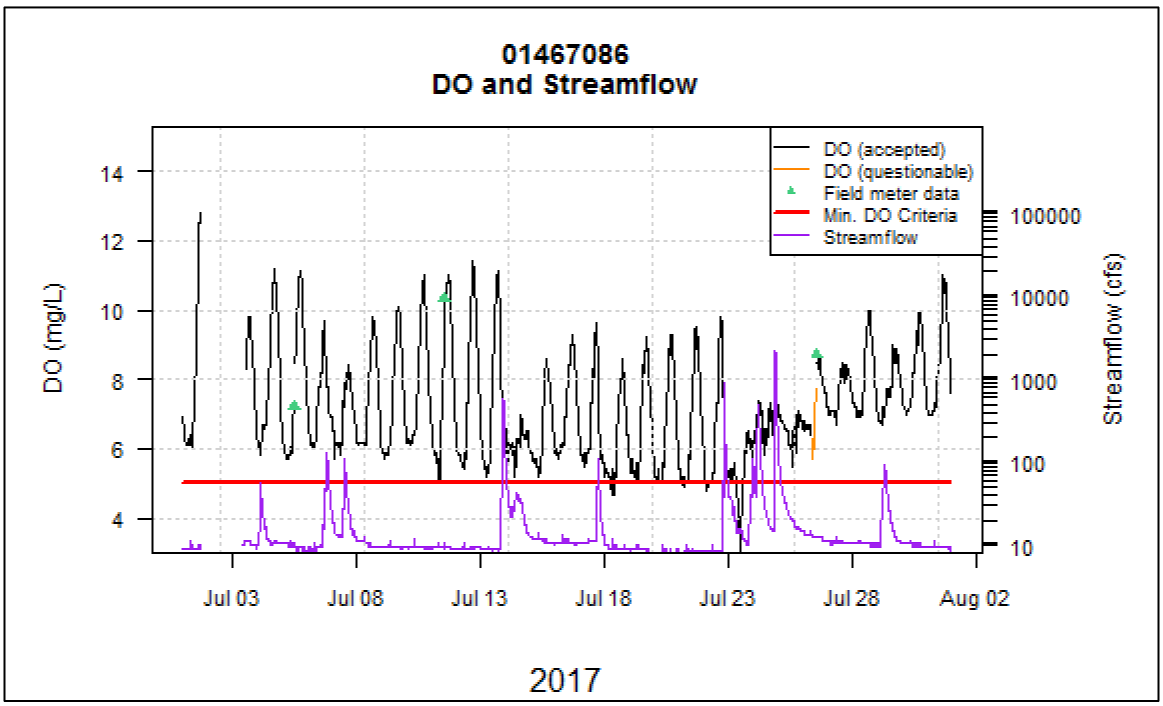


Figure 10. Gage 01467086, Dissolved Oxygen and Streamflow, July 2017.

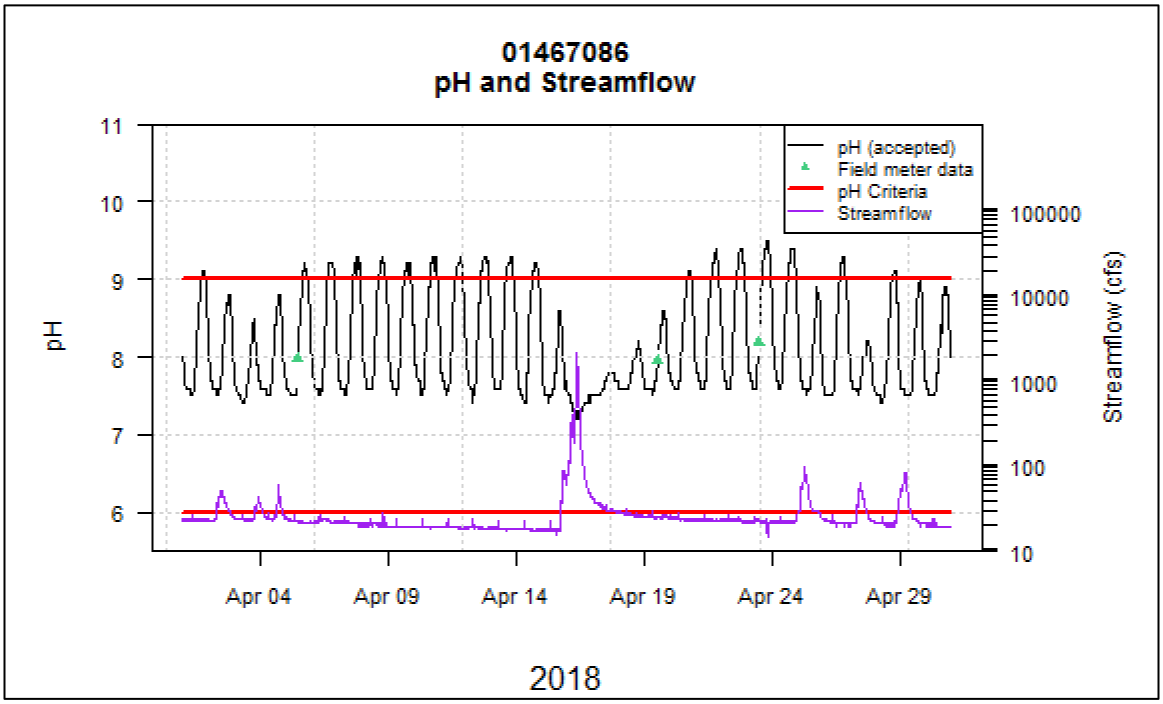


Figure 11. Gage 01467086, pH and Streamflow, April 2018.

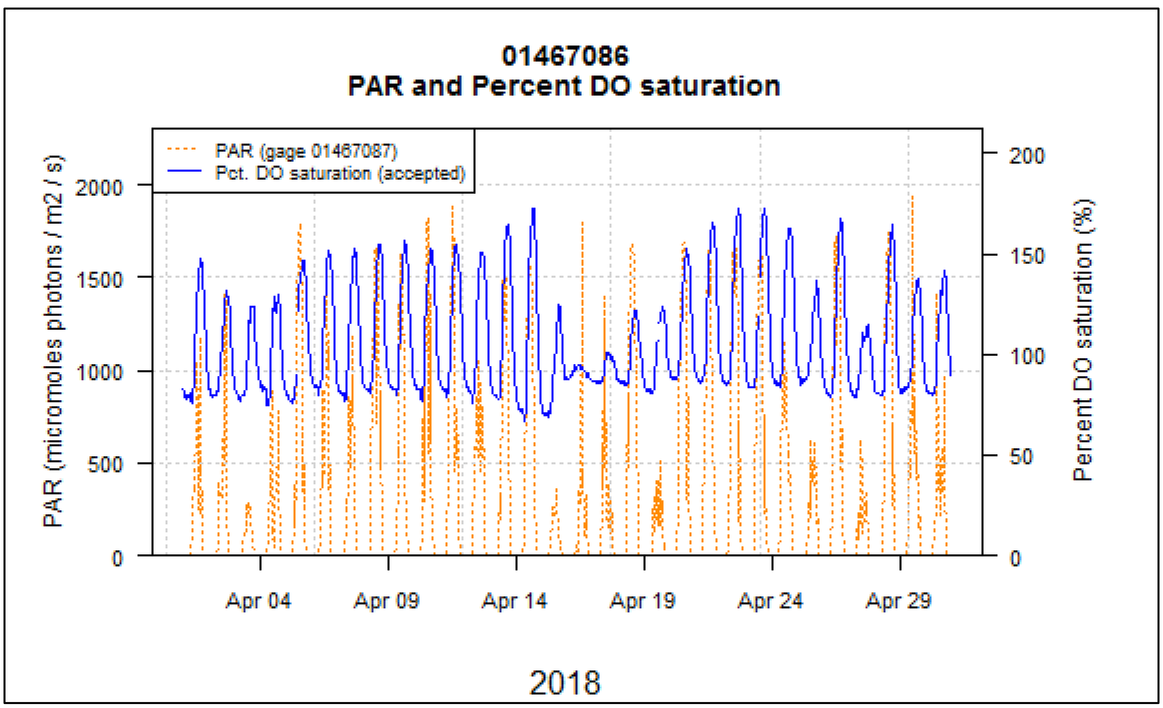


Figure 12. Gage 01467086, PAR and Percent Dissolved Oxygen Saturation, April 2018.

Figure 13. Gage 01467086, Tacony Creek at Adams Ave.

Figure 14. Gage 01467087, Frankford Creek at Castor Ave., looking downstream

Specific Conductance

Specific conductance observations were usually consistent between the two gage sites (Tables 19-20). Elevated levels of specific conductance were observed in November and March and are likely due to the effects of road salt entering the stream.

Table 19. Gage 01467086 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	701.0	29.2	5.8	34.0	837.0	607.0
Aug-17	741.5	30.9	0.3	94.0	835.0	618.8
Sep-17	719.0	30.0	0.1	184.0	892.0	726.3
Oct-17	740.5	30.9	0.5	67.0	860.0	660.0
Nov-17	718.5	29.9	0.2	271.0	821.0	699.4
Mar-18	538.0	22.4	0.0	825.0	3850.0	1138.0
Apr-18	717.0	29.9	0.4	94.0	1080.0	784.0
May-18	743.0	31.0	0.1	101.0	857.0	676.3
Jun-18	718.5	29.9	0.2	61.0	816.0	656.9

Table 20. Gage 01467087 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	743.0	31.0	0.0	75.0	862.0	541.9
Aug-17	742.8	30.9	0.0	78.0	850.0	573.2
Sep-17	718.5	29.9	0.0	239.0	959.0	729.0
Oct-17	742.0	30.9	0.0	88.0	930.0	636.3
Nov-17	718.0	29.9	0.0	297.0	849.0	673.8
Mar-18	607.3	25.3	0.0	784.0	3510.0	1209.0
Apr-18	719.0	30.0	0.0	89.0	988.0	789.7
May-18	742.3	30.9	0.0	114.0	876.0	644.2
Jun-18	244.8	10.2	0.0	10.0	826.0	563.1

Temperature

Monthly mean temperatures observed at the downstream gage were usually higher than at the upstream gage. Consequently, a higher rate of temperature criteria exceedance was typically observed at the downstream gage (Tables 21-22).

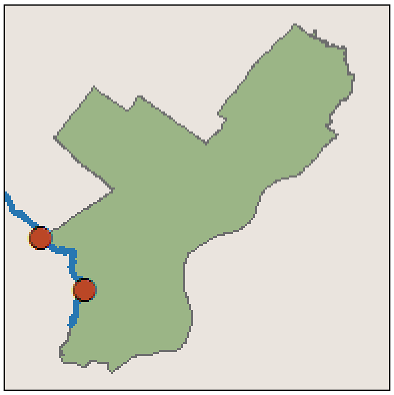
Table 21. Gage 01467086 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	5.8	701.0	29.2	18.7	28.6	23.8
WWF	1-Aug	15-Aug	0.0	100.0	0.3	359.0	15.0	17.5	26.4	22.0
WWF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	15.9			
WWF	1-Sep	15-Sep	0.0	100.0	0.0	360.0	15.0	15.4	24.2	19.9
WWF	16-Sep	30-Sep	0.0	100.0	0.3	359.0	15.0			
WWF	1-Oct	15-Oct	4.2	95.8	0.4	358.5	14.9	10.8	23.1	16.3
WWF	16-Oct	31-Oct	2.5	97.5	0.5	382.0	15.9			
WWF	1-Nov	15-Nov	18.1	81.9	0.0	360.0	15.0	3.0	15.9	8.6
WWF	16-Nov	30-Nov	2.4	97.6	0.4	358.5	14.9			
WWF	1-Mar	31-Mar	33.9	66.1	27.7	538.0	22.4	2.3	14.8	7.3
WWF	1-Apr	15-Apr	33.2	66.8	0.4	358.5	14.9	6.1	21.6	11.5
WWF	16-Apr	30-Apr	28.5	71.5	0.4	358.5	14.9			
WWF	1-May	15-May	42.2	57.8	0.0	360.0	15.0	9.8	23.4	18.0
WWF	16-May	31-May	3.7	96.3	0.3	383.0	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.0	360.0	15.0			
WWF	16-Jun	30-Jun	0.0	100.0	0.4	358.5	14.9	14.5	25.6	19.7

Table 22. Gage 01467087 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.1	743.3	31.0	20.6	30.4	24.9
WWF	1-Aug	15-Aug	0.0	100.0	0.1	359.5	15.0	18.1	27.3	23.1
WWF	16-Aug	31-Aug	0.0	100.0	0.2	383.3	16.0			
WWF	1-Sep	15-Sep	0.0	100.0	0.1	359.5	15.0	16.9	24.5	20.7
WWF	16-Sep	30-Sep	0.0	100.0	0.1	359.5	15.0			
WWF	1-Oct	15-Oct	8.4	91.6	0.1	359.5	15.0	11.6	23.2	16.8
WWF	16-Oct	31-Oct	3.7	96.3	0.2	383.3	16.0			
WWF	1-Nov	15-Nov	8.8	91.2	0.2	359.3	15.0	4.5	15.3	8.6
WWF	16-Nov	30-Nov	1.7	98.3	0.3	358.8	15.0			
WWF	1-Mar	31-Mar	25.2	74.8	18.3	608.0	25.4	2.3	13.6	7.1
WWF	1-Apr	15-Apr	29.4	70.6	0.1	359.8	15.0	7.8	19.2	11.8
WWF	16-Apr	30-Apr	40.2	59.8	0.2	359.3	15.0			
WWF	1-May	15-May	62.4	37.6	0.2	359.3	15.0	11.6	23.9	18.8
WWF	16-May	31-May	8.9	91.1	0.1	383.5	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	29.9	252.5	10.5			
WWF	16-Jun	30-Jun	0.0	100.0	0.1	371.6	16.5	14.4	24.0	19.7

Cobbs Creek (Gages 01475530 and 01475548)



Dissolved oxygen and pH

The upstream Cobbs Creek site (01475530) almost always met the minimum dissolved oxygen criterion and never exceeded the 7-day average guideline (Table 23, Figures 15, 16, 19). Dissolved oxygen at the downstream site (01475548) did not always attain the minimum, particularly during the warmer months. The downstream site did attain the 7-day average guideline for the duration of the year. The daily mean values are presented in Tables 25-26 for informational purposes.

The pattern of dissolved oxygen and pH values between the upstream and downstream Cobbs Creek gages is likely due to greater algal activity at the downstream gage. During the spring—key months for algal growth—pH exceeded the maximum guideline at both gage sites (Tables 27-28). Algae remove CO_2 during photosynthesis, raising pH by shifting the dissolved inorganic carbon (DIC) balance toward alkaline carbonates. Furthermore, the diel fluctuations in DO were more pronounced at the downstream gage during these months (Figures 19-20).

A third indicator of increased algal activity in Cobbs Creek is the supersaturation of oxygen caused by photosynthesis. During April, both gages recorded peak DO saturation levels greater than 150% during the day in dry weather conditions (Figures 21-22).

Table 23. Gage 01475530 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	WWF	742.8	30.9	0.0	0.0	100.0	5.7	10.1	7.6
Aug-17	WWF	742.8	30.9	0.0	0.0	100.0	6.2	12.4	8.1
Sep-17	WWF	718.5	29.9	0.0	0.0	100.0	6.2	11.6	8.1
Oct-17	WWF	743.5	31.0	0.0	0.0	100.0	6.2	11.4	8.7
Nov-17	WWF	719.3	30.0	0.0	0.0	100.0	8.5	14.3	10.9
Mar-18	WWF	634.0	26.4	0.0	0.0	100.0	8.7	16.7	12.9
Apr-18	WWF	719.0	30.0	0.0	0.1	99.9	1.8	16.0	11.2
May-18	WWF	744.0	31.0	0.0	0.0	100.0	6.6	13.6	8.8
Jun-18	WWF	641.8	26.7	0.0	0.0	100.0	6.6	10.3	8.5

Table 24. Gage 01475548 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	WWF	698.8	29.1	0.0	23.6	76.4	2.1	11.2	6.0
Aug-17	WWF	649.8	27.1	0.0	3.5	96.5	3.6	12.0	7.2
Sep-17	WWF	668.0	27.8	0.0	0.2	99.8	4.8	12.0	7.9
Oct-17	WWF	641.0	26.7	0.0	5.0	95.0	2.7	12.4	8.6
Nov-17	WWF	718.3	29.9	0.0	0.0	100.0	8.3	13.4	10.6
Mar-18	WWF	634.5	26.4	0.0	0.0	100.0	7.6	18.5	12.9
Apr-18	WWF	669.5	27.9	0.0	0.0	100.0	6.3	18.5	11.5
May-18	WWF	743.8	31.0	0.0	0.1	99.9	4.4	15.6	8.2
Jun-18	WWF	697.8	29.1	0.0	5.6	94.4	2.6	10.5	7.2

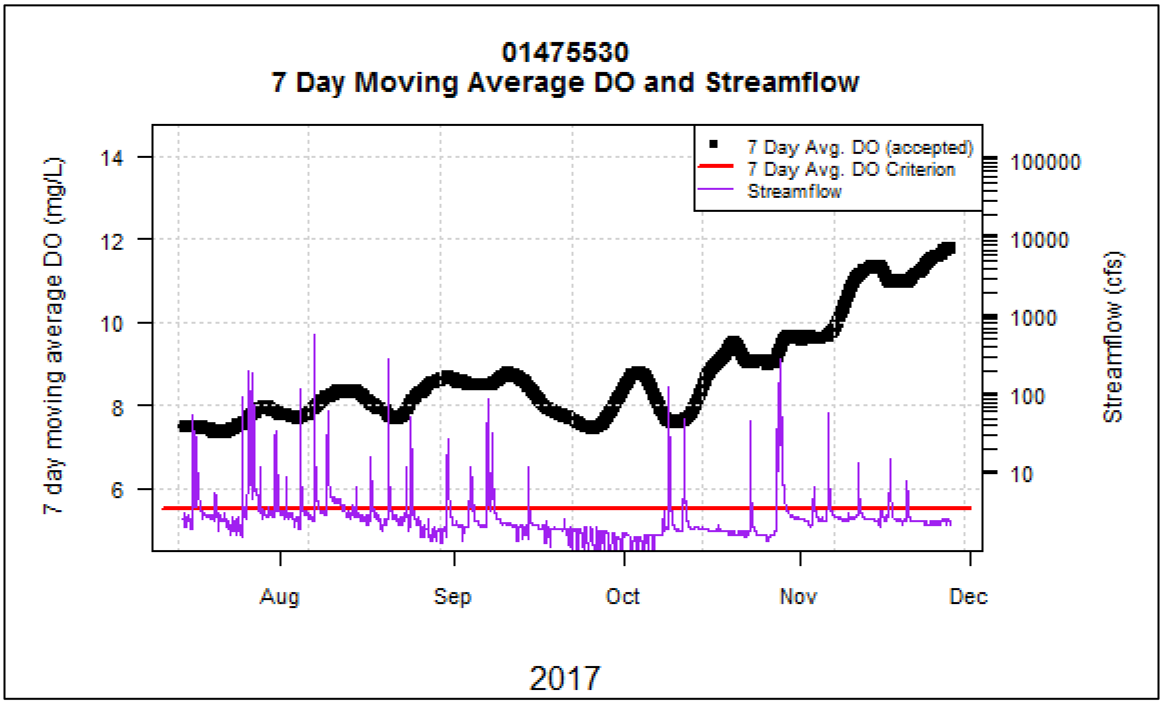


Figure 15. Gage 01475530, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

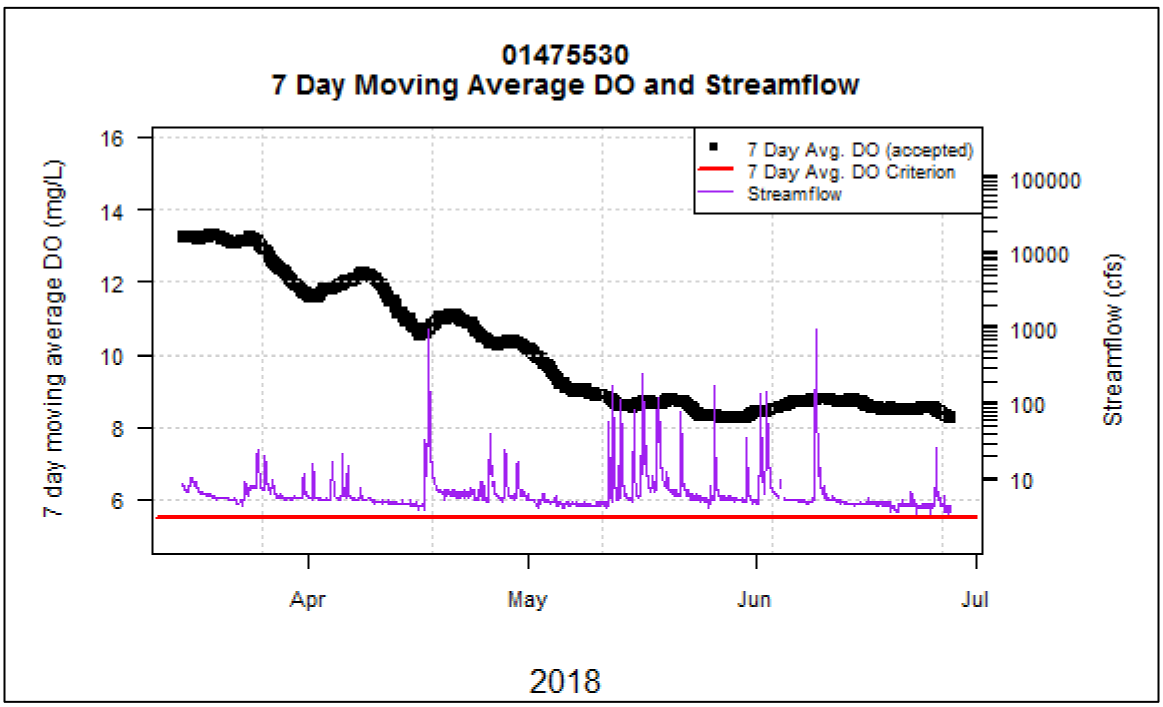


Figure 16. Gage 01475530, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

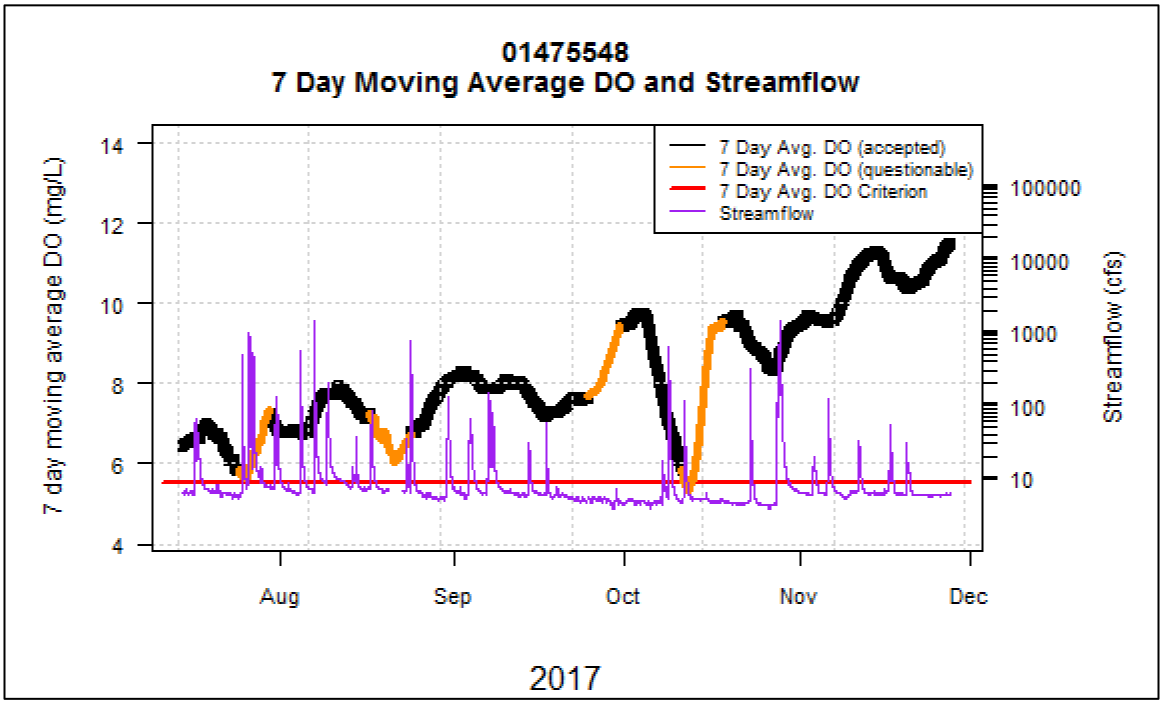


Figure 17. Gage 01475548, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

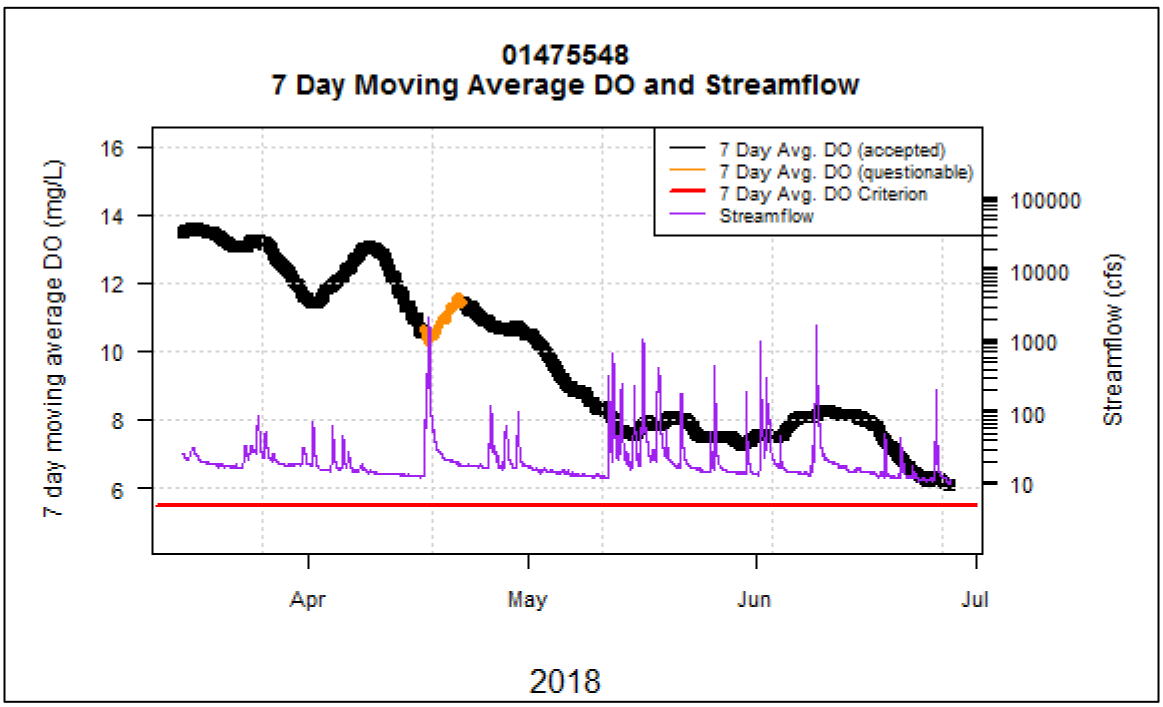


Figure 18. Gage 01475548, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

Table 25. Gage 01475530 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	WWF	29.0	6.5	6.7	8.3	7.6
Aug-17	WWF	29.0	6.5	7.3	9.2	8.1
Sep-17	WWF	28.0	6.7	7.3	9.2	8.2
Oct-17	WWF	30.0	3.2	6.9	9.9	8.8
Nov-17	WWF	29.0	3.3	9.1	12.1	10.9
Mar-18	WWF	25.0	5.4	10.5	13.6	12.9
Apr-18	WWF	29.0	3.3	9.6	12.5	11.2
May-18	WWF	31.0	0.0	7.6	10.8	8.8
Jun-18	WWF	23.0	23.3	7.8	9.1	8.5

Table 26. Gage 01475548 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	WWF	28.0	9.7	3.1	7.6	6.0
Aug-17	WWF	24.0	22.6	5.3	8.5	7.2
Sep-17	WWF	27.0	10.0	6.7	9.4	7.9
Oct-17	WWF	24.0	22.6	4.9	10.0	8.8
Nov-17	WWF	28.0	6.7	8.9	12.3	10.7
Mar-18	WWF	25.0	5.4	9.9	14.0	12.9
Apr-18	WWF	27.0	10.0	9.0	13.5	11.5
May-18	WWF	30.0	3.2	6.1	11.6	8.2
Jun-18	WWF	28.0	6.7	4.9	8.7	7.2

Table 27. Gage 01475530 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	608.5	25.4	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.0	7.3
Aug-17	743.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.7	8.6	7.4
Sep-17	671.8	28.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.7	7.7
Oct-17	743.5	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.9	7.4
Nov-17	719.3	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.1	7.4
Mar-18	634.0	26.4	0.0	1.2	11.1	0.0	0.0	98.8	88.9	7.3	9.2	7.8
Apr-18	719.0	30.0	0.0	1.2	13.3	0.0	0.0	98.8	86.7	7.1	9.2	7.7
May-18	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	9.0	7.6
Jun-18	641.8	26.7	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.1	7.5

Table 28. Gage 01475548 pH Criteria Summary Results by Month

Month	total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	695.3	29.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.7	7.5
Aug-17	649.8	27.1	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.7	7.5
Sep-17	668.0	27.8	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.4	7.6
Oct-17	667.8	27.8	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.5	7.6
Nov-17	702.3	29.3	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.2	7.7
Mar-18	634.5	26.4	0.0	4.5	29.6	0.0	0.0	95.5	70.4	7.4	9.3	8.1
Apr-18	669.5	27.9	0.0	12.6	55.2	0.0	0.0	87.4	44.8	7.1	9.4	8.1
May-18	743.8	31.0	0.0	1.7	9.7	0.0	0.0	98.3	90.3	7.2	9.2	7.7
Jun-18	697.8	29.1	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.2	7.4

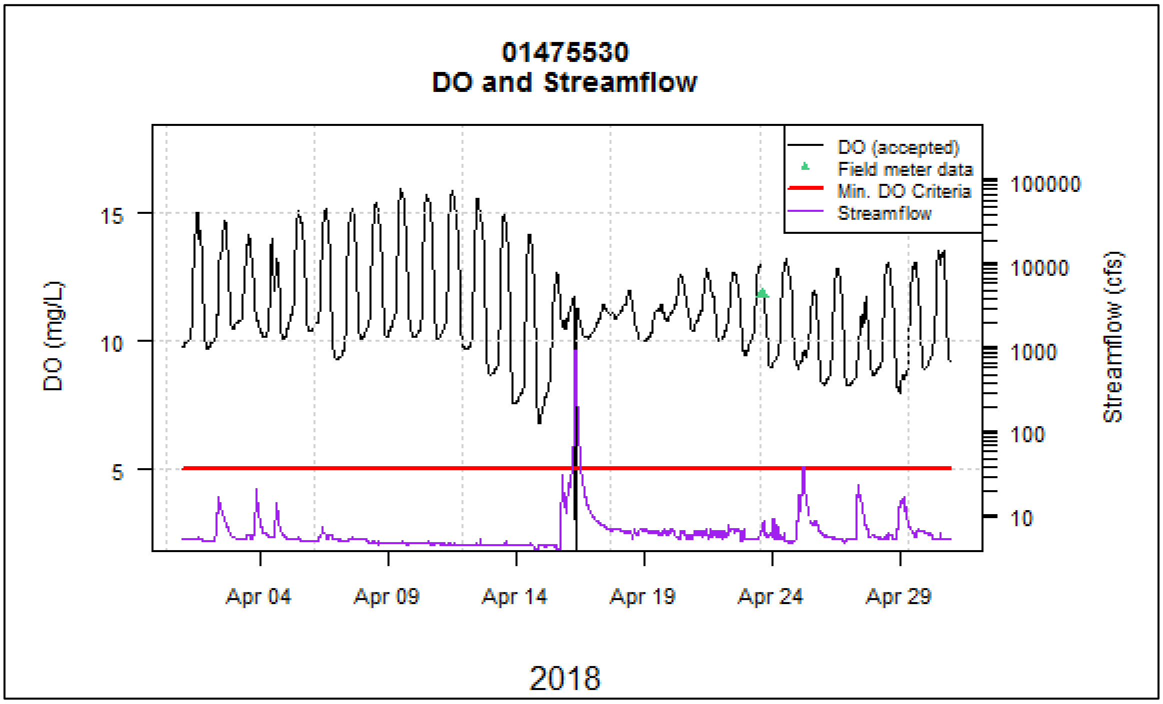


Figure 19. Gage 01475530, Dissolved Oxygen and Streamflow, April 2018.

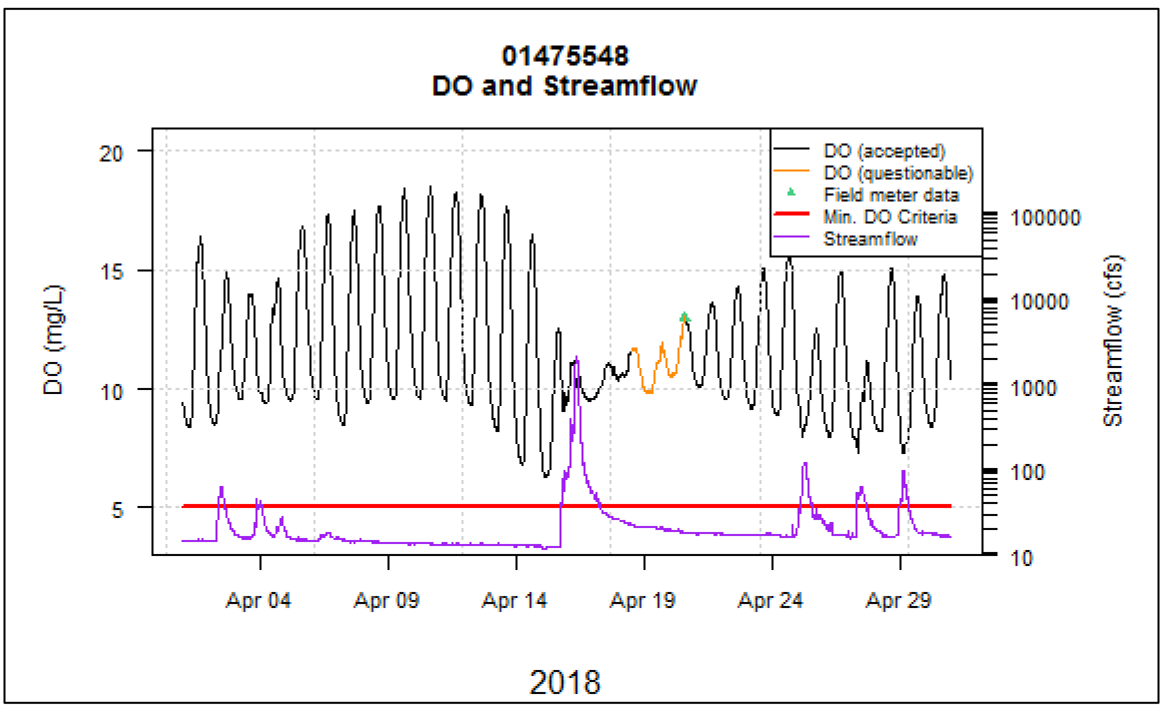


Figure 20. Gage 01475548, Dissolved Oxygen and Streamflow, April 2018.

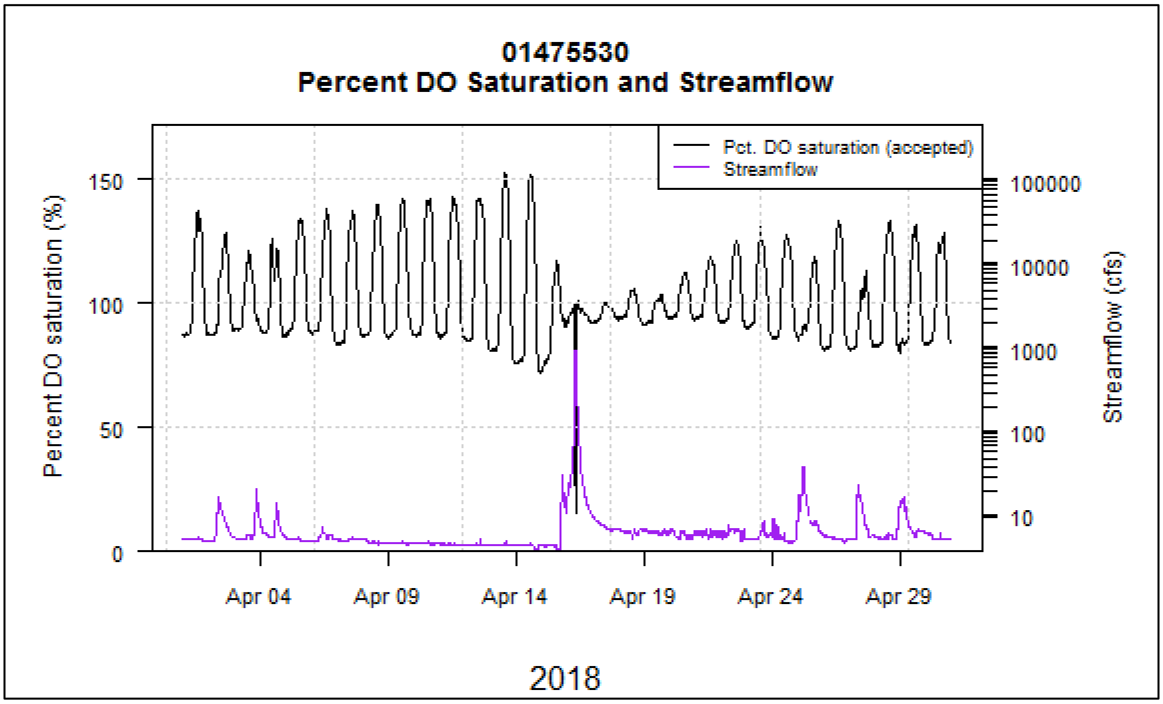


Figure 21. Gage 01475530, Percent DO Saturation and Streamflow, April 2018.

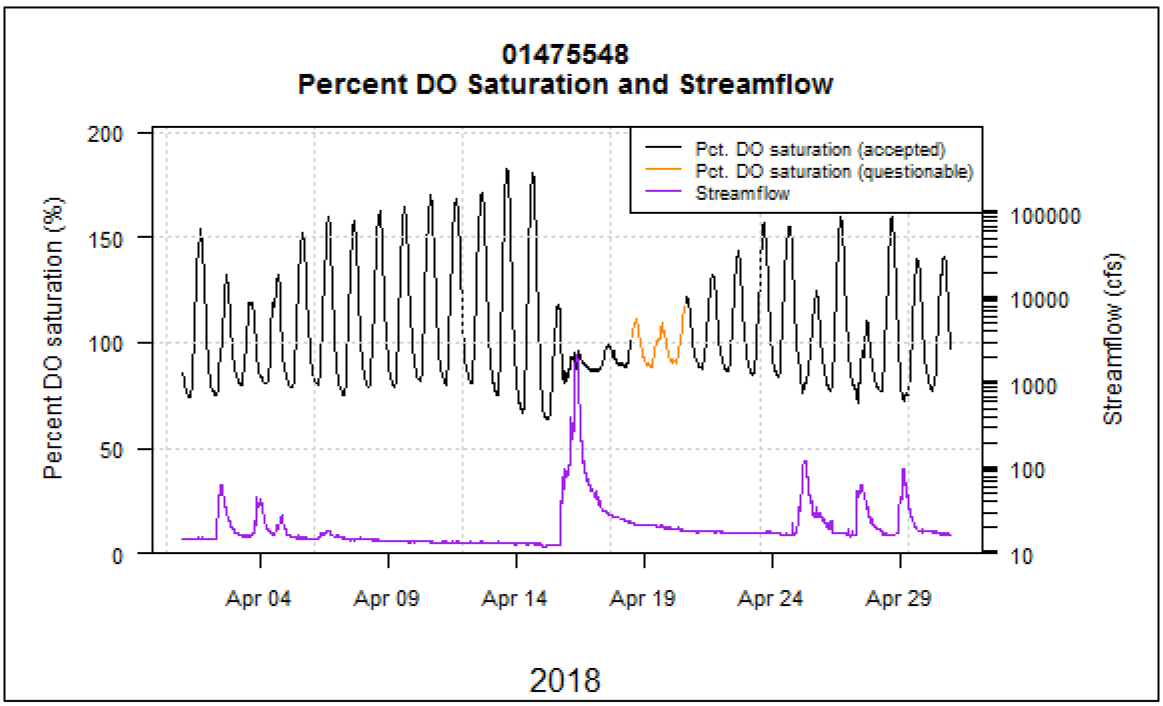


Figure 22. Gage 01475548, Percent DO Saturation and Streamflow, April 2018.

Figure 23. Gage 01475530, Cobbs Creek at Rte. 1, looking upstream

Figure 24. Gage 01475548, Cobbs Creek at Mt. Moriah Cemetery

Specific Conductance

Specific conductance observations were similar to those observed in Tacony Creek, with the exception of consistently higher conductance observed at the downstream gage 01475548 (Tables 29-30). Road salt may have had some impact on conductance at both gages in March. However, the typical pattern of stormwater lowering conductance levels in the stream is well-observed during the storms that occurred in June (Figures 25-26).

Table 29. Gage 01475530 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	742.5	30.9	0.0	56.0	959.0	504.4
Aug-17	706.5	29.4	0.0	42.0	618.0	487.8
Sep-17	718.5	29.9	0.0	116.0	703.0	565.1
Oct-17	743.5	31.0	0.0	64.0	635.0	539.6
Nov-17	719.3	30.0	0.0	168.0	638.0	558.5
Mar-18	633.8	26.4	0.0	532.0	5160.0	1204.3
Apr-18	719.0	30.0	0.0	94.0	2070.0	628.4
May-18	476.0	19.8	36.0	94.0	706.0	512.4
Jun-18	641.8	26.7	0.0	59.0	716.0	574.5

Table 30. Gage 01475548 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	129.0	757.0	509.6
Aug-17	649.5	27.1	0.0	90.0	763.0	495.2
Sep-17	668.0	27.8	0.0	193.0	716.0	577.9
Oct-17	743.0	31.0	0.0	102.0	747.0	590.9
Nov-17	718.0	29.9	0.0	367.0	734.0	628.6
Mar-18	634.5	26.4	0.0	710.0	5730.0	1387.5
Apr-18	669.5	27.9	0.0	105.0	1200.0	750.1
May-18	743.8	31.0	0.0	172.0	812.0	607.1
Jun-18	697.8	29.1	0.0	83.0	777.0	585.4

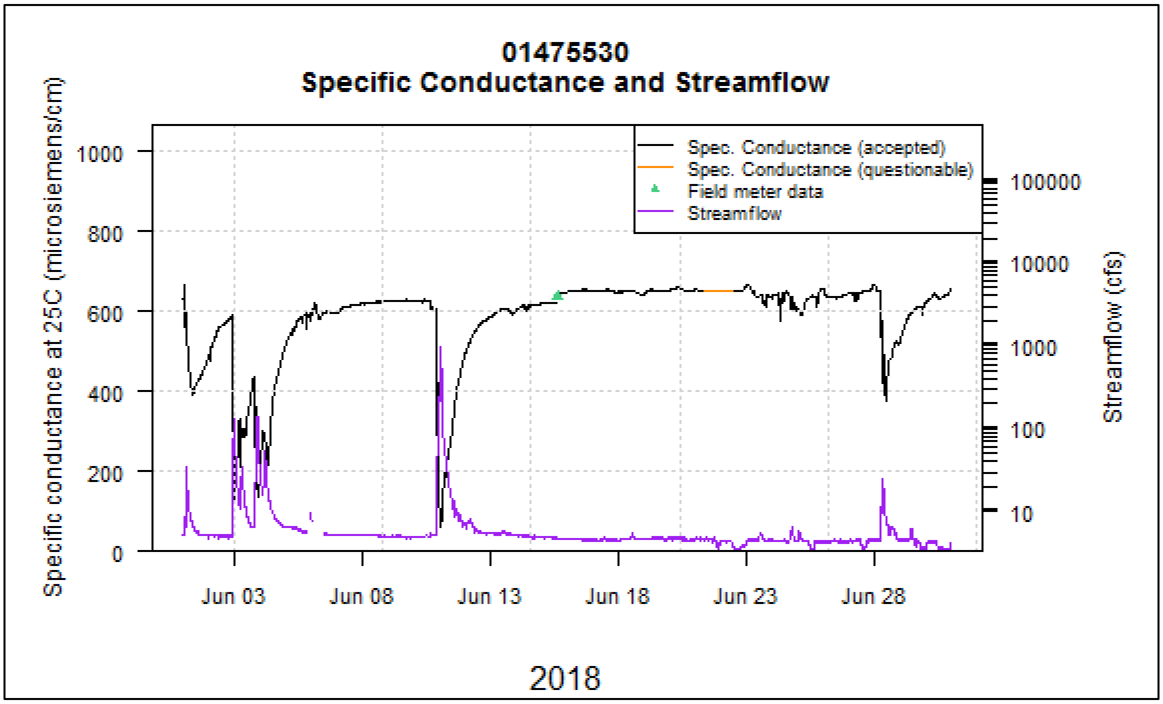


Figure 25. Gage 01475530, Specific Conductance and Streamflow, June 2018.

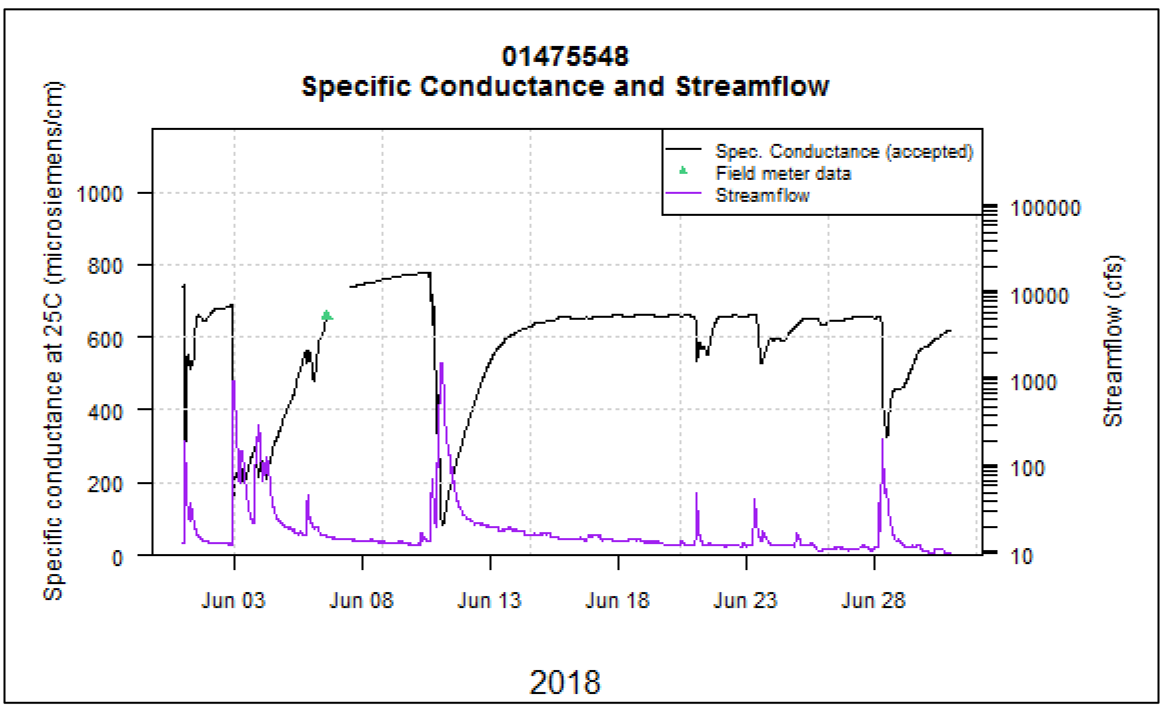


Figure 26. Gage 01475548, Specific Conductance and Streamflow, June 2018.

Temperature

As was also observed in Tacony Creek, slightly higher temperatures were usually recorded at the downstream gage in Cobbs Creek, resulting in more frequent exceedance of temperature maximum criteria at the downstream gage during fall and spring (Tables 31-32).

Table 31. Gage 01475530 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.2	742.8	31.0	18.3	27.5	22.9
WWF	1-Aug	15-Aug	0.0	100.0	0.0	360.0	15.0	17.4	26.1	21.3
WWF	16-Aug	31-Aug	0.0	100.0	0.3	383.0	16.0			
WWF	1-Sep	15-Sep	0.0	100.0	0.0	360.0	15.0	14.9	22.9	19.1
WWF	16-Sep	30-Sep	0.0	100.0	0.4	358.5	15.0			
WWF	1-Oct	15-Oct	0.7	99.3	0.0	360.0	15.0	10.5	22.2	15.8
WWF	16-Oct	31-Oct	1.2	98.8	0.1	383.5	16.0			
WWF	1-Nov	15-Nov	15.3	84.7	0.0	360.0	15.0	4.0	16.0	8.7
WWF	16-Nov	30-Nov	4.1	95.9	0.2	359.3	15.0			
WWF	1-Mar	31-Mar	29.0	71.0	14.8	634.0	26.4	1.6	14.7	7.0
WWF	1-Apr	15-Apr	31.9	68.1	0.0	360.0	15.0	6.2	20.8	11.2
WWF	16-Apr	30-Apr	21.7	78.3	0.3	359.0	15.0			
WWF	1-May	15-May	27.6	72.4	0.0	360.0	15.0	9.6	22.5	17.4
WWF	16-May	31-May	0.8	99.2	0.0	384.0	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.4	358.5	15.0			
WWF	16-Jun	30-Jun	0.0	100.0	21.3	283.3	11.8	14.7	25.6	19.4

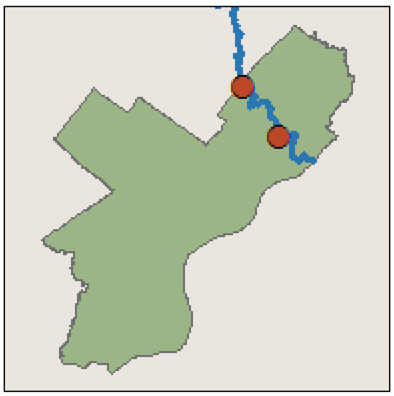
Table 32. Gage 01475548 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.0	744.0	31.0	19.8	28.7	24.3
WWF	1-Aug	15-Aug	0.0	100.0	0.3	358.8	15.0	18.1	26.8	22.4
WWF	16-Aug	31-Aug	0.0	100.0	24.2	291.0	12.2			
WWF	1-Sep	15-Sep	0.0	100.0	0.0	360.0	15.0	15.9	23.9	19.9
WWF	16-Sep	30-Sep	0.0	100.0	14.4	308.0	12.9			
WWF	1-Oct	15-Oct	6.5	93.5	0.0	360.0	15.0	11.0	23.0	16.4
WWF	16-Oct	31-Oct	2.1	97.9	0.2	383.3	16.0			
WWF	1-Nov	15-Nov	17.6	82.4	0.3	359.0	15.0	4.1	15.8	8.7
WWF	16-Nov	30-Nov	2.8	97.2	0.3	359.0	15.0			
WWF	1-Mar	31-Mar	24.6	75.4	14.7	634.5	26.5	2.2	14.3	6.8
WWF	1-Apr	15-Apr	31.8	68.2	0 .0	360.0	15.0	6.8	20.6	11.6
WWF	16-Apr	30-Apr	32.5	67.5	0.2	359.3	15.0			
WWF	1-May	15-May	43.8	56.2	0.0	360.0	15.0	10.7	23.6	18.5
WWF	16-May	31-May	6.8	93.2	0.1	383.8	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	6.2	337.8	14.1			
WWF	16-Jun	30-Jun	0.0	100.0	0.0	360.0	15.0	15.5	26.7	20.9

Gages in Separate Sewer System Watersheds

Gages in the Pennypack, Wissahickon and Poquessing watersheds are situated in the separate sewer system areas of Philadelphia. Although these sites are not affected by combined sewer overflows, discharge of untreated stormwater runoff from stormwater outfalls can negatively affect water quality.

Pennypack Creek (Gages 01467042 and 01467048)



Dissolved oxygen and pH

Both the upstream (01467042) and downstream (01467048) gages of Pennypack Creek showed pronounced diel fluctuations in dissolved oxygen and pH as a result of algal activity. These patterns are most evident during dry weather periods, when algal growth is able to excel because of abundant sunshine and a lack of storm events that might otherwise scour the algal population.

At both upstream and downstream Pennypack Creek gages, periods of dry weather in warm months are conducive to excessive algal growth. During these periods, algal populations seemed to flourish, with daily DO amplitudes at times nearly 10 mg/L during April (Figures 31-32).

In April, maximum daily pH fluctuations of approximately 1.5 units were observed (Figures 33-34). Maximum pH criteria exceedance occurred at both gages in the spring. It would be reasonable to conclude that if not for periodic interruptions of algal activity due to rainfall, those extreme fluctuations and chronic pH criteria exceedance would likely occur through the entire season.

Algal communities in the area of both gages recover quickly after storm events, as seen in Figures 33-34. Prior to a storm occurring in April 2018, both DO and pH showed the typical pronounced fluctuations indicative of strong algal activity. This stopped abruptly with the storm, when much of the algae was likely scoured away and overcast conditions likely inhibited further growth, as indicated by the PAR data at 01467042 for April 2018

(Figure 35). However, within 2-3 days of the conclusion of the rainfall and the return of sunny conditions, fluctuations of DO and pH resumed, indicative of high algal density. This not only demonstrates the resilience of the algal population in this ecosystem, but also a likely abundance of nutrients that allows regrowth to occur so quickly.

Table 33. Gage 01467042 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	TSF	743.8	31.0	0.0	0.0	100.0	5.7	13.3	7.8
Aug-17	TSF	742.0	30.9	0.0	0.0	100.0	6.2	11.3	8.0
Sep-17	TSF	719.5	30.0	0.0	0.0	100.0	6.0	11.9	8.4
Oct-17	TSF	743.0	31.0	0.0	0.0	100.0	6.0	11.8	8.7
Nov-17	TSF	719.8	30.0	0.0	0.0	100.0	8.3	14.0	10.7
Mar-18	TSF	468.0	19.5	0.0	0.0	100.0	7.7	18.7	12.8
Apr-18	TSF	719.3	30.0	0.0	0.0	100.0	6.4	19.9	11.5
May-18	TSF	742.3	30.9	0.0	0.0	100.0	5.7	16.0	8.5
Jun-18	TSF	718.0	29.9	0.0	0.0	100.0	6.6	10.3	8.2

Table 34. Gage 01467048 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	TSF	743.5	31.0	0.1	0.0	100.0	6.0	12.3	7.9
Aug-17	TSF	743.5	31.0	0.1	0.0	100.0	6.2	13.6	8.4
Sep-17	TSF	660.0	27.5	8.3	0.0	100.0	6.6	12.0	8.7
Oct-17	TSF	636.0	26.5	14.5	0.0	100.0	6.5	12.7	9.0
Nov-17	TSF	719.5	30.0	0.1	0.0	100.0	9.1	14.8	11.4
Mar-18	TSF	488.0	20.3	10.2	0.0	100.0	10.3	19.0	13.8
Apr-18	TSF	720.0	30.0	0.0	0.0	100.0	7.4	19.9	12.2
May-18	TSF	558.5	23.3	24.9	2.1	97.9	0.0	16.1	8.7
Jun-18	TSF	720.0	30.0	0.0	0.0	100.0	7.1	12.2	8.9

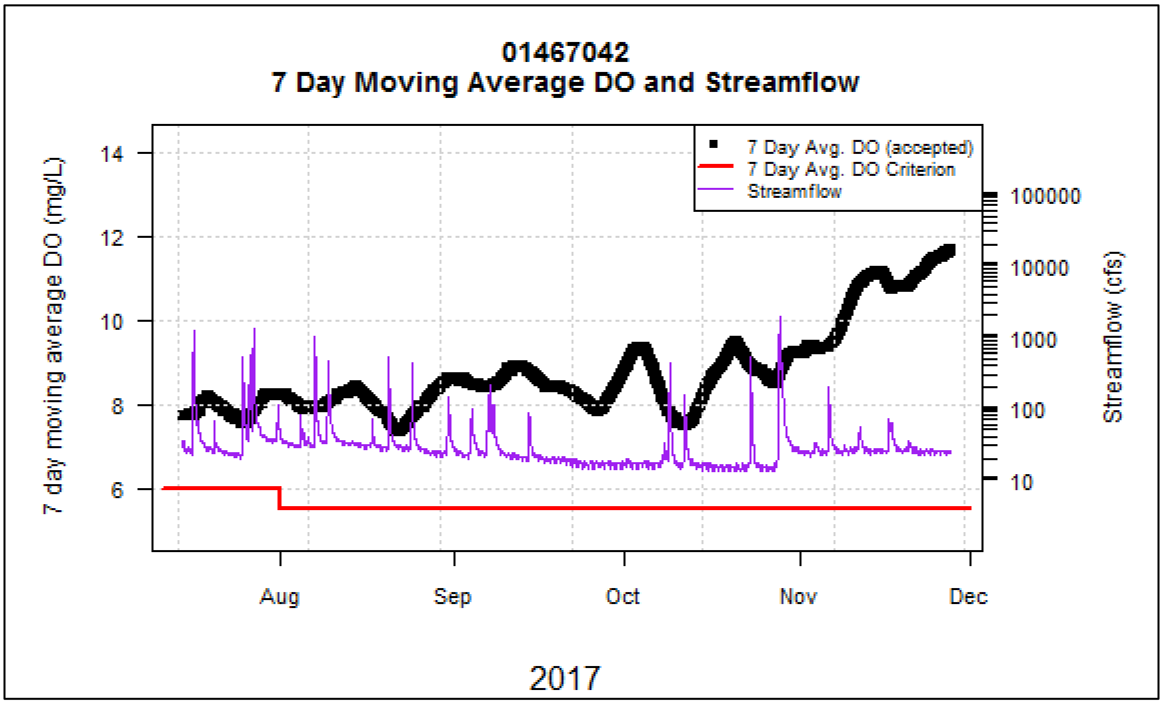


Figure 27. Gage 01467042, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

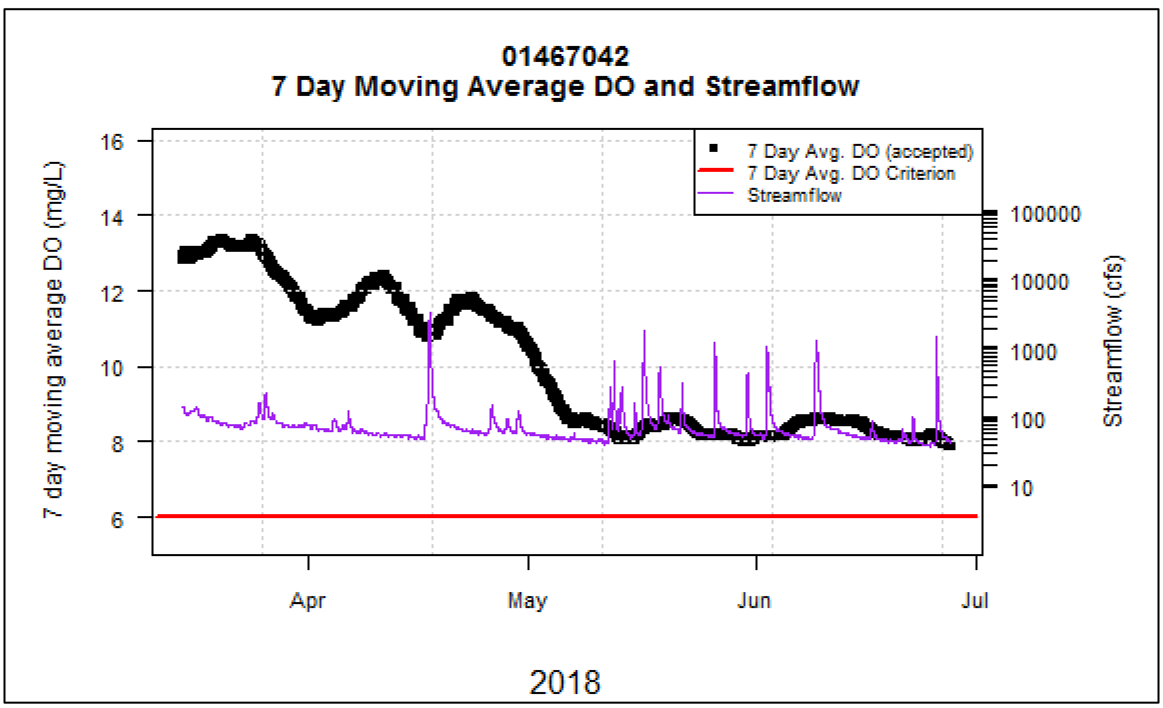


Figure 28. Gage 01467042, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

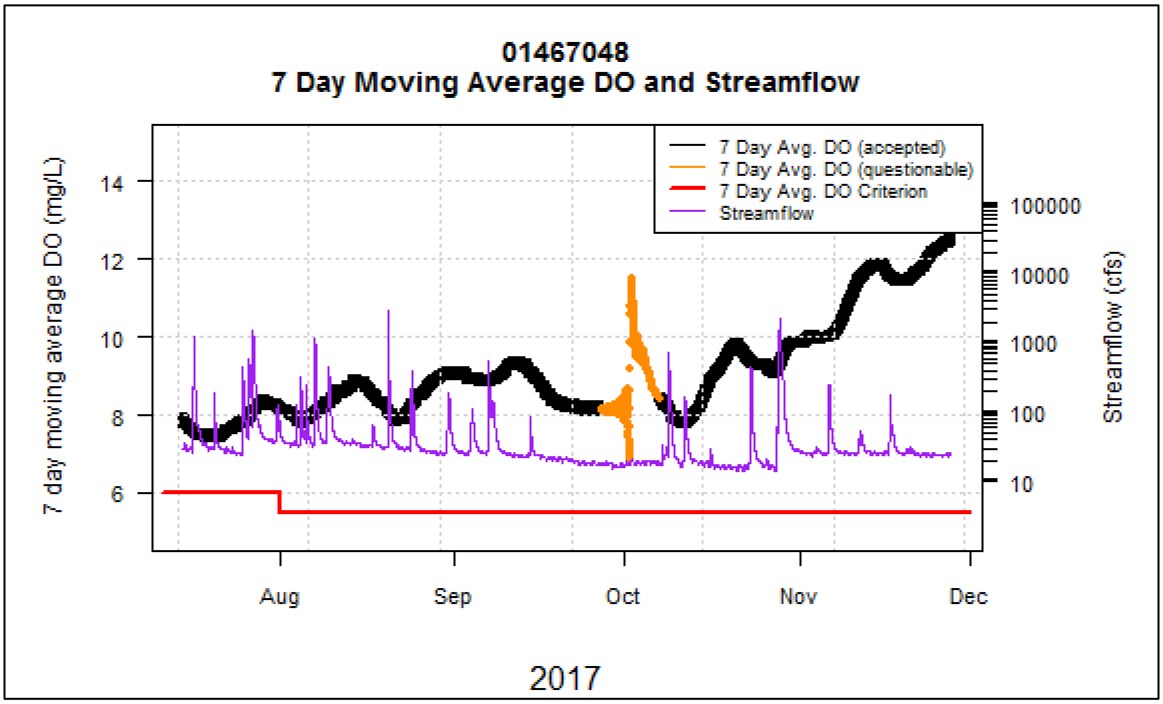


Figure 29. Gage 01467048, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

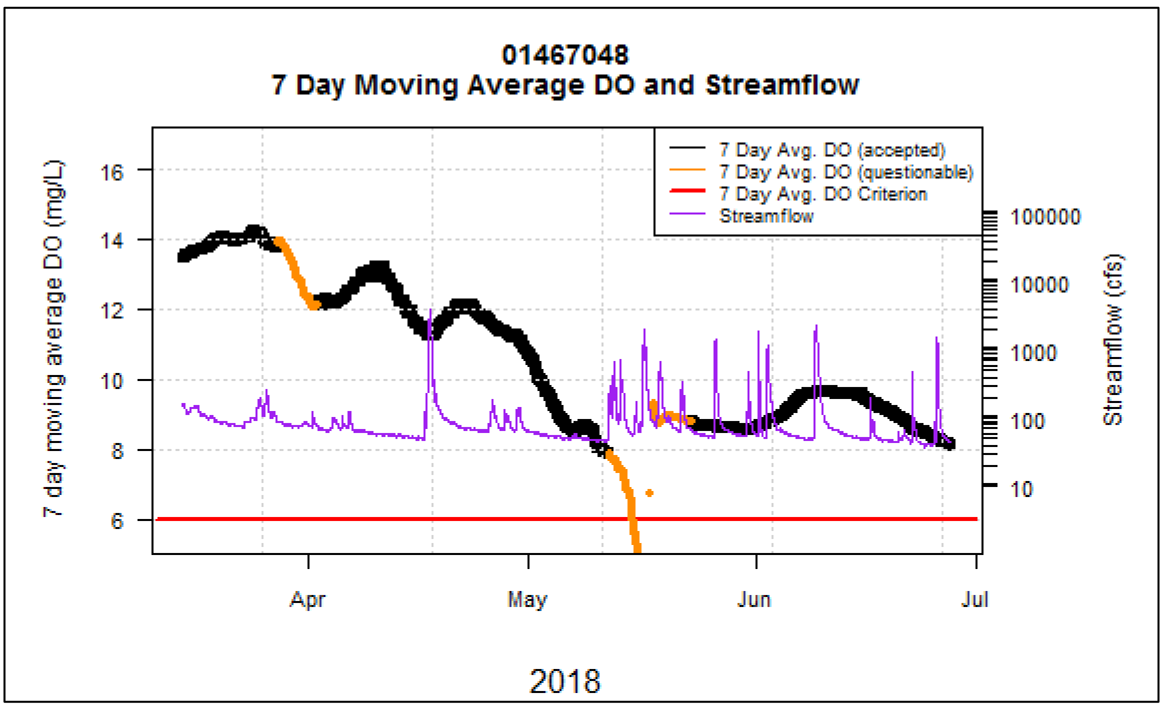


Figure 30. Gage 01467048, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

Table 35. Gage 01467042 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	TSF	30.0	3.2	6.6	8.6	7.8
Aug-17	TSF	29.0	6.5	6.9	8.8	8.0
Sep-17	TSF	29.0	3.3	7.3	9.2	8.4
Oct-17	TSF	29.0	6.5	6.7	9.7	8.6
Nov-17	TSF	29.0	3.3	8.9	11.9	10.7
Mar-18	TSF	19.0	2.6	10.4	14.3	12.8
Apr-18	TSF	29.0	3.3	9.7	13.0	11.4
May-18	TSF	28.0	9.7	7.2	11.5	8.6
Jun-18	TSF	27.0	10.0	7.5	8.8	8.3

Table 36. Gage 01467048 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	TSF	30.0	3.2	7.1	8.9	7.9
Aug-17	TSF	30.0	3.2	7.5	9.5	8.4
Sep-17	TSF	25.0	16.7	7.9	9.8	8.7
Oct-17	TSF	22.0	29.0	7.5	10.1	9.1
Nov-17	TSF	29.0	3.3	9.6	12.6	11.3
Mar-18*	TSF	N/A	N/A	N/A	N/A	N/A
Apr-18	TSF	30.0	0.0	10.0	13.7	12.0
May-18	TSF	21.0	32.3	7.2	11.9	8.9
Jun-18	TSF	30.0	0.0	7.6	10.0	8.9

*****Periodic outages during this month made it impossible to calculate a true daily average.

Table 37. Gage 01467042 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hours max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	743.8	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.9	7.7
Aug-17	741.5	30.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.4	7.7
Sep-17	719.3	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.3	7.7
Oct-17	743.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.1	7.5
Nov-17	719.3	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.2	7.6
Mar-18	468.0	19.5	0.0	1.5	20.0	0.0	0.0	98.5	80.0	7.3	9.2	7.9
Apr-18	719.3	30.0	0.0	6.8	30.0	0.0	0.0	93.2	70.0	7.0	9.5	8.0
May-18	742.3	30.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.9	7.6
Jun-18	716.8	29.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.0	7.6

Table 38. Gage 01467048 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	6.7	8.7	7.6
Aug-17	743.5	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.9	7.7
Sep-17	660.0	27.5	8.3	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.7	7.8
Oct-17	636.0	26.5	14.5	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.9	7.6
Nov-17	719.5	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.4	9.0	7.8
Mar-18	488.0	20.3	10.2	3.1	18.2	0.0	0.0	96.9	81.8	7.5	9.2	8.2
Apr-18	612.0	25.5	15.0	13.2	38.5	0.0	0.0	86.8	61.5	7.0	9.6	8.3
May-18	252.0	10.5	66.1	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.8	7.6
Jun-18	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	8.4	7.5

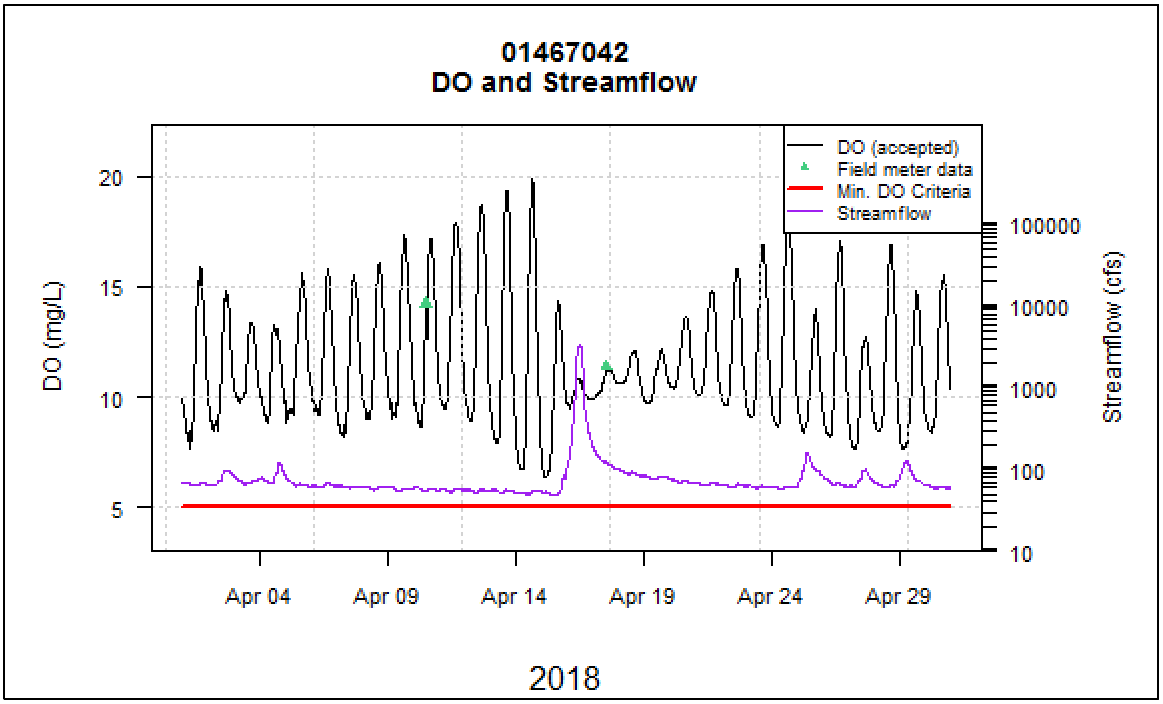


Figure 31. Gage 01467042, Dissolved Oxygen and Streamflow, April 2018.

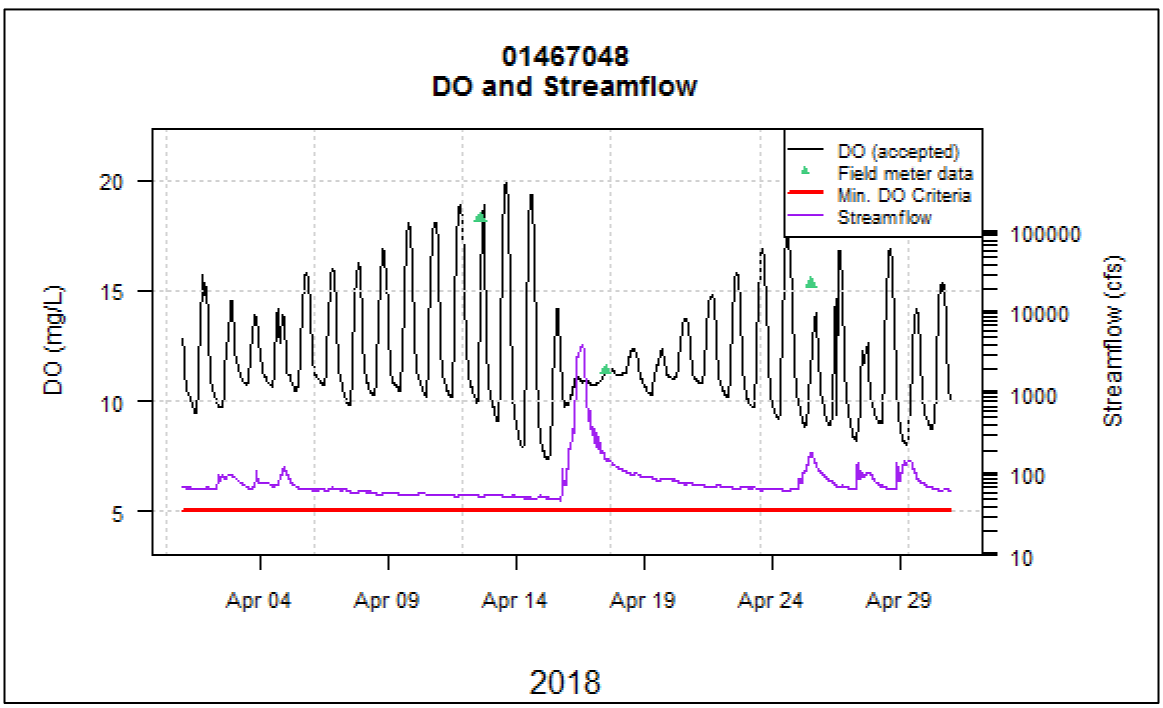


Figure 32. Gage 01467048, Dissolved Oxygen and Streamflow, April 2018.

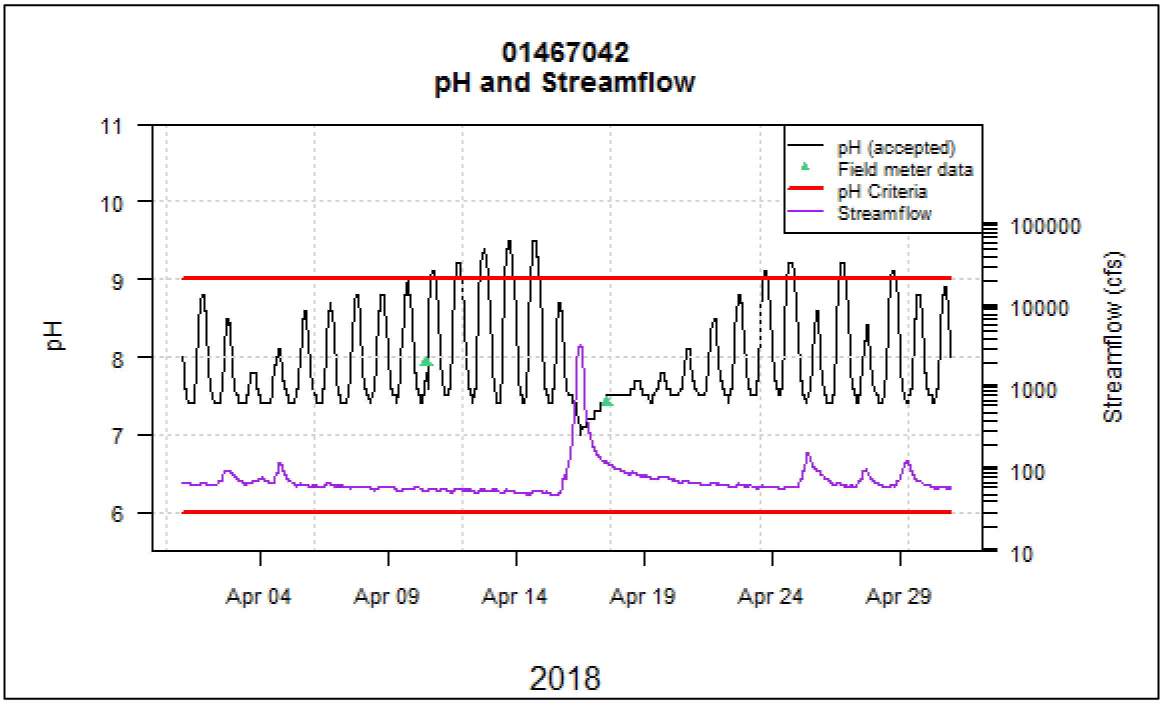


Figure 33. Gage 01467042, pH and Streamflow, April 2018.

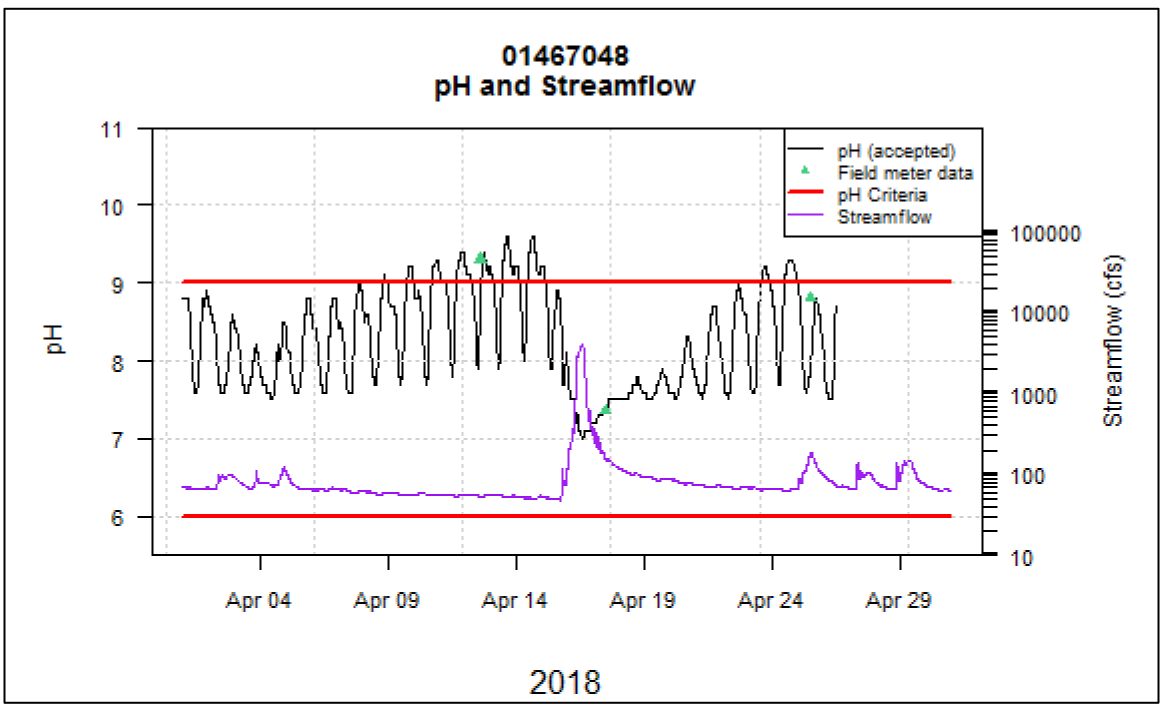


Figure 34. Gage 01467048, pH and Streamflow, April 2018.

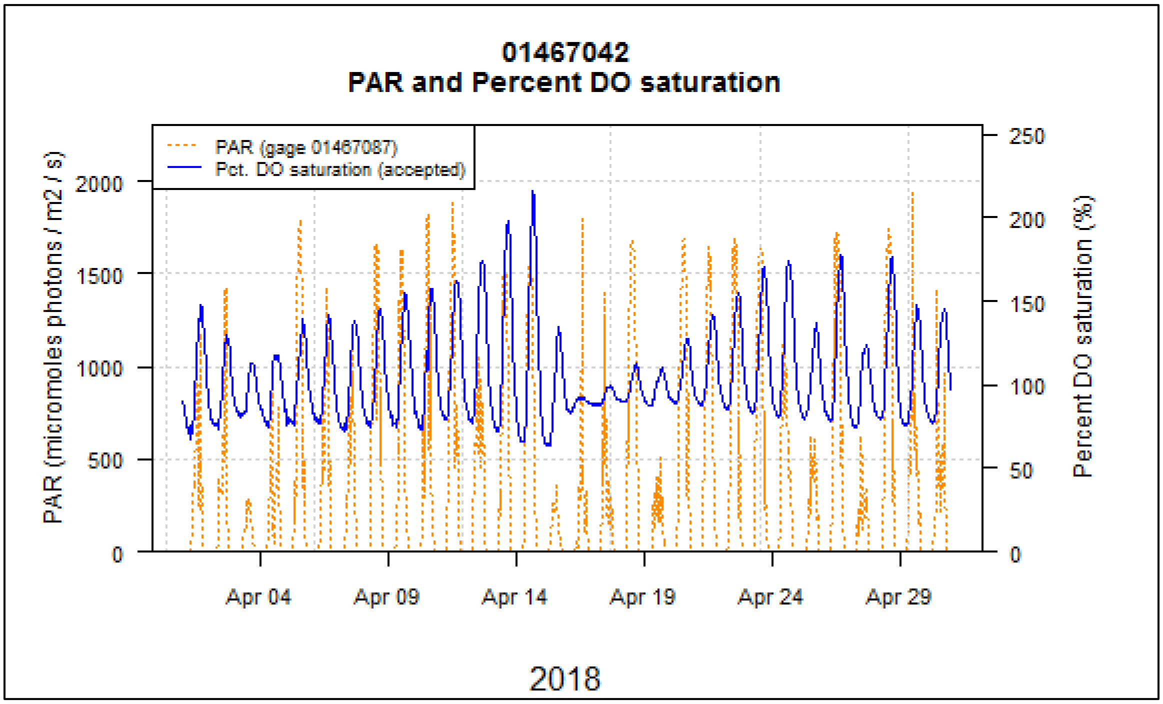


Figure 35. Gage 01467042, PAR and Percent Dissolved Oxygen Saturation, April 2018.

Figure 36. Gage 01467042, Pennypack Creek at Pine Rd., looking upstream

Figure 37. Gage 01467048, Pennypack Creek at Lower Rhawn St. Bridge, looking upstream

Turbidity

Turbidity data at the Pennypack Creek gages tend to reflect streamflow conditions. When there is high flow (*i.e.*, during and after storms), increases in turbidity are common and expected, as sediment in the creek bed is resuspended and particles present in runoff enter the stream (Figure 38). The downstream gage generally exhibited higher turbidity values throughout the year (Tables 39-40).

Flagged data are often due to periods during the month when sondes report high turbidity values that were corrected after the instrumentation was cleaned. After a storm, optical sensors such as those used to detect dissolved oxygen and turbidity can return inaccurate readings due to the sonde pipe becoming clogged with sediment and other debris. When turbidity readings come down after a cleaning, it is typical procedure to flag data back to the end of a storm, when the sonde pipe likely became clogged and did not reflect actual conditions in the stream.

Table 39. Gage 01467042, Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	729.8	30.4	0.0	33.1	66.9	0.0	267.0	6.9
Aug-17	732.0	30.5	0.0	29.2	70.8	0.0	210.0	4.2
Sep-17	703.5	29.3	0.0	10.2	89.8	0.0	22.6	1.2
Oct-17	704.3	29.3	0.0	20.4	79.6	0.0	250.0	4.2
Nov-17	718.8	29.9	0.0	3.4	96.6	0.0	13.1	0.6
Mar-18	467.8	19.5	0.0	18.8	81.2	1.9	9.0	2.6
Apr-18	718.3	29.9	0.0	12.0	88.0	0.5	440.0	5.6
May-18	742.5	30.9	0.0	34.3	65.7	0.0	281.0	7.9
Jun-18	718.8	29.9	0.0	31.2	68.8	0.0	237.0	6.8

Table 40. Gage 01467048, Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	468.0	19.5	37.1	67.5	32.5	0.9	325.0	14.4
Aug-17	743.5	31.0	0.1	41.2	58.8	0.8	245.0	14.7
Sep-17	660.0	27.5	8.3	15.8	84.2	0.9	120.0	2.5
Oct-17	636.0	26.5	14.5	27.7	72.3	0.5	340.0	8.7
Nov-17	530.5	22.1	22.6	8.6	91.4	0.1	24.2	1.7
Mar-18	487.5	20.3	10.2	20.4	79.6	1.0	8.0	2.3
Apr-18	720.0	30.0	0.0	53.5	46.5	0.3	360.0	6.5
May-18	604.0	25.2	18.8	39.2	60.8	0.4	1440.0	99.2
Jun-18	720.0	30.0	0.0	54.2	45.8	0.5	303.0	11.8

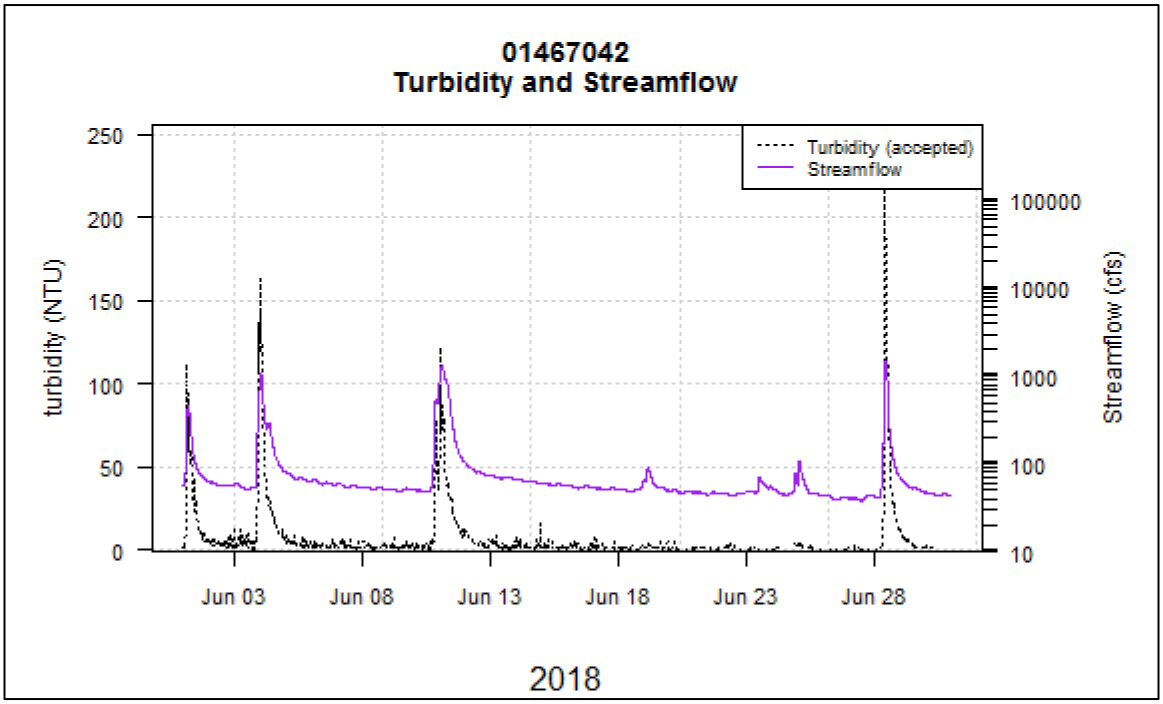


Figure 38. Gage 01467042, Turbidity and Streamflow, June 2018.

Specific Conductance

Specific conductance data were similar to other Philadelphia area streams. Elevated mean and maximum conductance values at both gages in March may be evidence of the effects of stormwater runoff and snowmelt containing road salt. Data marked as flagged at the downstream gage usually represents missing data from offline sondes during bridge reconstruction.

Table 41. Gage 01467042 Specific Conductance Summary Results by Month

Month	Total hours accepted data	Total days accepted data	Percent hours flagged data	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	165.0	765.0	579.3
Aug-17	741.3	30.9	0.0	197.0	779.0	596.3
Sep-17	719.0	30.0	0.0	334.0	837.0	698.9
Oct-17	743.0	31.0	0.0	118.0	860.0	657.0
Nov-17	719.8	30.0	0.0	430.0	774.0	648.3
Mar-18	468.0	19.5	0.0	774.0	2790.0	1044.7
Apr-18	718.8	29.9	0.0	174.0	1400.0	790.1
May-18	742.0	30.9	0.0	141.0	808.0	636.3
Jun-18	718.3	29.9	0.0	148.0	746.0	610.2

Table 42. Gage 01467048 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	74.0	746.0	519.4
Aug-17	743.5	31.0	0.1	116.0	768.0	541.7
Sep-17	660.0	27.5	8.3	327.0	817.0	661.3
Oct-17	632.5	26.4	15.0	122.0	839.0	585.5
Nov-17	719.5	30.0	0.1	368.0	770.0	650.5
Mar-18	488.0	20.3	10.2	783.0	2640.0	1082.8
Apr-18	720.0	30.0	0.2	156.0	1240.0	805.9
May-18	742.0	30.9	0.3	126.0	794.0	600.8
Jun-18	720.0	30.0	0.0	117.0	738.0	577.4

Temperature

Temperature data showed variable attainment of maximum temperature criteria (Tables 43-44). Spring and early summer months are always subject to major air temperature fluctuations, and reliably predicting average stream temperatures during these periods is difficult at best. Maximum criteria for the summer months, for example, do not take into account natural summer temperature peaks. Above normal air temperatures are the likely cause of high stream temperature exceedance rates in July 2017 (Figures 39-40).

Table 43. Gage 01467042 Temperature Summary Results by Maximum Criteria Period

Des. Use	Date range start	Date range end	Percent hours exceedance	Percent hours attaining	Percent hours flagged data	Total hours accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	53.9	46.1	0.0	744	31	18.9	27.4	23.3
TSF	1-Aug	15-Aug	0.0	100.0	0.3	359	15	17.8	25.3	21.7
TSF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	16			
TSF	1-Sep	15-Sep	0.0	100.0	0.1	359.5	15	15.8	23.0	19.7
TSF	16-Sep	30-Sep	0.0	100.0	0.0	360	15			
TSF	1-Oct	15-Oct	1.1	98.9	0.1	359.5	15	11.1	22.3	16.1
TSF	16-Oct	31-Oct	1.7	98.3	0.1	383.5	16			
TSF	1-Nov	15-Nov	19.9	80.1	0.0	360	15	4.6	15.8	8.9
TSF	16-Nov	30-Nov	3.8	96.2	0.1	359.85	15			
TSF	1-Mar	31-Mar	33.5	66.5	37.1	468	19.5	2.8	13.3	7.5
TSF	1-Apr	15-Apr	26.3	73.7	0.2	359.3	15	6.8	19.9	11.3
TSF	16-Apr	30-Apr	23.3	76.7	0.0	360	15			
TSF	1-May	15-May	37.3	62.7	0.3	359	15	10.4	22.8	17.7
TSF	16-May	31-May	15.1	84.9	0.2	383.3	16			
TSF	1-Jun	15-Jun	9.4	90.6	0.0	360	15			
TSF	16-Jun	30-Jun	26.9	73.1	0.6	357.8	15	14.8	25.2	19.8

Table 44. Gage 01467048, Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	75.7	24.3	0.1	743.5	31.0	20.0	29.3	24.3
TSF	1-Aug	15-Aug	0.0	100.0	0.0	360.0	15.0	17.8	26.5	22.5
TSF	16-Aug	31-Aug	0.0	100.0	0.1	383.5	16.0			
TSF	1-Sep	15-Sep	0.0	100.0	0.3	359.0	15.0	16.3	24.5	20.3
TSF	16-Sep	30-Sep	0.0	100.0	16.4	301.0	12.5			
TSF	1-Oct	15-Oct	3.8	96.2	30.0	252.0	10.5	11.4	23.0	16.5
TSF	16-Oct	31-Oct	0.0	100.0	1.4	378.5	15.8			
TSF	1-Nov	15-Nov	10.8	89.2	0.0	360.0	15.0	4.2	15.3	8.4
TSF	16-Nov	30-Nov	0.0	100.0	0.1	359.5	15.0			
TSF	1-Mar	31-Mar	18.6	81.4	34.4	488.0	20.3	2.5	13.0	6.8
TSF	1-Apr	15-Apr	19.5	80.5	0.0	360.0	15.0	7.3	19.6	10.9
TSF	16-Apr	30-Apr	32.5	67.5	0.0	360.0	15.0			
TSF	1-May	15-May	51.6	48.4	0.1	359.5	15.0	11.1	23.8	18.4
TSF	16-May	31-May	27.8	72.2	0.3	383.0	16.0			
TSF	1-Jun	15-Jun	18.9	81.1	0.0	360.0	15.0			
TSF	16-Jun	30-Jun	48.9	51.1	0.0	360.0	15 .0	15.1	26.5	20.6

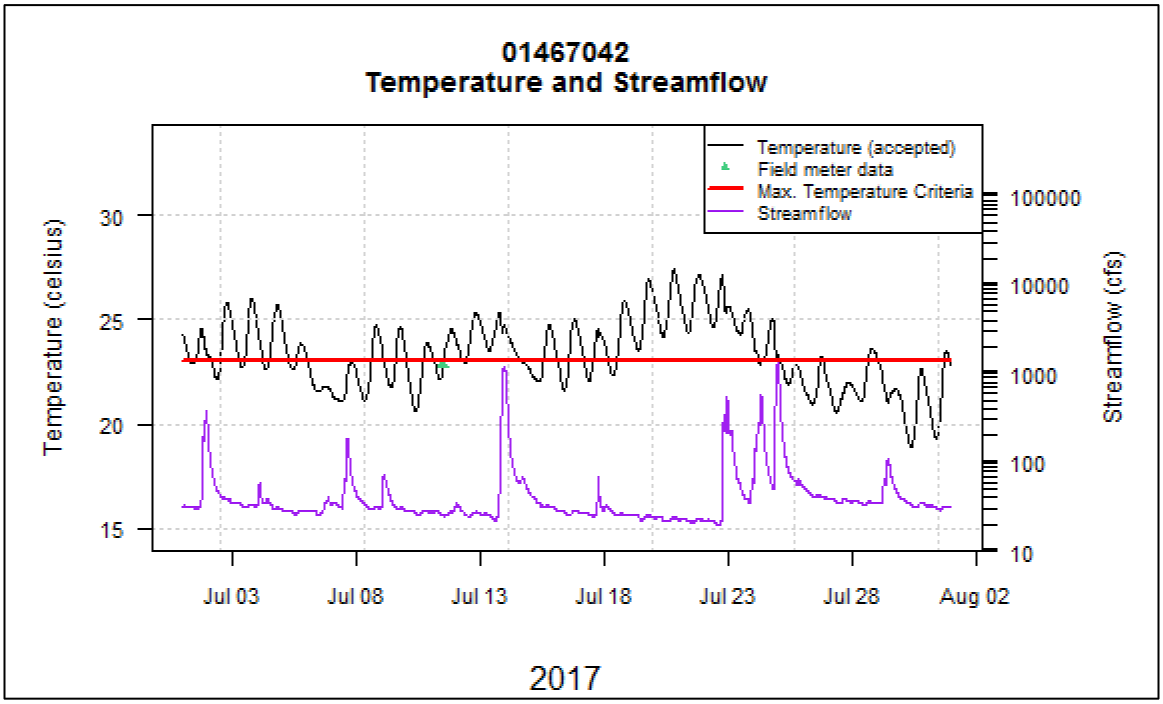


Figure 39. Gage 01467042, Temperature and Streamflow, July 2017.

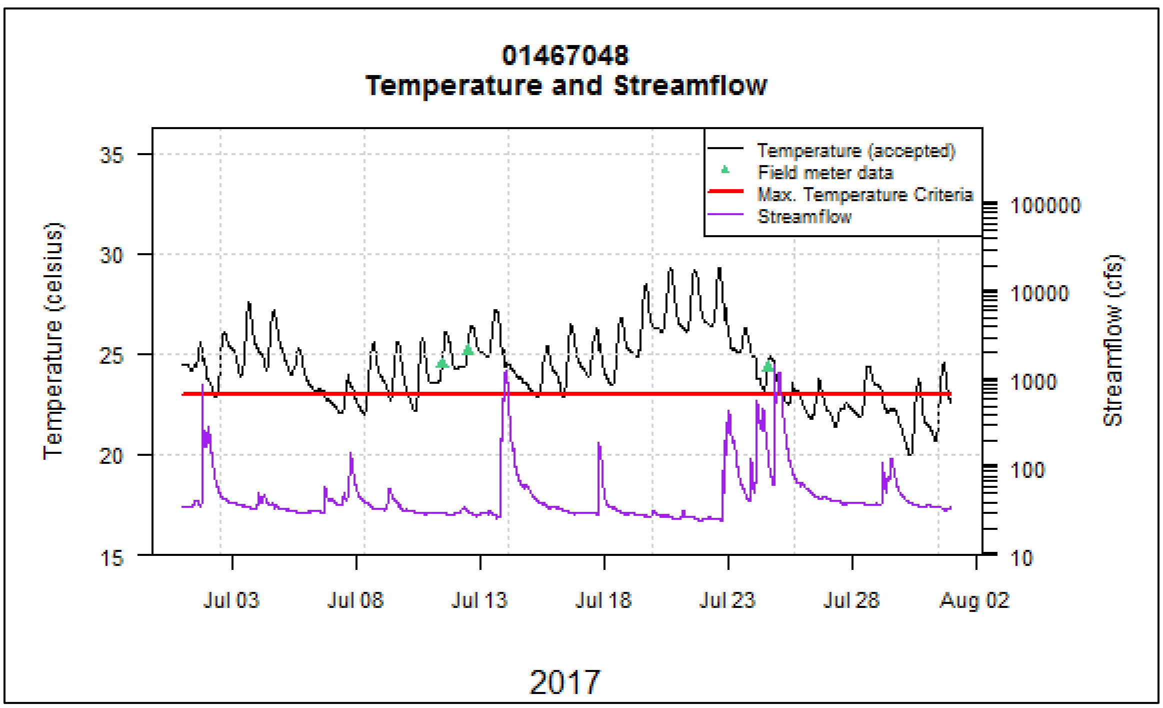
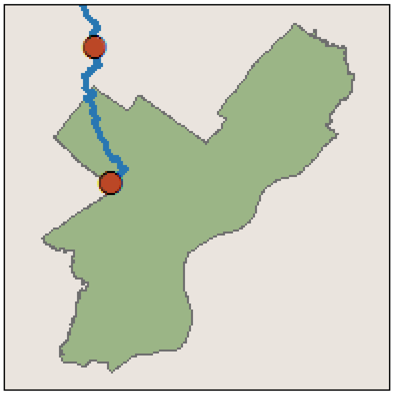


Figure 40. Gage 01467048, Temperature and Streamflow, July 2017.

Wissahickon Creek (Gages 01473900 and 01474000)



Dissolved oxygen and pH

Dissolved oxygen and pH data collected from the Wissahickon Creek gages also show signs of strong algal activity in the form of diel fluctuations. Although these two sites never exceeded the 7-day average guideline for dissolved oxygen, the upper gage (01473900) exhibits some of the most dramatic diel fluctuations of any of the Philadelphia USGS gage sites. In April 2018, dissolved oxygen can be observed to fluctuate by approximately 16 mg/L in a single day/night period (Figure 45), with pH ranging from approximately 7.6 to 9.5 at the same time (Figure 46). The pH maxima were exceeded in spring, a direct result of algal activity (Table 49).

Table 45. Gage 01473900 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	TSF	744.0	31.0	0.0	0.0	100.0	5.7	13.1	8.2
Aug-17	TSF	744.0	31.0	0.0	0.0	100.0	6.1	12.0	8.1
Sep-17	TSF	679.0	28.3	5.7	1.4	98.6	4.8	12.8	8.4
Oct-17	TSF	742.5	30.9	0.2	0.4	99.6	4.9	14.7	8.7
Nov-17	TSF	720.0	30.0	0.0	0.0	100.0	8.1	19.7	11.5
Mar-18	TSF	466.5	19.4	0.2	0.0	100.0	7.2	21.7	13.4
Apr-18	TSF	718.5	29.9	0.2	0.0	100.0	5.3	23.1	12.2
May-18	TSF	741.5	30.9	0.3	1.5	98.5	4.3	20.0	8.7
Jun-18	TSF	718.5	29.9	0.2	0.0	100.0	6.0	10.7	8.1

Table 46. Gage 01474000 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	TSF	744.0	31.0	0.0	0.0	100.0	6.4	11.6	8.3
Aug-17	TSF	743.0	31.0	0.1	0.0	100.0	6.8	12.1	8.7
Sep-17	TSF	719.0	30.0	0.1	0.0	100.0	7.0	12.7	9.0
Oct-17	TSF	741.5	30.9	0.3	0.0	100.0	7.1	11.8	9.3
Nov-17	TSF	719.0	30.0	0.1	0.0	100.0	9.4	14.4	11.7
Mar-18	TSF	394.5	16.4	0.0	0.0	100.0	9.3	18.4	13.4
Apr-18	TSF	719.5	30.0	0.1	0.0	100.0	7.6	19.5	12.0
May-18	TSF	743.0	31.0	0.1	0.0	100.0	6.8	16.5	9.3
Jun-18	TSF	720.0	30.0	0.0	0.0	100.0	7.5	10.9	8.8

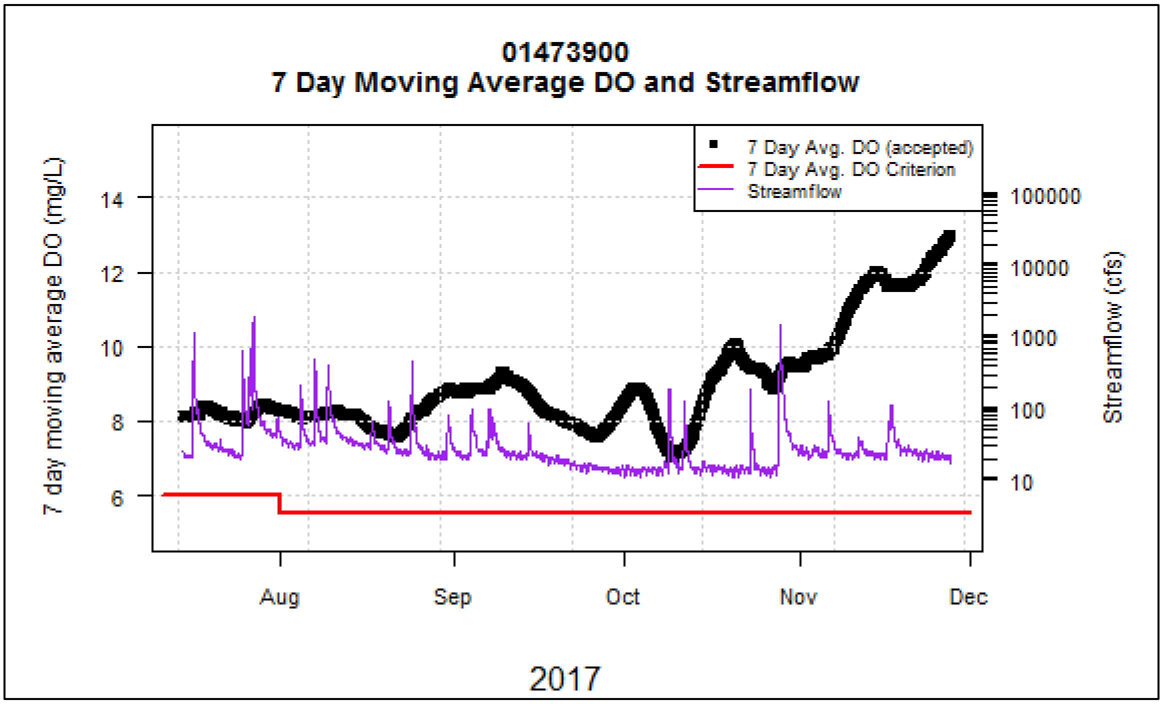


Figure 41. Gage 01473900, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

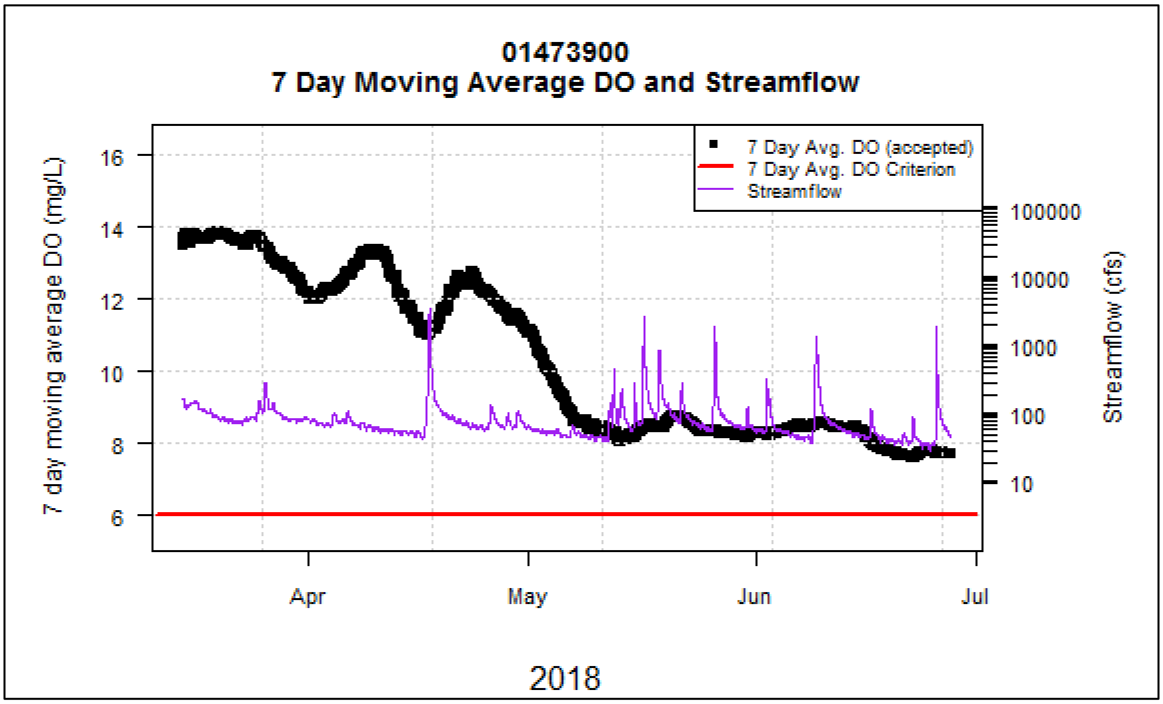


Figure 42. Gage 01473900, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

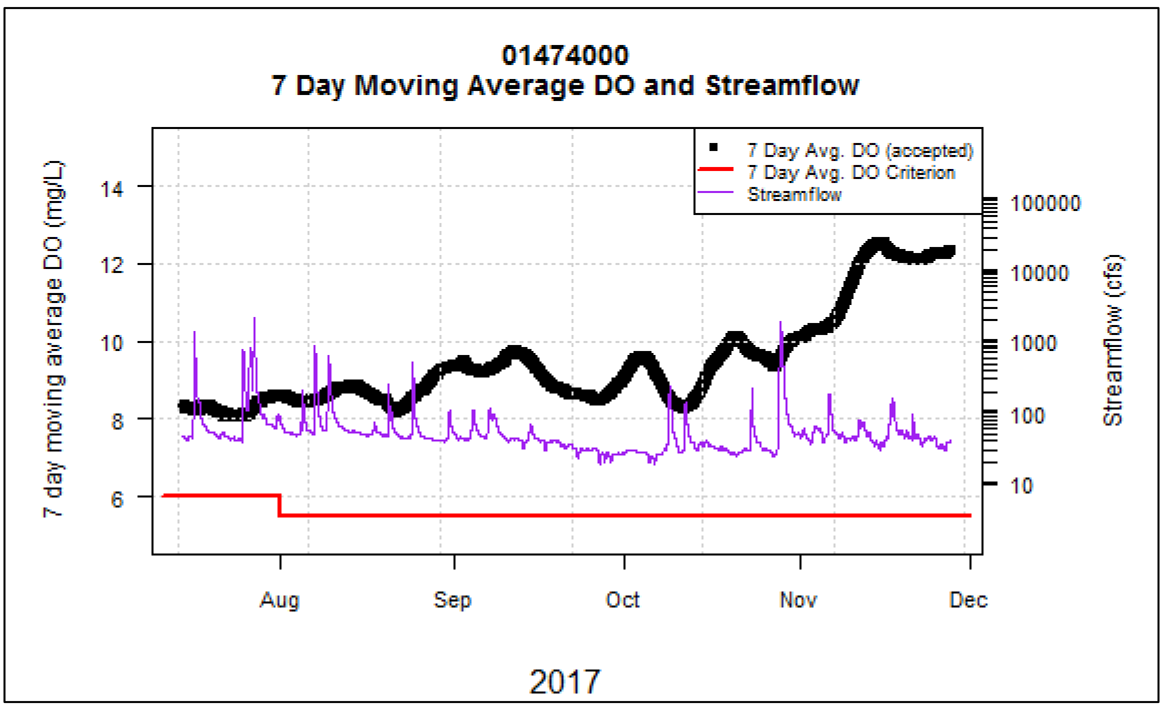


Figure 43. Gage 01474000, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

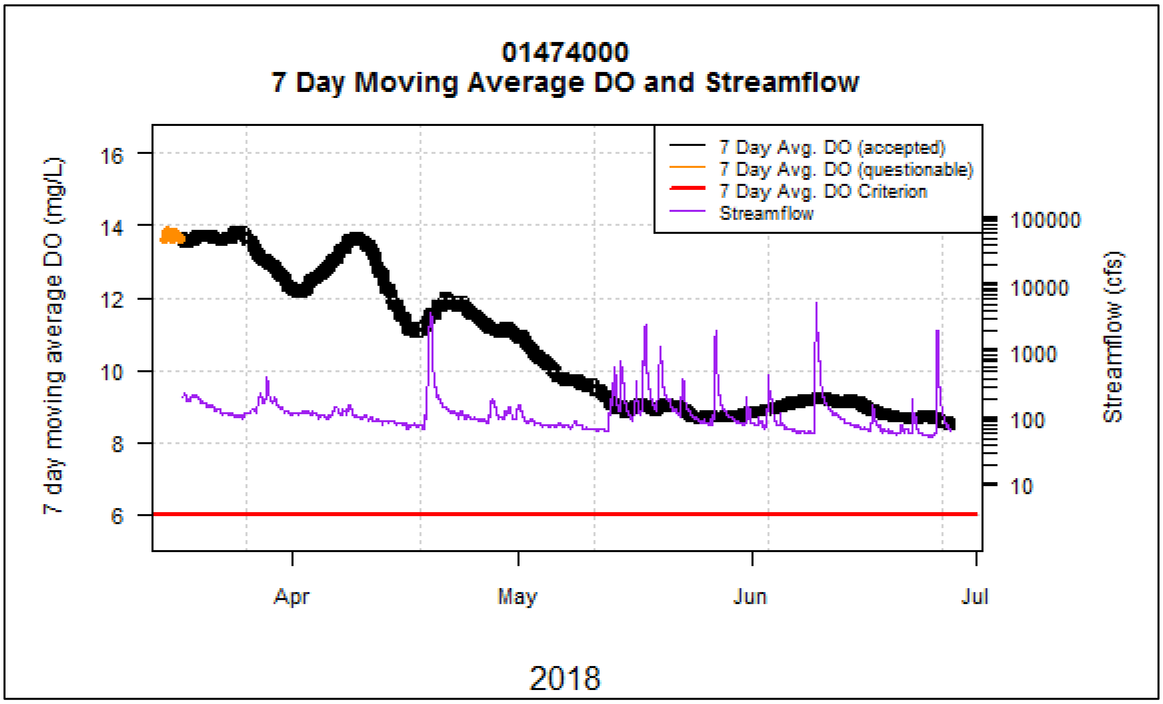


Figure 44. Gage 01474000, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

Table 47. Gage 01473900 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	TSF	31.0	0.0	7.4	9.0	8.2
Aug-17	TSF	31.0	0.0	7.3	9.2	8.1
Sep-17	TSF	27.0	10.0	7.1	9.6	8.4
Oct-17	TSF	28.0	9.7	5.7	10.3	8.8
Nov-17	TSF	30.0	0.0	9.3	13.4	11.5
Mar-18	TSF	18.0	7.6	11.0	14.7	13.4
Apr-18	TSF	28.0	6.7	9.2	13.8	12.2
May-18	TSF	28.0	9.7	6.9	11.4	8.6
Jun-18	TSF	28.0	6.7	7.0	8.8	8.1

Table 48. Gage 01474000 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	TSF	31.0	0.0	7.5	8.9	8.3
Aug-17	TSF	30.0	3.2	7.9	9.5	8.7
Sep-17	TSF	29.0	3.3	8.1	10.2	9.1
Oct-17	TSF	30.0	3.2	7.8	10.3	9.3
Nov-17	TSF	29.0	3.3	10.0	13.0	11.7
Mar-18	TSF	16.0	2.7	11.1	14.7	13.4
Apr-18	TSF	29.0	3.3	9.4	14.0	12.0
May-18	TSF	30.0	3.2	8.1	11.4	9.2

Jun-18	TSF	30.0	0.0	8.2	9.5	8.8

Table 49. Gage 01473900 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	8.5	7.7
Aug-17	743.5	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.2	7.7
Sep-17	679.0	28.3	5.7	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.2	7.7
Oct-17	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.4	7.7
Nov-17	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.5	8.9	7.8
Mar-18	402.5	16.8	13.9	17.8	66.7	0.0	0.0	82.2	33.3	7.6	9.5	8.4
Apr-18	718.5	29.9	0.2	18.1	66.7	0.0	0.0	81.9	33.3	7.2	9.5	8.3
May-18	741.0	30.9	0.4	1.7	9.7	0.0	0.0	98.3	90.3	7.3	9.3	7.8
Jun-18	717.5	29.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.1	7.7

Table 50. Gage 01474000 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.3	8.6	8.0
Aug-17	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.5	8.6	8.0
Sep-17	719.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.8	8.7	8.2
Oct-17	741.5	30.9	0.3	0.0	0.0	0.0	0.0	100.0	100.0	7.5	8.4	8.0
Nov-17	719.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.9	8.5	8.2
Mar-18	394.5	16.4	0.0	21.7	82.4	0.0	0.0	78.3	17.6	8.0	9.5	8.7
Apr-18	719.5	30.0	0.1	23.6	70.0	0.0	0.0	76.4	30.0	7.3	9.5	8.6
May-18	743.0	31.0	0.1	3.0	19.4	0.0	0.0	97.0	80.6	7.5	9.3	8.2
Jun-18	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.6	8.6	8.2

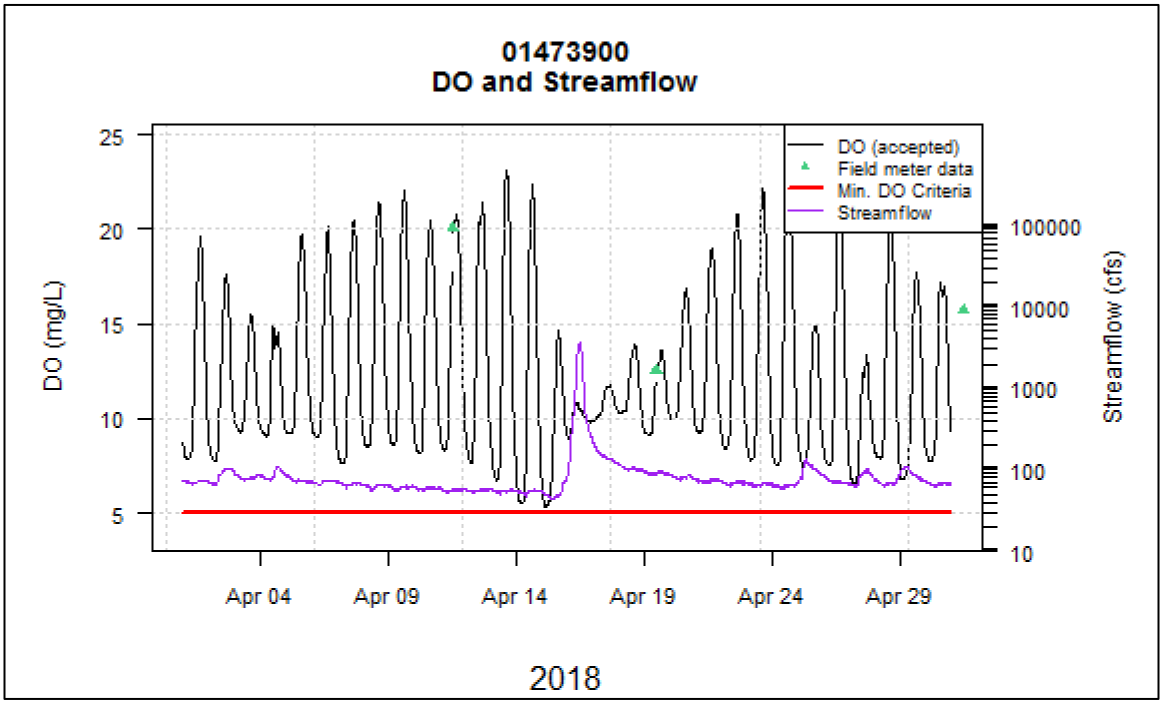


Figure 45. Gage 01473900, Dissolved Oxygen and Streamflow, April 2018.

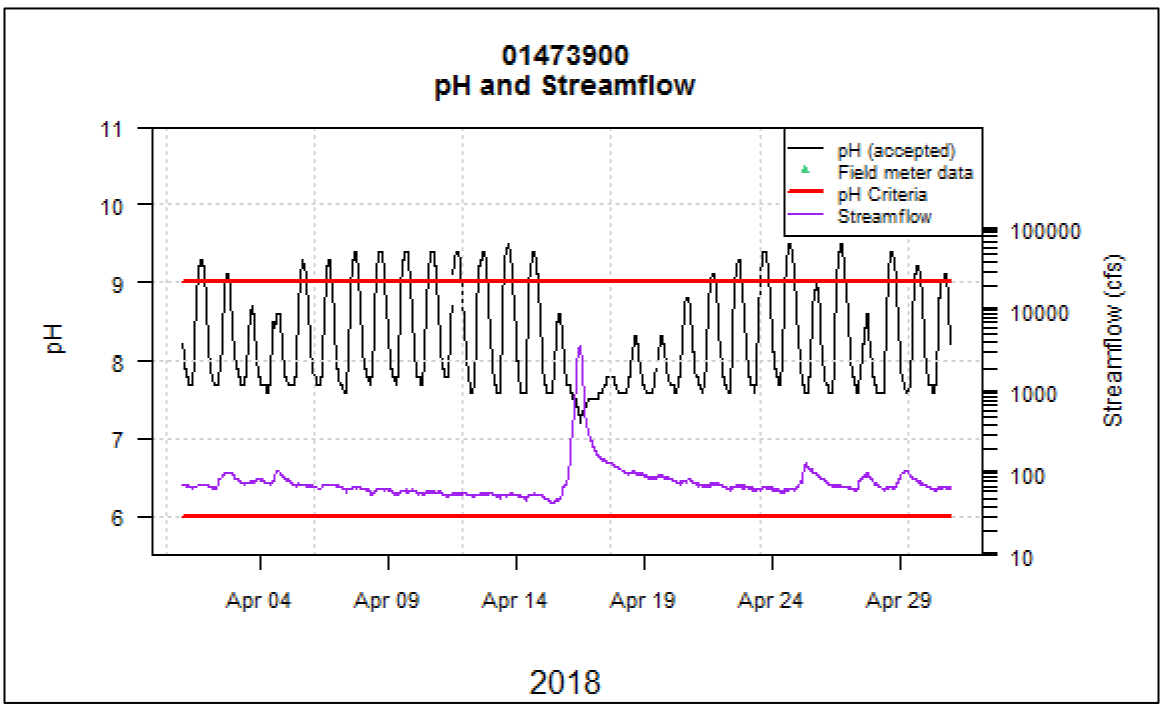


Figure 46. Gage 01473900, pH and Streamflow, April 2018.

Figure 47. Gage 01473900, Wissahickon Creek at Ft. Washington, looking downstream

Figure 48. Gage 01474000, Wissahickon Creek at mouth, looking downstream

Turbidity

Turbidity in the Wissahickon, as with most of Philadelphia's streams, increases drastically with increased flow from rainfall (Tables 51-52). It is possible that these spikes represent a temporarily fouled sensor (i.e., sediment or debris obscures the optical probe for turbidity), but the general rule in QAQC procedures is not to flag turbidity spikes that recede to normal levels on their own. If the sensor remains fouled after a storm or a field check confirms aberrant values, the data is flagged as in Figure 49.

Table 51. Gage 01473900 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	61.7	38.3	1.4	372.0	8.6
Aug-17	744.0	31.0	0.0	31.9	68.1	0.9	109.0	4.6
Sep-17	679.0	28.3	5.7	10.2	89.8	0.1	15.2	1.5
Oct-17	742.5	30.9	0.2	33.1	66.9	0.4	192.0	5.6
Nov-17	639.0	26.6	11.3	19.1	80.9	0.3	31.2	2.7
Mar-18	390.5	16.3	16.5	20.7	79.3	0.8	26.4	2.5
Apr-18	719.0	30.0	0.1	60.5	39.5	0.7	342.0	9.0
May-18	633.5	26.4	14.9	76.7	23.3	0.8	264.0	16.6
Jun-18	682.0	28.4	5.3	32.6	67.4	0.9	268.0	6.8

Table 52. Gage 01474000 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	21.7	78.3	0.1	304.0	6.5
Aug-17	743.0	31.0	0.1	14.1	85.9	0.2	281.0	2.9
Sep-17	714.0	29.8	0.3	2.9	97.1	0.0	42.7	0.6
Oct-17	727.5	30.3	0.3	10.9	89.1	0.0	451.0	3.5
Nov-17	719.0	30.0	0.1	4.0	96.0	0.0	99.1	1.8
Mar-18	394.5	16.4	0.0	10.6	89.4	0.9	7.1	1.8
Apr-18	719.5	30.0	0.1	12.6	87.4	0.8	345.0	7.1
May-18	742.5	30.9	0.2	42.9	57.1	0.4	273.0	10.0
Jun-18	720.0	30.0	0.0	19.4	80.6	0.5	423.0	7.0

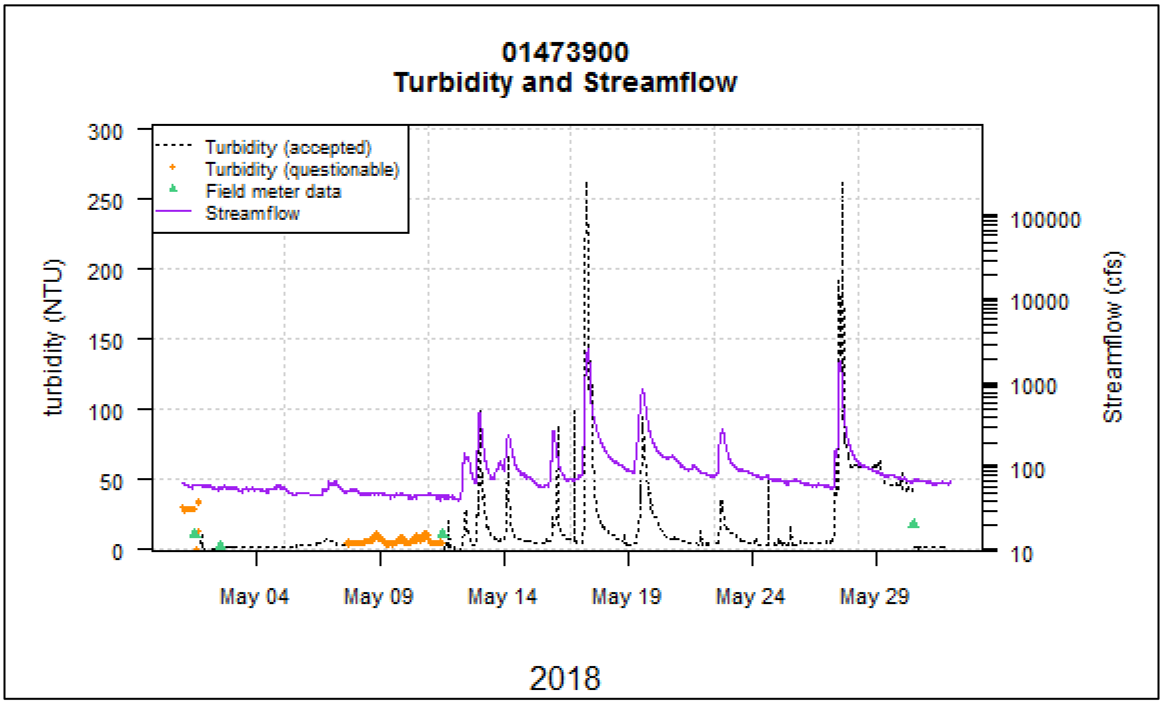


Figure 49. Gage 01473900, Turbidity and Streamflow, May 2018.

Specific Conductance

Specific conductance data at the Wissahickon Creek gage sites generally follow the established pattern in other Philadelphia streams: Runoff from rain events dilutes the stream and decreases conductivity. However, a reversal in this trend sometimes occurs during winter storms, when it is presumed that the application of road salt (sodium chloride) prior to the storm washes into Wissahickon Creek and causes conductivity to increase in conjunction with streamflow. This pattern is observed when the downstream gage comes online during mid-March 2017 (Figure 50).

Table 53. Gage 01473900 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	123.0	939.0	724.2
Aug-17	743.0	31.0	0.1	265.0	937.0	724.0
Sep-17	678.5	28.3	5.8	555.0	1110.0	923.9
Oct-17	742.0	30.9	0.3	152.0	1180.0	932.1
Nov-17	720.0	30.0	0.0	603.0	966.0	853.5
Mar-18	466.0	19.4	0.3	847.0	2500.0	1110.5
Apr-18	718.5	29.9	0.2	172.0	1350.0	901.8
May-18	741.5	30.9	0.3	151.0	953.0	730.7
Jun-18	718.5	29.9	0.2	141.0	890.0	723.2

Table 54. Gage 01474000 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	153.0	878.0	670.1
Aug-17	743.0	31.0	0.1	250.0	880.0	690.3
Sep-17	718.0	29.9	0.3	513.0	972.0	826.7
Oct-17	741.5	30.9	0.3	195.0	1020.0	809.9
Nov-17	719.0	30.0	0.1	409.0	899.0	789.1
Mar-18	394.5	16.4	0.0	848.0	2190.0	1070.7
Apr-18	719.5	30.0	0.1	191.0	1170.0	820.2
May-18	743.0	31.0	0.1	181.0	886.0	683.5
Jun-18	720.0	30.0	0.0	180.0	835.0	679.6

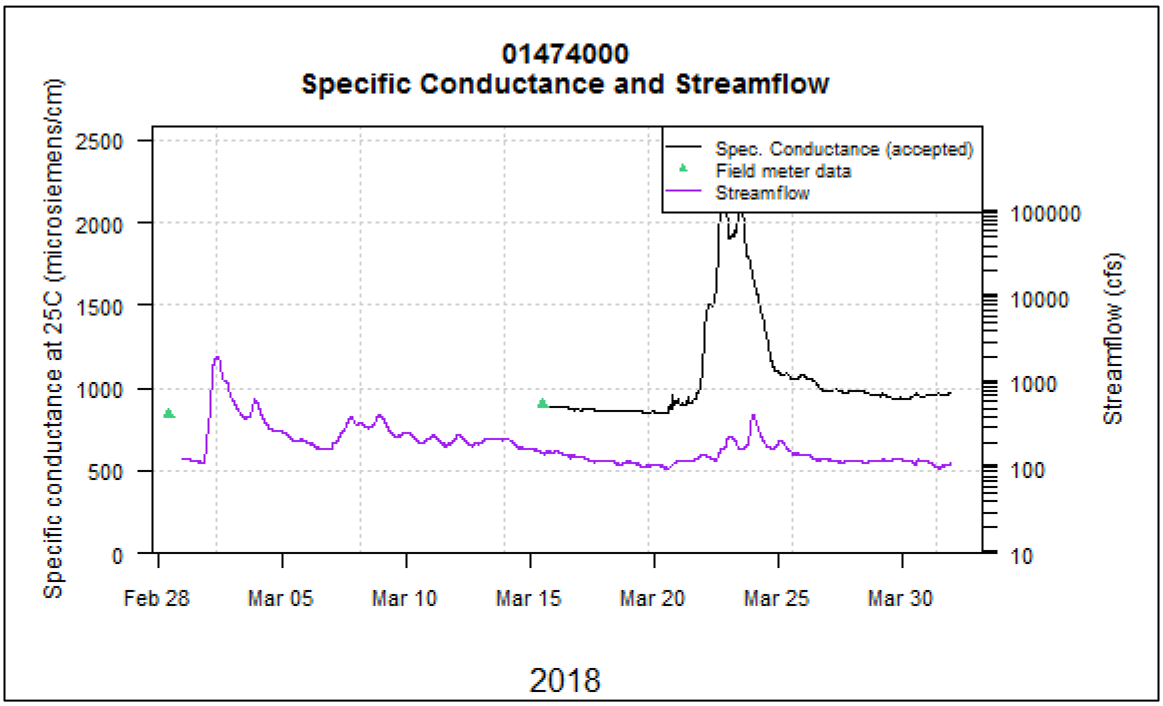


Figure 50. Gage 01474000, Specific Conductance and Streamflow, March 2018.

Temperature

Temperature trends and exceedance rates in Wissahickon Creek Watershed were similar to those observed in Pennypack Creek, with frequent exceedances during the spring and summer in conjunction with higher ambient air temperatures (Tables 55-56, Figures 51-52).

Table 55. Gage 01473900 Temperature Summary Results by Month by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	51.5	48.5	1.9	729.5	30.4	18.8	27.0	23.2
TSF	1-Aug	15-Aug	0.0	100.0	1.5	354.5	14.8	17.7	25.3	21.8
TSF	16-Aug	31-Aug	0.0	100.0	0.9	380.5	15.9			
TSF	1-Sep	15-Sep	0.0	100.0	12.4	315.5	13.1	15.6	23.5	19.8
TSF	16-Sep	30-Sep	0.0	100.0	0.6	358.0	14.9			
TSF	1-Oct	15-Oct	2.2	97.8	1.0	356.5	14.9	11.4	22.4	16.6
TSF	16-Oct	31-Oct	2.1	97.9	1.4	378.5	15.8			
TSF	1-Nov	15-Nov	21.6	78.4	0.4	358.5	14.9	4.9	16.5	9.5
TSF	16-Nov	30-Nov	6.1	93.9	0.3	359.0	15.0			
TSF	1-Mar	31-Mar	31.8	68.2	37.9	462.0	19.3	3.0	13.3	7.4
TSF	1-Apr	15-Apr	26.9	73.1	1.0	356.5	14.9	6.4	19.8	11.3
TSF	16-Apr	30-Apr	22.6	77.4	1.3	355.5	14.8			
TSF	1-May	15-May	36.8	63.2	0.8	357.0	14.9	10.1	22.2	17.5
TSF	16-May	31-May	10.0	90.0	1.4	378.5	15.8			
TSF	1-Jun	15-Jun	6.0	94.0	1.1	356.0	14.8			
TSF	16-Jun	30-Jun	31.2	68.8	0.3	359.0	15.0	15.4	25.0	20.0

Table 56. Gage 01474000 Temperature Summary Results by Month by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
TSF	1-Jul	31-Jul	67.7	32.3	0.9	737.5	30.7	19.8	27.4	23.9
TSF	1-Aug	15-Aug	0.0	100.0	1.5	354.5	14.8	18.0	25.5	22.1
TSF	16-Aug	31-Aug	0.0	100.0	2.1	376.0	15.7			
TSF	1-Sep	15-Sep	0.0	100.0	1.4	355.0	14.8	16.0	22.6	19.7
TSF	16-Sep	30-Sep	0.0	100.0	1.7	354.0	14.8			
TSF	1-Oct	15-Oct	0.0	100.0	1.8	353.5	14.7	11.7	21.7	16.1
TSF	16-Oct	31-Oct	0.0	100.0	0.9	380.5	15.9			
TSF	1-Nov	15-Nov	5.0	95.0	0.6	358.0	14.9	4.8	14.7	8.5
TSF	16-Nov	30-Nov	0.0	100.0	1.1	356.0	14.8			
TSF	1-Mar	31-Mar	27.7	72.3	47.3	392.0	16.3	2.7	13.0	7.4
TSF	1-Apr	15-Apr	22.8	77.2	1.1	356.0	14.8	7.6	18.4	11.3
TSF	16-Apr	30-Apr	26.9	73.1	0.8	357.0	14.9			
TSF	1-May	15-May	41.7	58.3	1.5	354.5	14.8	11.1	22.5	17.8
TSF	16-May	31-May	13.1	86.9	1.7	377.5	15.7			
TSF	1-Jun	15-Jun	5.9	94.1	0.7	357.5	14.9			
TSF	16-Jun	30-Jun	31.6	68.4	1.0	356.5	14.9	15.0	25.4	20.2

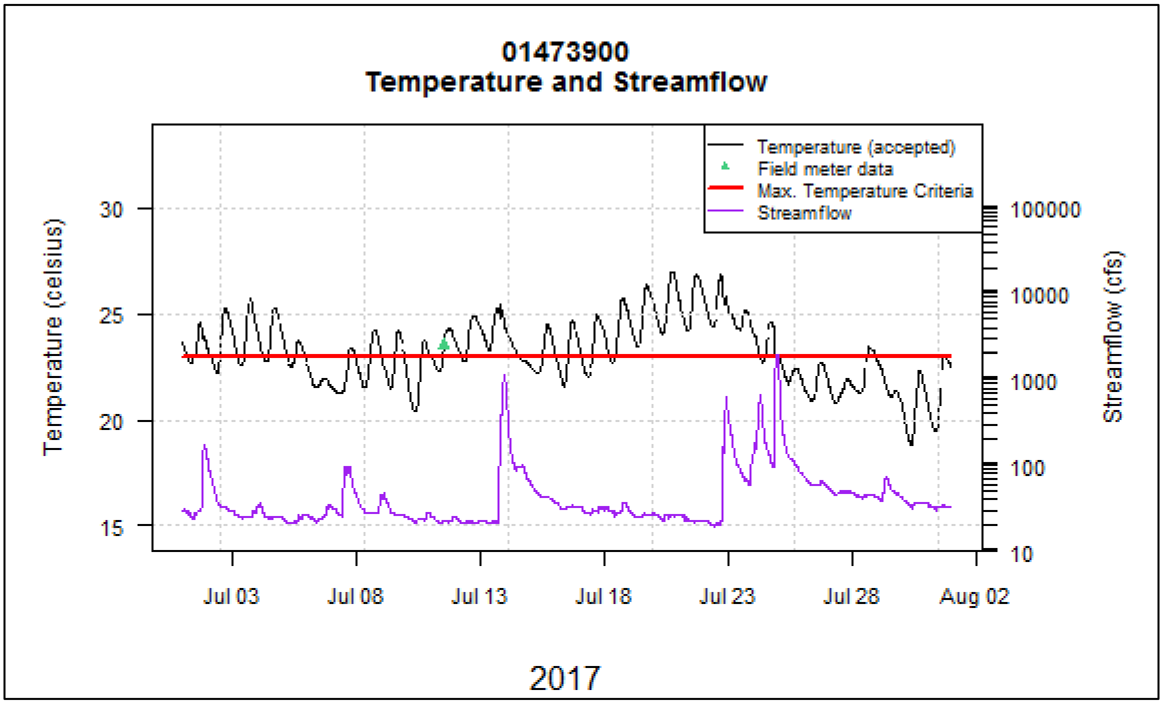


Figure 51. Gage 01473900, Temperature and Streamflow, July 2017.

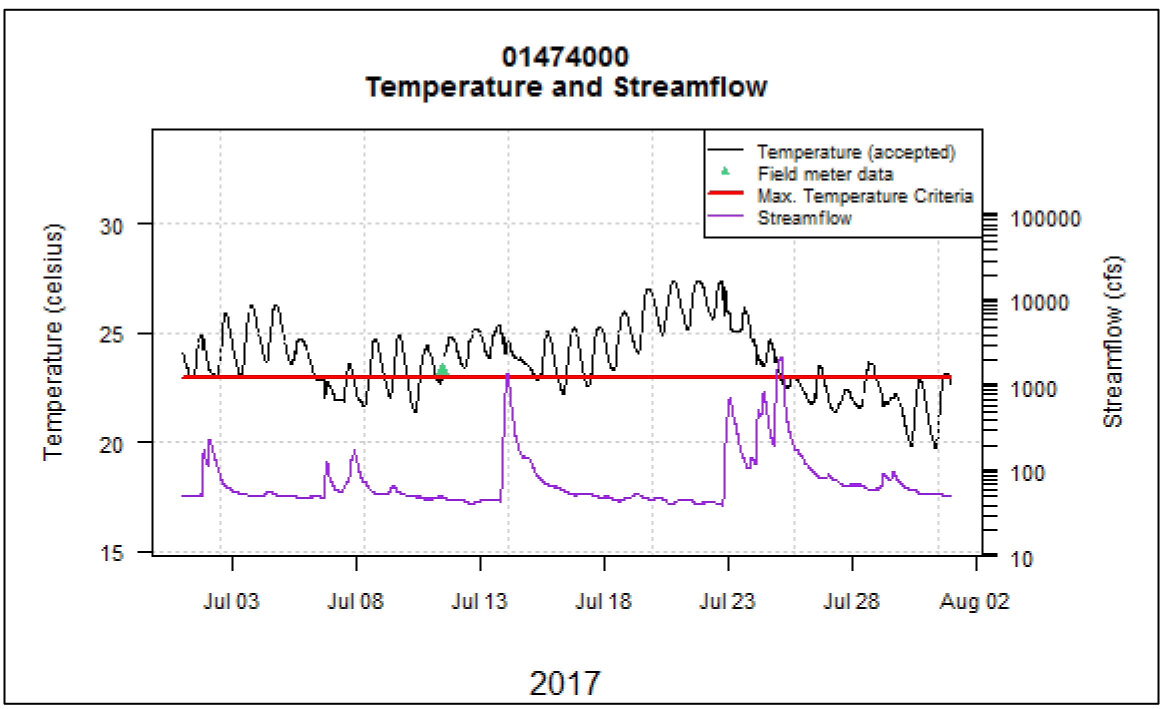
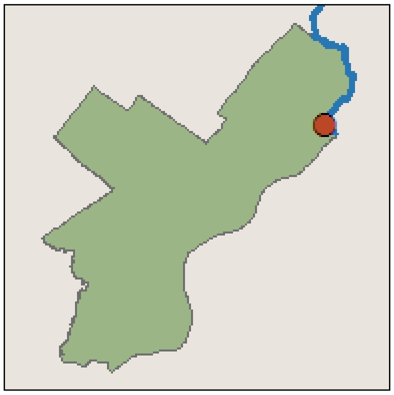


Figure 52. Gage 01474000, Temperature and Streamflow, July 2017.

Poquessing Creek (Gage 01465798)



Dissolved oxygen and pH

Dissolved oxygen and pH at this gage site were usually within acceptable ranges and only occasionally fell below the minimum DO criterion. The site never exceeded the pH maximum criterion (Tables 57-59, Figures 53-54). Data collected from Poquessing Creek did exhibit classic signs of algal activity, as indicated by diel fluctuations in both DO and pH.

As seen with previous sites, the algal activity and related diel fluctuations in DO and pH are only suppressed by storm events. These suppressions, however, are only very temporary. Given an adequate period of uninterrupted algal growth, such as occurred in April 2018 (Figures 55-56), one can expect steadily increasing DO and pH fluctuations.

Table 57. Gage 01465798 Dissolved Oxygen Min. Criteria Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	WWF	738.3	30.8	0.0	1.6	98.4	4.2	13.3	7.4
Aug-17	WWF	731.3	30.5	0.0	0.1	99.9	4.8	14.6	8.1
Sep-17	WWF	717.8	29.9	0.0	0.0	100.0	5.4	13.6	8.1
Oct-17	WWF	712.5	29.7	0.0	1.9	98.1	0.9	12.2	8.4
Nov-17	WWF	655.3	27.3	0.0	0.0	100.0	5.6	13.0	10.3
Mar-18	WWF	610.0	25.4	0.0	0.0	100.0	8.0	18.8	12.9
Apr-18	WWF	717.3	29.9	0.0	0.0	100.0	6.5	18.9	11.6
May-18	WWF	734.0	30.6	0.0	0.0	100.0	5.0	15.1	8.0
Jun-18	WWF	716.0	29.8	0.0	0.0	100.0	4.9	11.8	8.1

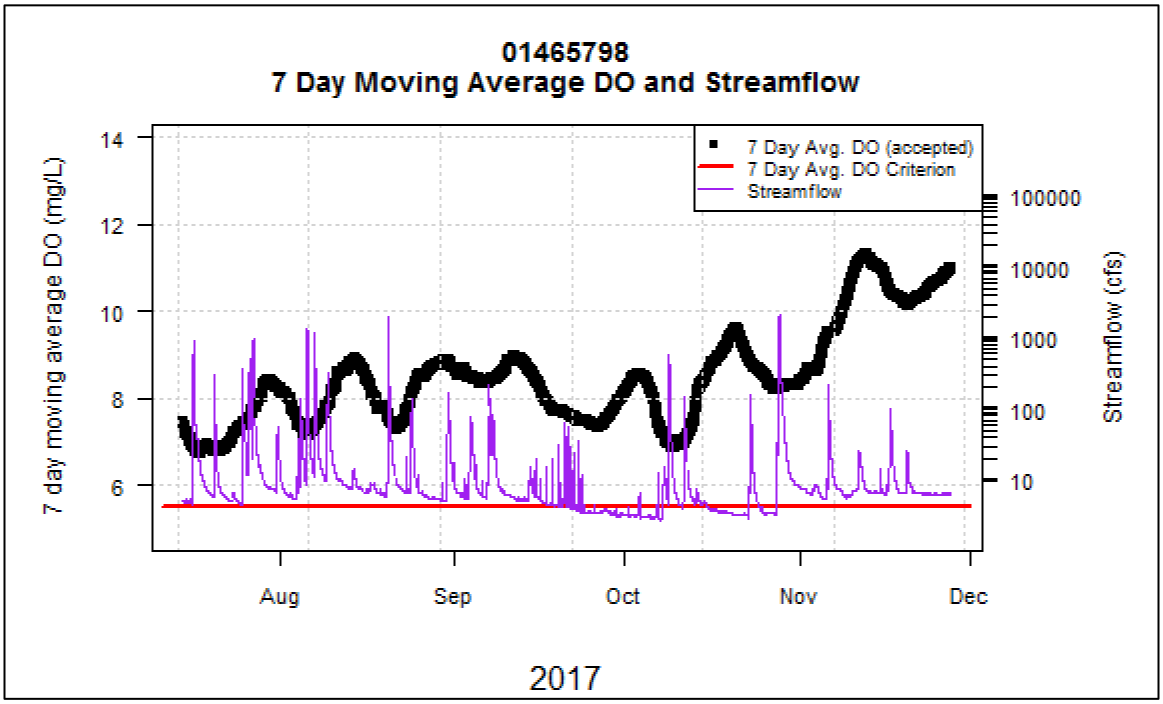


Figure 53. Gage 01465798, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

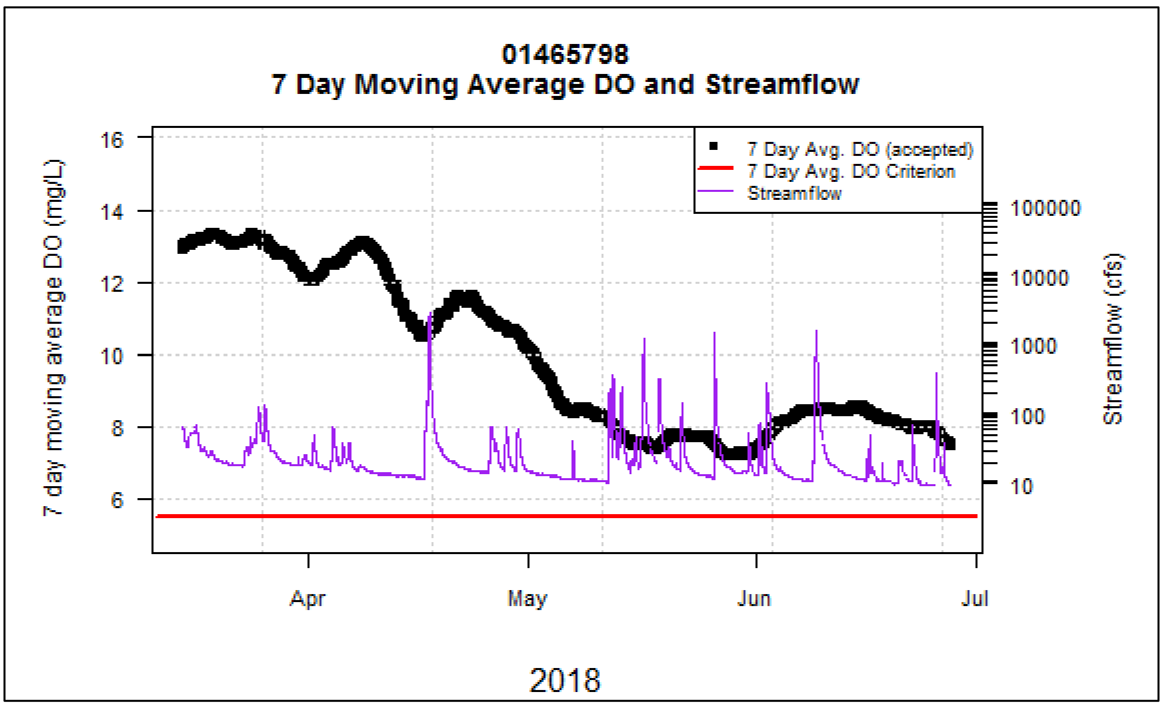


Figure 54. Gage 01465798, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

Table 58. Gage 01465798 Dissolved Oxygen Mean Criteria Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	WWF	29.0	6.5	6.3	9.0	7.4
Aug-17	WWF	28.0	9.7	6.6	9.8	8.2
Sep-17	WWF	27.0	10.0	6.8	9.6	8.2
Oct-17	WWF	28.0	9.7	5.3	9.8	8.4
Nov-17	WWF	24.0	20.0	7.4	11.9	10.4
Mar-18	WWF	24.0	5.6	10.7	13.9	12.9
Apr-18	WWF	28.0	6.7	9.4	13.5	11.6
May-18	WWF	29.0	6.5	6.2	11.2	8.0
Jun-18	WWF	29.0	3.3	6.8	8.8	8.1

Table 59. Gage 01465798 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	743.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.7	7.4
Aug-17	742.0	30.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	8.9	7.3
Sep-17	718.8	29.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.9	8.4	7.2
Oct-17	681.3	28.4	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.6	7.6	7.1
Nov-17	689.3	28.7	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.5	7.3
Mar-18	609.0	25.4	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	9.0	7.4
Apr-18	717.3	29.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.5	9.0	7.4
May-18	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.7	8.1	7.0
Jun-18	718.8	29.9	0.0	0.0	0.0	0.0	0.0	100.0	100.0	6.8	7.8	7.2

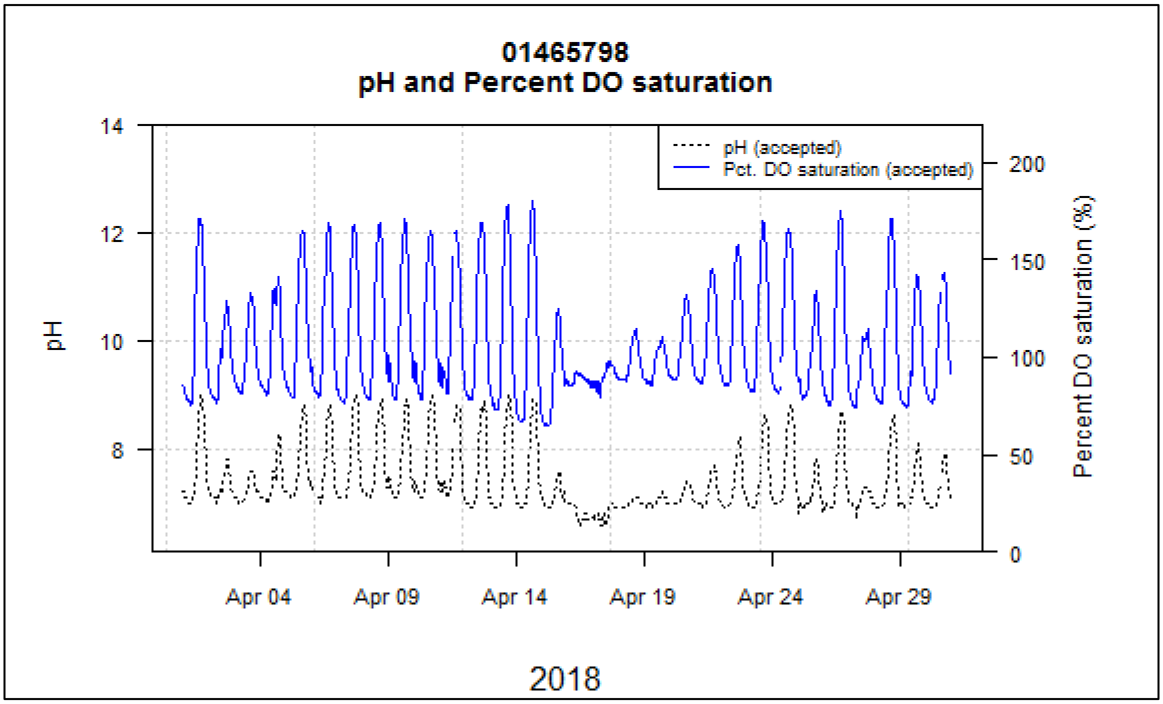


Figure 55. Gage 01465798, pH and Percent DO Saturation, April 2018.

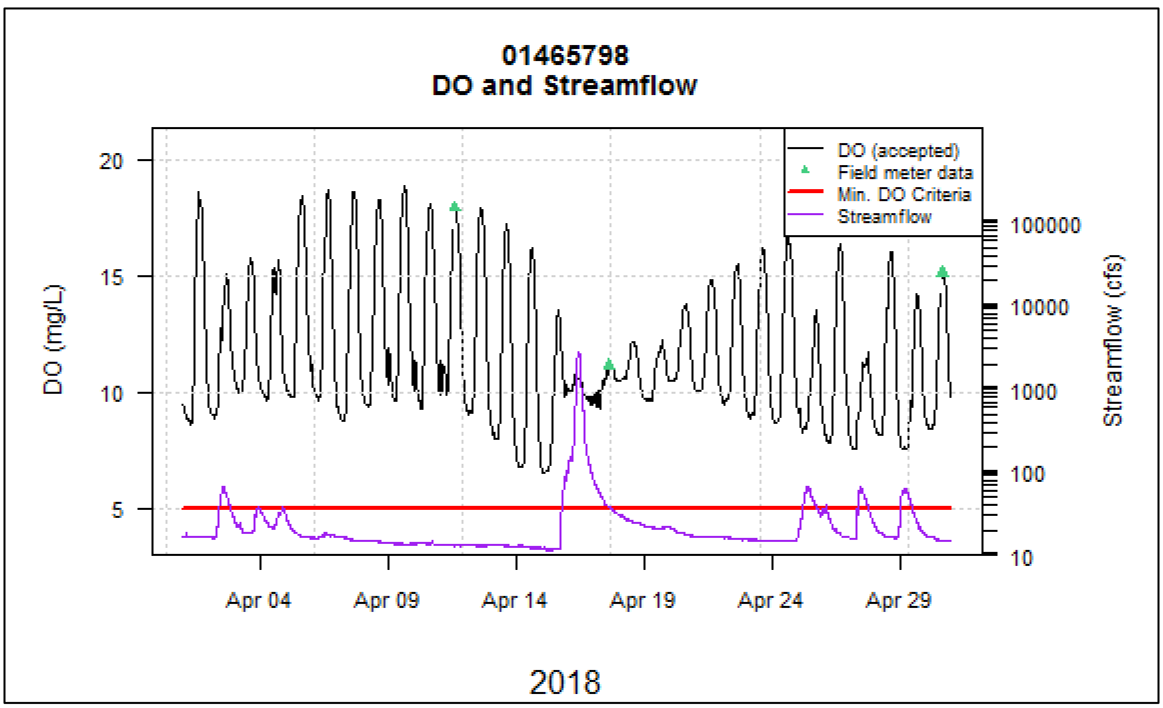


Figure 56. Gage 01465798, DO and Streamflow, April 2018.

Figure 57. Gage 01465798, Poquessing Creek at Grant Ave., looking upstream

Turbidity

As in other Philadelphia streams, high turbidity levels accompanied storm events and increased streamflow.

Table 60. Gage 01465798 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	742.3	30.9	0.0	45.3	54.7	0.5	538.0	8.6
Aug-17	740.3	30.8	0.0	34.6	65.4	0.4	1670.0	9.4
Sep-17	717.8	29.9	0.0	7.9	92.1	0.4	31.8	1.6
Oct-17	740.8	30.9	0.0	19.9	80.1	0.3	1930.0	6.7
Nov-17	719.3	30.0	0.0	15.0	85.0	0.2	22.8	2.0
Mar-18	609.8	25.4	0.0	50.3	49.7	1.0	26.0	4.1
Apr-18	716.8	29.9	0.0	20.3	79.7	0.6	422.0	5.4
May-18	744.0	31.0	0.0	49.8	50.2	0.4	499.0	9.7
Jun-18	718.3	29.9	0.0	21.7	78.3	0.3	373.0	5.5

Specific Conductance

Specific conductance data were similar to other Philadelphia streams, with evidence of road salt causing spikes in specific conductance in early March.

Table 61. Gage 01465798 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	742.8	30.9	0.0	61.0	717.0	454.1
Aug-17	742.8	30.9	0.0	54.0	834.0	483.2
Sep-17	718.8	29.9	0.0	188.0	806.0	635.1
Oct-17	742.0	30.9	0.0	68.0	821.0	562.5
Nov-17	718.8	29.9	0.0	186.0	704.0	561.5
Mar-18	610.0	25.4	0.0	804.0	5880.0	1379.8
Apr-18	717.3	29.9	0.0	148.0	1680.0	831.2
May-18	743.8	31.0	0.0	149.0	851.0	627.7
Jun-18	718.5	29.9	0.0	97.0	818.0	637.8

Temperature

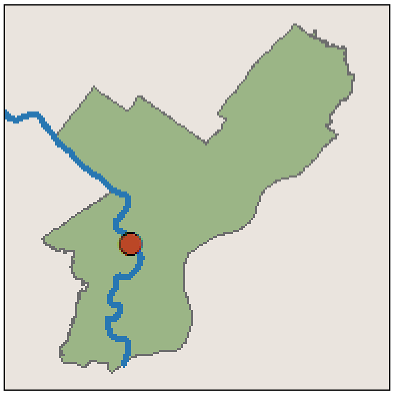
Temperature exceedance rates observed in Poquessing Creek were similar to those in other WWF designated-use creeks (*e.g.*, Tacony and Cobbs Creeks).

Table 62. Gage 01465798 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.1	743.3	31.0	19.2	29.1	24.0
WWF	1-Aug	15-Aug	0.0	100.0	0.1	359.8	15.0	18.1	27.0	22.3
WWF	16-Aug	31-Aug	0.0	100.0	0.3	383.0	16.0			
WWF	1-Sep	15-Sep	0.0	100.0	0.1	359.8	15.0	15.7	24.7	20.1
WWF	16-Sep	30-Sep	0.0	100.0	0.3	359.0	15.0			
WWF	1-Oct	15-Oct	7.3	92.7	0.3	359.0	15.0	11.3	23.2	16.6
WWF	16-Oct	31-Oct	2.6	97.4	0.2	383.3	16.0			
WWF	1-Nov	15-Nov	17.8	82.2	0.2	359.3	15.0	4.0	16.0	8.7
WWF	16-Nov	30-Nov	4.9	95.1	0.0	360.0	15.0			
WWF	1-Mar	31-Mar	22.9	77.1	18.1	609.0	25.4	0.1	14.0	6.4
WWF	1-Apr	15-Apr	29.4	70.6	0.4	358.5	15.0	6.0	21.4	11.3
WWF	16-Apr	30-Apr	30.9	69.1	0.4	358.5	15.0			
WWF	1-May	15-May	44.0	56.0	0.0	360.0	15.0	10.4	24.2	18.2
WWF	16-May	31-May	6.3	93.7	0.0	384.0	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.3	358.8	15.0			
WWF	16-Jun	30-Jun	0.0	100.0	0.0	360.0	15.0	15.1	27.1	20.6

Gages in Large Watersheds

Schuylkill River (Gage 01474500)



Dissolved oxygen and pH

DO water quality criteria were not exceeded at this location (Table 63, Figures 58-59), and pH criteria were exceeded only in April 2018 (Table 65). Supersaturated DO conditions were observed concomitant with daily pH peaks greater than 9.0 in April (Figure 60), indicating high algal activity.

Table 63. Gage 01474500 Dissolved Oxygen Minimum Criterion Summary Results by Month

Month	Des. Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining	Min	Max	Mean
Jul-17	WWF	743.5	31.0	0.1	0.0	100.0	6.6	9.2	7.8
Aug-17	WWF	729.5	30.4	1.9	0.0	100.0	7.2	8.9	8.0
Sep-17	WWF	720.0	30.0	0.0	0.0	100.0	8.1	10.1	9.0
Oct-17	WWF	743.0	31.0	0.1	0.0	100.0	8.1	11.4	9.6
Nov-17	WWF	719.0	30.0	0.1	0.0	100.0	9.3	12.6	11.0
Mar-18	WWF	610.0	25.4	0.1	0.0	100.0	11.1	13.8	12.7
Apr-18	WWF	718.5	29.9	0.2	0.0	100.0	9.5	13.4	11.4
May-18	WWF	742.5	30.9	0.2	0.0	100.0	7.6	11.0	8.9
Jun-18	WWF	719.0	30.0	0.1	0.0	100.0	7.1	9.4	8.1

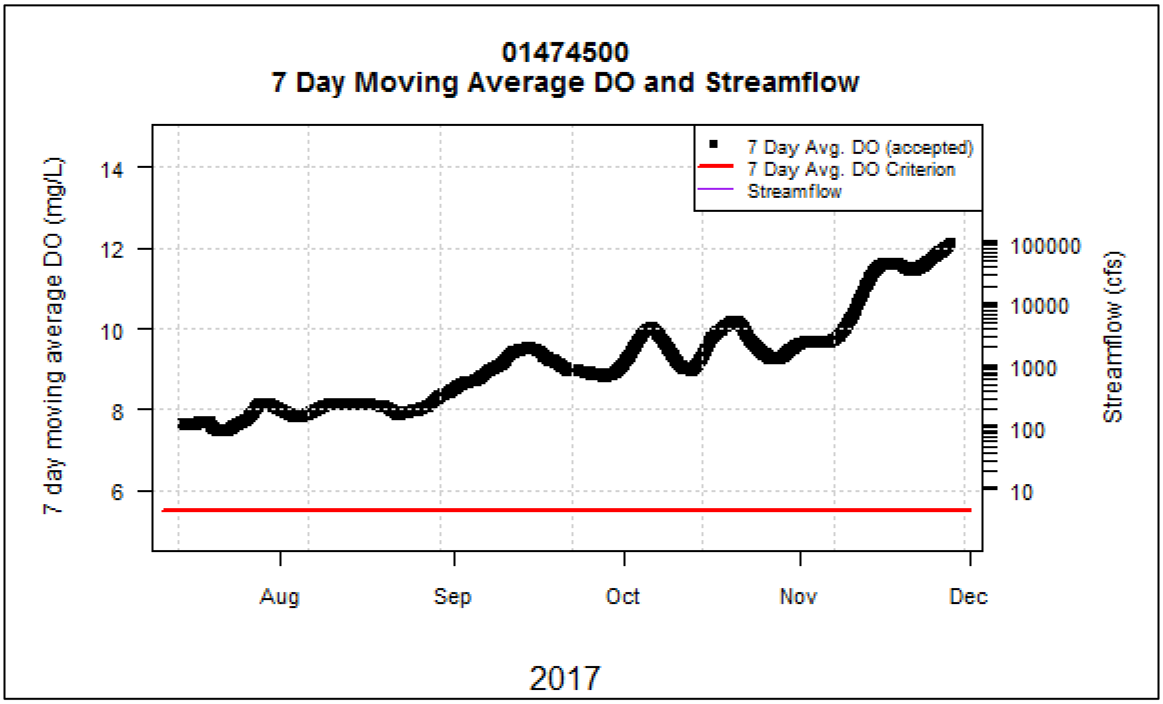


Figure 58. Gage 01474500, 7 Day Average Dissolved Oxygen and Streamflow, Jul-Dec 2017.

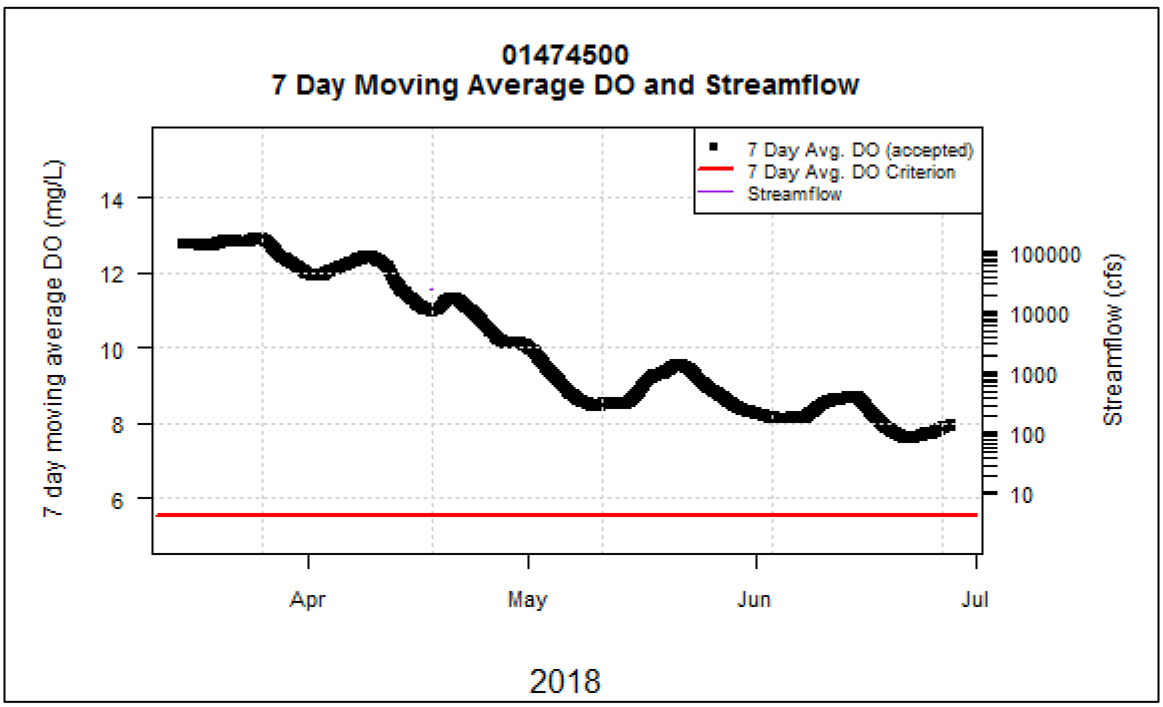


Figure 59. Gage 01474500, 7 Day Average Dissolved Oxygen and Streamflow, Mar-Jun 2018.

Table 64. Gage 01474500 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	Min.	Max.	Mean
Jul-17	WWF	30.0	3.2	7.0	8.3	7.8
Aug-17	WWF	29.0	6.5	7.5	8.6	8.0
Sep-17	WWF	30.0	0.0	8.5	9.7	9.0
Oct-17	WWF	30.0	3.2	8.5	10.6	9.5
Nov-17	WWF	29.0	3.3	9.5	12.2	11.0
Mar-18	WWF	23.0	9.6	11.6	13.5	12.7
Apr-18	WWF	29.0	3.3	9.9	12.5	11.3
May-18	WWF	30.0	3.2	8.0	10.4	8.9
Jun-18	WWF	29.0	3.3	7.4	9.3	8.1

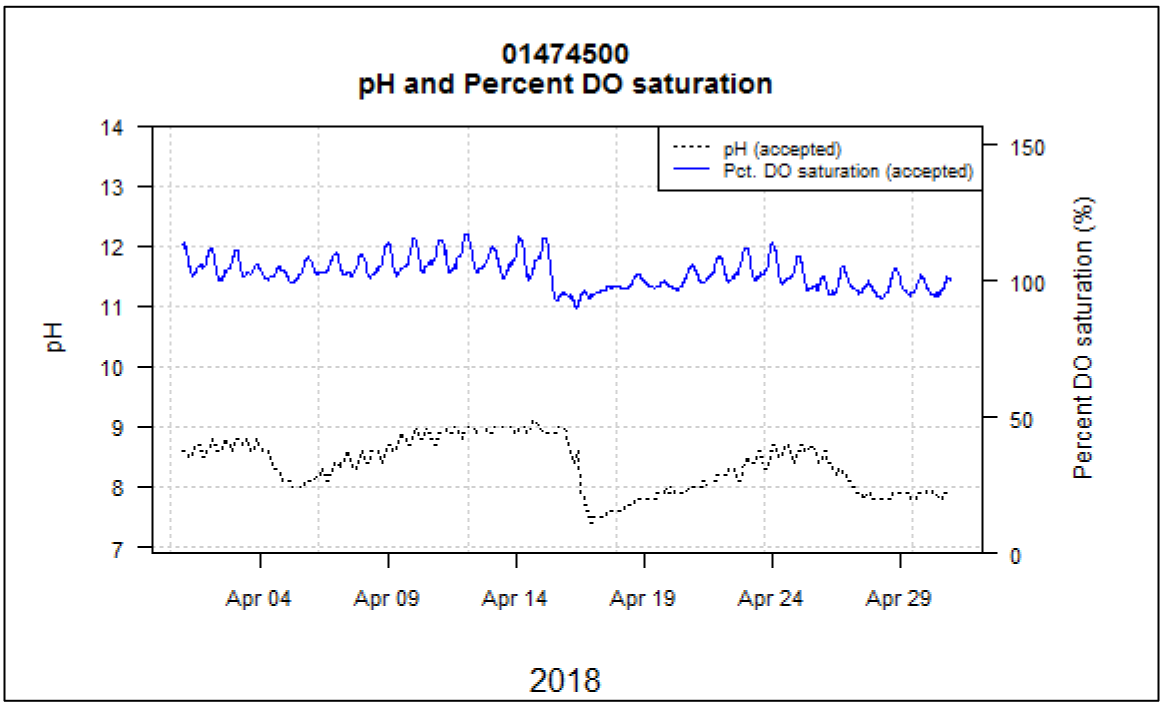


Figure 60. Gage 01474500, pH and Percent Dissolved Oxygen Saturation, April 2018.

Table 65. Gage 01474500 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.2	7.7
Aug-17	742.5	30.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.6	8.0	7.8
Sep-17	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.8	8.2	8.0
Oct-17	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.5	8.3	7.9
Nov-17	719.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.6	8.2	7.9
Mar-18	610.0	25.4	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.7	8.6	8.0
Apr-18	718.0	29.9	0.3	0.7	3.3	0.0	0.0	99.3	96.7	7.4	9.1	8.4
May-18	742.5	30.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.4	8.1	7.7
Jun-18	719.0	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.4	7.9	7.7

Temperature

Table 66. Gage 01474500 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
WWF	1-Jul	31-Jul	0.0	100.0	0.1	743.5	31.0	22.2	29.5	25.6
WWF	1-Aug	15-Aug	0.0	100.0	0.0	360.0	15.0	20.9	26.2	23.7
WWF	16-Aug	31-Aug	0.0	100.0	0.4	382.5	15.9			
WWF	1-Sep	15-Sep	0.0	100.0	0.0	360.0	15.0	18.2	26.0	21.7
WWF	16-Sep	30-Sep	0.0	100.0	0.0	360.0	15.0			
WWF	1-Oct	15-Oct	11.0	89.0	0.0	360.0	15.0	13.5	22.8	18.3
WWF	16-Oct	31-Oct	0.0	100.0	0.3	383.0	16.0			
WWF	1-Nov	15-Nov	4.9	95.1	0.0	360.0	15.0	5.8	14.8	9.2
WWF	16-Nov	30-Nov	0.0	100.0	0.3	359.0	15.0			
WWF	1-Mar	31-Mar	10.0	90.0	18.0	610.0	25.4	4.1	11.2	6.3
WWF	1-Apr	15-Apr	15.9	84.1	0.4	358.5	14.9	7.4	15.0	11.0
WWF	16-Apr	30-Apr	29.3	70.7	0.0	360.0	15.0			
WWF	1-May	15-May	69.3	30.7	0.4	358.5	14.9	12.8	21.2	18.4
WWF	16-May	31-May	0.0	100.0	0.0	384.0	16.0			
WWF	1-Jun	15-Jun	0.0	100.0	0.3	359.0	15.0			
WWF	16-Jun	30-Jun	0.0	100.0	0.0	360.0	15.0	17.0	26.4	22.4

Figure 61. Gage 01474500, Schuylkill River at the Fairmount Dam, looking upstream

Turbidity

Turbidity levels at the Schuylkill gage were less susceptible to extreme peaks due to storms and increased flow.

Table 67. Gage 01474500 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	55.1	44.9	1.2	75.8	5.4
Aug-17	742.0	30.9	0.3	78.0	22.0	1.8	41.0	4.8
Sep-17	720.0	30.0	0.0	23.1	76.9	1.0	15.1	2.8
Oct-17	743.0	31.0	0.1	34.5	65.5	0.8	30.4	3.7
Nov-17	719.0	30.0	0.1	28.0	72.0	1.0	14.7	2.6
Mar-18	610.0	25.4	0.1	87.4	12.6	2.1	9.1	4.3
Apr-18	718.5	29.9	0.2	73.3	26.7	1.5	157.0	7.9
May-18	742.5	30.9	0.2	87.1	12.9	2.1	486.0	14.2
Jun-18	719.0	30.0	0.1	94.2	5.8	1.9	148.0	10.8

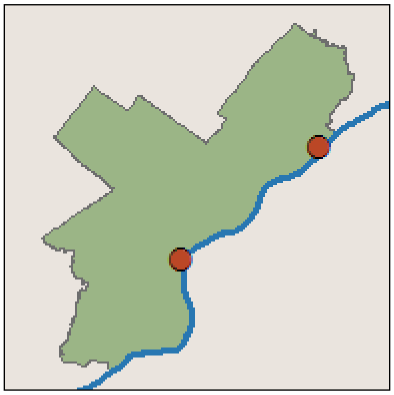
Specific Conductance

The Schuylkill River generally exhibits intermediate conductance, lower than the small Philadelphia tributary streams described elsewhere in this report, but greater than that observed in the Delaware River. Observed differences are likely due to geology and preponderance of anthropogenic sources in the respective watersheds.

Table 68. Gage 01474500 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	222.0	450.0	347.9
Aug-17	741.5	30.9	0.3	257.0	436.0	356.1
Sep-17	720.0	30.0	0.0	319.0	557.0	441.8
Oct-17	742.5	30.9	0.2	278.0	598.0	510.8
Nov-17	719.0	30.0	0.1	287.0	497.0	445.6
Mar-18	610.0	25.4	0.1	345.0	732.0	495.6
Apr-18	718.0	29.9	0.3	254.0	496.0	407.7
May-18	742.5	30.9	0.2	201.0	474.0	353.6
Jun-18	719.0	30.0	0.1	218.0	508.0	416.2

Delaware River (Gages 01467200 and 014670261)



Dissolved oxygen and pH

The DRBC DO daily mean and pH criteria for Zone 3 was attained at Gage 01467200 for the entire reporting period (Tables 69 and 71). The Zone 2 DO daily mean and pH criteria were also attained at Gage 014670261 (Tables 70 and 72). In 2018, the collection of data at gage 01467200 began March 31. Thus, data for that month is incomplete for that location. Data is collected year-round at 014670261. From December 28, 2017 to January 26, 2018, water quality monitoring equipment was removed from site 014670261 in order to protect it from ice.

Figure 62. Delaware River at Ben Franklin Bridge, near Gage 01467200

Table 69. Gage 01467200 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days non-attaining	% days attaining	Daily Avg. Min.	Daily Avg. Max.	Daily Avg. Mean	Min.	Max
Jul-17	DRBC	31.0	0.0	0.0	100.0	5.0	6.9	5.6	4.5	7.4
Aug-17	DRBC	31.0	0.0	0.0	100.0	5.1	6.6	5.8	4.7	7.3
Sep-17	DRBC	30.0	0.0	0.0	100.0	5.4	6.2	5.8	4.9	6.7
Oct-17	DRBC	31.0	0.0	0.0	100.0	5.6	7.8	6.3	5.1	8.2
Nov-17	DRBC	29.0	3.3	0.0	100.0	8.0	10.4	9.1	7.6	10.8
Mar-18*	DRBC	1.0	36.8	0.0	100.0	12.2	12.2	12.2	12.0	12.4
Apr-18	DRBC	28.0	6.7	0.0	100.0	9.5	12.4	11.4	9.3	12.6
May-18	DRBC	29.0	6.5	0.0	100.0	6.5	9.2	8.1	6.1	9.5
Jun-18	DRBC	26.0	13.3	0.0	100.0	5.9	6.8	6.3	5.3	7.3

*Data collection at this site did not begin until March 31.

Table 70. Gage 014670261 Dissolved Oxygen Daily Mean Criterion Summary Results by Month

Month	Des. Use	Total days accepted data	% days flagged data	% days non-attaining	% days attaining	Daily Avg. Min.	Daily Avg. Max.	Daily Avg. Mean	Min.	Max
Jul-17	DRBC	30.0	3.2	0.0	100.0	6.5	8.3	7.4	6.3	8.9
Aug-17	DRBC	30.0	3.2	0.0	100.0	6.0	7.5	6.7	5.7	8.4
Sep-17	DRBC	30.0	0.0	0.0	100.0	6.6	7.3	7.0	6.4	7.8
Oct-17	DRBC	30.0	3.2	0.0	100.0	6.6	8.4	7.4	6.4	8.6
Nov-17	DRBC	28.0	6.7	0.0	100.0	8.5	10.9	9.8	8.2	11.1
Dec-17	DRBC	22.0	29.0	0.0	100.0	10.9	13.1	11.7	10.7	13.3
Jan-18	DRBC	5.0	83.9	0.0	100.0	13.2	13.4	13.3	12.8	13.5
Feb-18	DRBC	27.0	3.6	0.0	100.0	12.3	13.5	12.9	11.9	13.6
Mar-18	DRBC	29.0	6.3	0.0	100.0	11.7	12.7	12.4	11.5	13.0
Apr-18	DRBC	30.0	0.0	0.0	100.0	9.6	12.4	11.5	9.4	12.7
May-18	DRBC	29.0	6.5	0.0	100.0	6.6	9.6	8.3	6.4	9.9
Jun-18	DRBC	29.0	3.3	0.0	100.0	6.4	7.5	7.0	6.1	8.2

Table 71. Gage 01467200 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.3	7.1
Aug-17	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.2	7.1
Sep-17	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.3	7.2
Oct-17	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.4	7.3
Nov-17	719.5	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.4	7.3
Mar-18	37.0	1.5	2.6	0.0	0.0	0.0	0.0	100.0	100.0	7.3	7.5	7.4
Apr-18	717.0	29.9	0.4	0.0	0.0	0.0	0.0	100.0	100.0	7.3	7.7	7.5
May-18	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.4	7.3
Jun-18	711.5	29.6	1.2	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.4	7.2

Table 72. Gage 014670261 pH Criteria Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining	Min.	Max.	Mean
Jul-17	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.6	7.3
Aug-17	742.5	30.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.4	7.2
Sep-17	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.5	7.3
Oct-17	744.0	31.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.5	7.4
Nov-17	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.5	7.3
Dec-17	657.0	27.4	11.7	0.0	0.0	0.0	0.0	100.0	100.0	7.4	7.7	7.5
Jan-18	131.0	5.5	82.4	0.0	0.0	0.0	0.0	100.0	100.0	7.1	7.3	7.2
Feb-18	670.5	27.9	0.2	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.5	7.4
Mar-18	706.0	29.4	5.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	7.9	7.5
Apr-18	720.0	30.0	0.0	0.0	0.0	0.0	0.0	100.0	100.0	7.2	8.1	7.5
May-18	743.0	31.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	6.9	7.5	7.3
Jun-18	719.5	30.0	0.1	0.0	0.0	0.0	0.0	100.0	100.0	7.0	7.6	7.3

Temperature

Temperature criteria for the Delaware River were rarely exceeded at either gage.

Table 73. Gage 01467200 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
DRBC	1-Jul	31-Jul	0.0	100.0	0.0	744.0	31.0	25.2	28.2	26.7
DRBC	1-Aug	31-Aug	0.0	100.0	0.0	744.0	31.0	24.0	26.3	25.3
DRBC	1-Sep	30-Sep	0.0	100.0	0.1	719.0	30.0	21.4	24.2	22.7
DRBC	1-Oct	31-Oct	0.0	100.0	0.0	744.0	31.0	16.0	22.5	20.4
DRBC	1-Nov	30-Nov	0.0	100.0	0.1	719.5	30.0	7.7	16.4	11.3
DRBC	31-Mar	31-Mar	0.0	100.0	2.6	37.0	1.5	6.7	8.0	7.3
DRBC	1-Apr	30-Apr	0.0	100.0	0.5	716.5	29.9	6.9	13.5	9.1
DRBC	1-May	31-May	0.0	100.0	0.4	741.0	30.9	12.9	20.4	17.4
DRBC	1-Jun	30-Jun	0.0	100.0	0.3	718.0	29.9	20.3	25.5	22.3

Table 74. Gage 014670261 Temperature Summary Results by Maximum Criteria Period

Designated Use	Date range start	Date range end	% hrs. exceedance	% hrs. attaining	% hrs. flagged data	Total hrs. accepted data	Total days accepted data	Min.	Max.	Mean
DRBC	1-Jul	31-Jul	0.0	100.0	0.1	743.5	31.0	23.8	28.6	26.5
DRBC	1-Aug	31-Aug	0.0	100.0	0.1	743.5	31.0	23.4	26.2	25.0
DRBC	1-Sep	30-Sep	0.0	100.0	0.0	720.0	30.0	20.6	24.3	22.4
DRBC	1-Oct	31-Oct	0.0	100.0	0.0	744.0	31.0	14.9	22.6	19.9
DRBC	1-Nov	30-Nov	0.0	100.0	0.0	720.0	30.0	6.6	15.0	9.9
DRBC	1-Dec	31-Dec	0.0	100.0	11.7	657.0	27.4	1.6	7.2	4.6
DRBC	1-Jan	31-Jan	0.0	100.0	82.4	131.0	5.5	1.3	2.5	1.9
DRBC	1-Feb	28-Feb	0.0	100.0	0.1	671.5	28.0	0.9	7.0	3.7
DRBC	1-Mar	31-Mar	0.0	100.0	0.3	741.0	30.9	3.6	8.9	5.2
DRBC	1-Apr	30-Apr	0.0	100.0	0.0	720.0	30.0	6.5	14.1	9.2
DRBC	1-May	31-May	0.0	100.0	0.1	743.0	31.0	12.7	20.4	17.5
DRBC	1-Jun	30-Jun	0.0	100.0	0.0	720.0	30.0	19.7	26.1	22.6

Specific Conductance

The Delaware River exhibits much lower conductivity than the small Philadelphia tributary streams described elsewhere in this report. This is likely caused by differences in geology and proportionally fewer anthropogenic sources in the less-developed Delaware River watershed.

Table 75. Gage 01467200 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	744.0	31.0	0.0	216.0	284.0	254.7
Aug-17	743.5	31.0	0.1	213.0	290.0	255.1
Sep-17	720.0	30.0	0.0	265.0	331.0	289.8
Oct-17	744.0	31.0	0.0	260.0	383.0	329.7
Nov-17	719.0	30.0	0.1	199.0	301.0	250.9
Mar-18	37.0	1.5	2.6	341.0	409.0	380.0
Apr-18	717.0	29.9	0.4	188.0	388.0	232.5
May-18	740.0	30.8	0.5	174.0	239.0	208.5
Jun-18	713.0	29.7	1.0	186.0	321.0	259.3

Table 76. Gage 014670261 Specific Conductance Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	202.0	290.0	243.2
Aug-17	743.5	31.0	0.1	195.0	291.0	239.9
Sep-17	720.0	30.0	0.0	245.0	312.0	269.0
Oct-17	744.0	31.0	0.0	194.0	346.0	288.5
Nov-17	719.5	30.0	0.1	170.0	307.0	234.4
Dec-17	655.0	27.3	12.0	267.0	453.0	313.3
Jan-18	262.0	5.5	82.4	86.0	281.0	212.4
Feb-18	671.0	28.0	0.1	177.0	466.0	286.6
Mar-18	740.5	30.9	0.3	177.0	567.0	323.6
Apr-18	720.0	30.0	0.0	185.0	382.0	231.8
May-18	743.0	31.0	0.1	163.0	270.0	203.5
Jun-18	719.5	30.0	0.1	195.0	319.0	259.9

Turbidity

Turbidity guidelines at 014670261 were almost always exceeded throughout the year. Turbidity is not continuously measured at 01467200.

Table 77. Gage 014670261 Turbidity Summary Results by Month

Month	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline	Min.	Max.	Mean
Jul-17	743.5	31.0	0.1	98.8	1.2	2.3	44.8	6.5
Aug-17	743.5	31.0	0.1	93.9	6.1	1.8	25.3	5.4
Sep-17	720.0	30.0	0.0	92.8	7.2	1.7	16.6	5.4
Oct-17	742.5	30.9	0.2	95.7	4.3	2.0	44.5	6.2
Nov-17	719.5	30.0	0.1	100.0	0.0	4.5	70.3	11.7
Dec-17	658.0	27.4	11.6	99.7	0.3	1.0	49.9	13.8
Jan-18	131.0	5.5	82.4	100.0	0.0	8.5	53.7	15.7
Feb-18	672.0	28.0	0.0	99.9	0.1	2.6	80.9	12.7
Mar-18	742.0	30.9	0.1	98.7	1.3	2.3	57.8	8.3
Apr-18	720.0	30.0	0.0	74.0	26.0	1.3	49.9	6.2
May-18	743.5	31.0	0.1	97.0	3.0	0.7	57.7	9.5
Jun-18	719.0	30.0	0.1	99.9	0.1	2.7	80.5	11.1

Wet Weather and Dry Weather Results

Annual Summary, July 2017 - June 2018

Water quality data was also categorized as wet or dry for the purpose of evaluating weather effects on water quality, and specifically the incidence of non-attainment of water quality criteria. A wet weather condition was defined as rainfall greater than 0.05 inches in the preceding 72 hours, as measured at the nearest PWD rain gage.

In general, more frequent non-attainment of DO criteria was observed in wet weather due to the tendency of storm events to decrease DO via the introduction of stormwater runoff and BOD (Tables 78-79). The turbidity maximum guideline was also usually more frequently surpassed in wet weather (Tables 84-85). The pH maximum criterion was exceeded in both wet and dry weather (Tables 82-83). Temperature criteria were more likely to be exceeded at Trout Stocking Fishery (TSF) gages due to more stringent seasonal criteria (Tables 88-89).

Table 78. USGS Gage July 2017 - June 2018 Dissolved Oxygen Minimum Criterion Summary Results During Wet Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining
01465798	WWF	4167.5	173.6	2.5	0.6	99.4
01467042	TSF	4299.5	179.1	0.1	0.0	100.0
01467048	TSF	3970.5	165.4	5.6	0.3	99.7
01467086	WWF	4091.0	170.5	0.7	0.7	99.3
01467087	WWF	3578.5	149.1	15.1	17.1	82.9
01467200*	DRBC	NA	NA	NA	NA	NA
01473900	TSF	4124.5	171.9	1.1	0.1	99.9
01474000	TSF	3883.0	161.8	0.1	0.0	100.0
01474500	WWF	4134.0	172.3	0.4	0.0	100.0
01475530	WWF	4262.0	177.6	0.1	0.0	100.0
01475548	WWF	4008.5	167.0	4.4	6.5	93.5
014670261*	DRBC	NA	NA	NA	NA	NA

*No minimum DO criterion applies at these locations.

Table 79. USGS Gage July 2017 - June 2018 Dissolved Oxygen Minimum Criterion Summary Results During Dry Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. non-attaining	% hrs. attaining
01465798	WWF	2164.5	90.2	1.3	0.0	100.0
01467042	TSF	2016.5	84.0	0.2	0.0	100.0
01467048	TSF	2008.5	83.7	8.0	0.0	100.0
01467086	WWF	2226.0	92.8	0.4	0.2	99.8
01467087	WWF	1919.0	80.0	14.8	3.5	96.5
01467200*	DRBC	NA	NA	NA	NA	NA
01473900	TSF	2150.0	89.6	0.1	1.0	99.0
01474000	TSF	2360.5	98.4	0.2	0.0	100.0
01474500	WWF	2311.0	96.3	0.2	0.0	100.0
01475530	WWF	2192.0	91.3	1.4	0.0	100.0
01475548	WWF	2113.0	88.0	5.3	0.0	100.0
014670261*	DRBC	NA	NA	NA	NA	NA

*No minimum DO criterion applies at these locations.

Table 80. USGS Gage July 2017 - June 2018 Dissolved Oxygen Daily Mean Criterion Summary Results During Wet Weather

Gage number	Designated Use	Total days accepted data	% days flagged data
01465798	WWF	181.0	3.6
01467042	TSF	182.0	0.6
01467048	TSF	155.0	7.3
01467086	WWF	162.0	0.6
01467087	WWF	161.0	21.1
01467200	DRBC	151.0	0.0
01473900	TSF	165.0	1.2
01474000	TSF	152.0	0.0
01474500	WWF	163.0	0.6
01475530	WWF	182.0	0.0
01475548	WWF	177.0	5.5
014670261	DRBC	216.0	0.5

Table 81. USGS Gage July 2017 - June 2018 Dissolved Oxygen Daily Mean Criterion Summary Results During Dry Weather

Gage number	Designated Use	Total days accepted data	% days flagged data
01465798	WWF	95.0	1.3
01467042	TSF	89.0	0.0
01467048	TSF	72.0	10.1
01467086	WWF	82.0	0.0
01467087	WWF	86.0	18.3
01467200	DRBC	75.0	0.0
01473900	TSF	79.0	0.0
01474000	TSF	85.0	0.0
01474500	WWF	83.0	0.0
01475530	WWF	97.0	2.6
01475548	WWF	95.0	7.7
014670261	DRBC	93.0	0.0

Table 82. USGS Gage July 2017 - June 2018 pH Criteria Summary Results During Wet Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining
01465798	4202.5	175.1	1.7	0.0	0.0	0.0	0.0	100.0	100.0
01467042	4299.0	179.1	0.1	0.3	2.0	0.0	0.0	99.7	98.0
01467048	3795.0	158.1	9.8	0.1	1.1	0.0	0.0	99.9	98.9
01467086	4106.0	171.1	0.3	1.7	8.2	0.0	0.0	98.3	91.8
01467087	3788.0	157.8	10.1	0.0	0.0	0.0	0.0	100.0	100.0
01467200	3813.0	158.9	0.1	0.0	0.0	0.0	0.0	100.0	100.0
01473900	4095.5	170.6	1.8	2.2	9.3	0.0	0.0	97.8	90.7
01474000	3883.0	161.8	0.1	2.7	10.2	0.0	0.0	97.3	89.8
01474500	4147.0	172.8	0.1	0.0	0.0	0.0	0.0	100.0	100.0
01475530	4128.0	172.0	3.2	0.1	0.5	0.0	0.0	99.9	99.5
01475548	4015.0	167.3	4.3	1.4	7.6	0.0	0.0	98.6	92.4
014670261	5456.0	227.3	0.6	0.0	0.0	0.0	0.0	100.0	100.0

Table 83. USGS Gage July 2017 - June 2018 pH Criteria Summary Results During Dry Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. max. non-attaining	% days max. non-attaining	% hrs. min. non-attaining	% days min. non-attaining	% hrs. attaining	% days attaining
01465798	2161.0	90.0	1.4	0.0	0.0	0.0	0.0	100.0	100.0
01467042	2014.5	83.9	0.3	2.2	8.4	0.0	0.0	97.8	91.6
01467048	1769.5	73.7	18.9	7.1	12.7	0.0	0.0	92.9	87.3
01467086	2226.0	92.8	0.4	5.5	17.8	0.0	0.0	94.5	82.2
01467087	2196.5	91.5	2.5	0.0	0.0	0.0	0.0	100.0	100.0
01467200	2068.0	86.2	0.1	0.0	0.0	0.0	0.0	100.0	100.0
01473900	2113.5	88.1	1.8	5.9	16.2	0.0	0.0	94.1	83.8
01474000	2360.5	98.4	0.2	7.3	18.1	0.0	0.0	92.7	81.9
01474500	2310.5	96.3	0.2	0.2	0.8	0.0	0.0	99.8	99.2
01475530	2145.0	89.4	3.6	0.5	5.1	0.0	0.0	99.5	94.9
01475548	2113.0	88.0	5.3	3.2	11.1	0.0	0.0	96.8	88.9
014670261	2561.5	106.7	0.4	0.0	0.0	0.0	0.0	100.0	100.0

Table 84. USGS Gage July 2017 - June 2018 Turbidity Summary Results During Wet Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline
01465798	4256.5	177.4	0.4	41.8	58.2
01467042	4285.5	178.6	0.4	29.9	70.1
01467048	3700.5	154.2	12.0	48.3	51.7
01467086*	NA	NA	NA	NA	NA
01467087*	NA	NA	NA	NA	NA
01467200*	NA	NA	NA	NA	NA
01473900	3978.0	165.8	4.6	51.3	48.7
01474000	3882.5	161.8	0.1	25.1	74.9
01474500	4146.5	172.8	0.1	67.7	32.3
01475530*	NA	NA	NA	NA	NA
01475548*	NA	NA	NA	NA	NA
014670261	5485.5	228.6	0.1	96.1	3.9

*Turbidity not continuously monitored at this location

Table 85. USGS Gage July 2017 - June 2018 Turbidity Summary Results During Dry Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. above max. guideline	% hrs. below max. guideline
01465798	2190.5	91.3	0.1	4.7	95.3
01467042	1952.5	81.4	3.4	3.5	96.5
01467048	1886.0	78.6	13.6	16.3	83.7
01467086*	NA	NA	NA	NA	NA
01467087*	NA	NA	NA	NA	NA
01467200*	NA	NA	NA	NA	NA
01473900	1995.0	83.1	7.3	16.0	84.0
01474000	2359.0	98.3	0.2	0.6	99.4
01474500	2311.0	96.3	0.2	51.4	48.6
01475530*	NA	NA	NA	NA	NA
01475548*	NA	NA	NA	NA	NA
014670261	2570.0	107.1	0.1	94.4	5.6

*Turbidity not continuously monitored at this location

Table 86. USGS Gage July 2017 - June 2018 Specific Conductance Summary Results During Wet Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data
01465798	4263.5	177.6	0.2
01467042	4298.5	179.1	0.1
01467048	4149.0	172.9	1.4
01467086	4106.0	171.1	0.3
01467087	3780.5	157.5	10.3
01467200	3810.0	158.8	0.2
01473900	4123.0	171.8	1.1
01474000	3883.0	161.8	0.1
01474500	4146.0	172.8	0.1
01475530	4193.0	174.7	1.7
01475548	4136.5	172.4	1.4
014670261	5484.0	228.5	0.1

Table 87. USGS Gage July 2017 - June 2018 Specific Conductance Summary Results During Dry Weather

Gage number	Total hrs. accepted data	Total days accepted data	% hrs. flagged data
01465798	2190.5	91.3	0.1
01467042	2015.0	84.0	0.3
01467048	2008.5	83.7	8.0
01467086	2231.0	93.0	0.2
01467087	2197.0	91.5	2.4
01467200	2067.5	86.1	0.1
01473900	2148.5	89.5	0.2
01474000	2359.5	98.3	0.2
01474500	2310.0	96.3	0.3
01475530	1956.5	81.5	12.0
01475548	2131.0	88.8	4.5
014670261	2567.5	107.0	0.2

Table 88. USGS Gage July 2017 - June 2018 Temperature Maximum Criteria Summary Results During Wet Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. exceedance	% hrs. attaining
01465798	WWF	4264.0	177.7	0.2	6.8	93.2
01467042	TSF	4299.5	179.1	0.1	15.8	84.2
01467048	TSF	4149.0	172.9	1.4	20.3	79.7
01467086	WWF	4106.0	171.1	0.3	7.1	92.9
01467087	WWF	3789.5	157.9	10.1	8.8	91.2
01467200	DRBC	3816.5	159.0	0.1	0.0	100.0
01473900	TSF	4087.0	170.3	2.0	14.3	85.7
01474000	TSF	3843.0	160.1	1.1	15.7	84.3
01474500	WWF	4147.0	172.8	0.1	6.5	93.5
01475530	WWF	4262.5	177.6	0.1	5.9	94.1
01475548	WWF	4160.0	173.3	0.8	8.4	91.6
014670261	DRBC	5487.0	228.6	0.1	0.0	100.0

Table 89. USGS Gage July 2017 - June 2018 Temperature Maximum Criteria Summary Results During Dry Weather

Gage number	Designated Use	Total hrs. accepted data	Total days accepted data	% hrs. flagged data	% hrs. exceedance	% hrs. attaining
01465798	WWF	2190.5	91.3	0.1	16.8	83.2
01467042	TSF	2016.0	84.0	0.2	23.5	76.5
01467048	TSF	2008.5	83.7	8.0	28.6	71.4
01467086	WWF	2231.0	93.0	0.2	16.9	83.1
01467087	WWF	2197.5	91.6	2.4	18.8	81.2
01467200	DRBC	2066.5	86.1	0.1	0.0	100.0
01473900	TSF	2128.0	88.7	1.1	25.1	74.9
01474000	TSF	2333.0	97.2	1.3	22.7	77.3
01474500	WWF	2311.0	96.3	0.2	11.2	88.8
01475530	WWF	2192.0	91.3	1.4	14.1	85.9
01475548	WWF	2158.5	89.9	3.3	15.2	84.8
014670261	DRBC	2568.5	107.0	0.1	0.0	100.0

References

Delaware River Basin Commission, 2007. Delaware River Basin Water Code: 18 CFR Part 410 (With Amendments Through September 27, 2006). West Trenton, NJ.

Appendix I – PWD/USGS Groundwater Monitoring Program

Background

The basis of PWD's CSO LTCPU wet weather source control strategy is the "capture" and infiltration of as much rainwater as possible with green stormwater infrastructure (GSI). The direct benefits of such an effort are a reduction of stormwater discharged directly to streams, as well as the increased recharge of stormwater to supplement groundwater resources. Increased infiltration, though advantageous in several respects, must be carefully planned and closely monitored to avoid unwanted impacts. Increasing groundwater levels in areas where the depth to water is shallow could result in the saturation of soils close to the surface, potentially causing basement flooding. In addition, building foundations could be impacted by rising groundwater levels.

The adaptive management approach being employed for the LTCPU is an iterative process strongly dependent on monitoring. In order to quantify the impact of this long-term effort on groundwater resources, it is necessary to monitor groundwater levels in Philadelphia. PWD has partnered with USGS to increase the geographic scope and frequency of groundwater monitoring in the Philadelphia region. A City-wide groundwater level monitoring network will provide long-term monthly data documenting current water levels and trends in groundwater elevations throughout the City, helping to track the impacts of widespread implementation of stormwater management practices (SMPs) and global climate change.

Data from the groundwater monitoring network will also be used to calibrate a Philadelphia groundwater model and update the USGS groundwater contour map of Philadelphia (Paulachok 1984). In addition to this City-wide, long term groundwater monitoring program, PWD is conducting site-scale monitoring to address the effectiveness of individual SMPs. The City-wide groundwater monitoring network and site-scale monitoring at GSI facilities provide complementary information regarding the effects of stormwater management practices at different spatial and temporal scales.

Methods

PWD and USGS identified existing wells that would be suitable for the network and obtained permission for site access. Once wells were identified and accessible, well condition and suitability for inclusion in the monitoring network were investigated by continuous water level monitoring and remote video camera inspection when accessible. Wells that met acceptance criteria were added to the monitoring network. After examining readily available information about existing wells, PWD elected to drill additional wells in order to provide better spatial distribution of wells in the monitoring network. USGS staff conduct groundwater observations monthly and upload water level data to the NWIS web server. PWD staff periodically download water level data from NWIS and summarize these data annually.

Well Network Establishment

Existing wells in the Philadelphia area were identified by USGS and PWD through digital and paper archives as well as through contacting representatives of other City agencies and large institutional landowners (*e.g.*, Philadelphia Fire Department, Philadelphia Department of Parks and Recreation, Philadelphia Gas Works, Southeastern Pennsylvania Transportation Authority, etc.). Priority was given to wells on publicly-owned or large institutional land uses in order to help ensure that wells would remain accessible in the future. The primary goal was to develop a network of wells with a spatial distribution and density sufficient to assess groundwater levels throughout the City of Philadelphia. Other criteria for establishment of the well network were:

- Sufficient density of wells in critical areas with a shallow water table
- No bias given to combined-sewered or separate-sewered areas
- Denser distribution of monitoring wells in the Northern Piedmont Ecoregion to reflect its more varied groundwater contours.

Wells that met acceptance criteria were assigned USGS location codes and added to the USGS well monitoring network and National Water Information System (NWIS) database. The well monitoring network contains 29 active sites that are monitored monthly. Additional sites are expected to be added once landowner access agreements are finalized or new wells are drilled.

Video Camera Inspection

The availability of well attribute information varied from well to well and in most cases the physical characteristics and condition of candidate wells to be added to the network was unknown. USGS staff perform remote video camera inspection, when possible, to determine physical characteristics such as screened intervals, total depth, depth to bottom of casing, and the location of potential water-bearing zones within the bore hole. Wells narrower than 4” diameter and wells with pumps or other plumbing could not accommodate the camera equipment and were not inspected with this method.

Continuous Water Level Monitoring

Monthly measurements are appropriate for monitoring long term trends in groundwater levels. However, it is important to verify that these monthly observations are representative of the unconfined aquifer and not influenced by anthropogenic activity or other conditions. USGS staff used data logging pressure transducers (LevelTroll model 500, In-Situ, Inc.) to conduct continuous water level monitoring in candidate wells. These sensors are vented to the surface of the well to provide atmospheric pressure correction. Continuous monitoring was carried out across all wells in the network to identify any aberrant trends, such as those that might be caused by local pumping operations. Sensors were deployed for three-month periods on a rotating schedule with five wells actively monitored at a time. Wells that appear to be influenced by permanent pumping operations will be removed from the monitoring network (*e.g.*, permanent wells dewatering the stadiums). Wells that are temporarily affected by local, dewatering operations (*e.g.*, a short term construction site), will remain in the system, but data collected during the period when dewatering operations affected the well will not be used in estimates of current water levels and water level trends.

Routine Groundwater Observations

USGS staff conduct groundwater observations monthly at each well using a water sensor and graduated tape. Equipment is sterilized in 10% bleach solution prior to and after measurements are taken in order to prevent introducing or transferring contamination between wells. Well level measurements are converted to elevation above the North American Vertical Datum of 1988 (NAVD88) based upon the known elevation correction factor for each well. Water level data are recorded on site in field notebooks along with any pertinent field notes and then uploaded to the NWIS web server. PWD periodically downloads data from NWIS and summarizes these data annually.

Monitoring Well Locations

Currently the well monitoring network contains 29 active sites that are monitored monthly. (Table 1, Figure 1). PWD is in the process of drilling additional wells on City-owned property in order to meet spatial distribution and other well network criteria. Of the 29 active wells, 11 are located within the Middle Atlantic Coastal Plain Ecoregion, while the remaining 18 wells are located in the Northern

Piedmont (Omernik 1987). As stated above, higher well density is required in the latter region to reflect the more complex geology and interactions with groundwater.

Table 1. PWD-USGS Groundwater Monitoring Well Network Locations.

Site ID	Site Name	Lat.	Long.	Established	Observations
USGS-395342075102101	PH 12	39.895	-75.172	10/22/1978	132
USGS-395353075151501	PH 1052	39.898	-75.254	3/7/2011	76
USGS-395408075104001	PH 63	39.902	-75.177	9/14/1954	93
USGS-395416075150301	PH 1053	39.904	-75.251	4/24/2003	75
USGS-395459075140501	PH 797	39.916	-75.259	10/15/1980	17
USGS-395516075113901	PH 1051	39.921	-75.194	--	67
USGS-395611075091301	PH 1059	39.936	-75.154	8/14/2014	47
USGS-395656075100401	PH 136	39.949	-75.167	12/6/1978	66
USGS-395656075104401	PH 1064	39.948	-75.178	6/5/2015	17
USGS-395705075135901	PH 1061	39.951	-75.232	6/5/2015	17
USGS-395849075134201	PH 1063	39.98	-75.228	6/5/2015	17
USGS-395859075085401	PH 1042	39.983	-75.148	2/14/2011	71
USGS-395942075144301	MG 2164	39.995	-75.245	2/14/2011	88
USGS-400001075040301	PH 1057	40	-75.068	8/14/2014	46
USGS-400016075102801	PH 1062	39.004	-75.174	6/5/2015	17
USGS-400038075094601	PH 1058	40.011	-75.163	8/14/2014	46
USGS-400055075122501	PH 1060	39.015	-75.206	6/5/2015	17
USGS-400132075031001	PH 1056	40.026	-75.053	8/14/2014	46
USGS-400211075093701	PH 1050	40.036	-75.16	--	88
USGS-400217075142101	PH 540	40.038	-75.239	3/29/1948	78
USGS-400229075104601	PH 1043*	40.041	-75.179	2/14/2011	86
USGS-400308074592201	PH 397	40.052	-74.989	1/4/1979	92
USGS-400311075101301	PH 1040	40.053	-75.17	2/17/2011	90
USGS-400327075152201	PH 1044	40.057	-75.256	3/16/2011	83
USGS-400424075104901	PH 550	40.073	-75.18	--/--/1906	83
USGS-400512075033401	PH 1045	40.087	-75.059	7/18/2011	84
USGS-400516075033201	PH 1046	40.088	-75.059	7/18/2011	77
USGS-400524075042601	MG 2195	40.09	-75.074	--	10
USGS-400527075042801	MG 2193	40.091	-75.074	--	77
USGS-400527075042802	MG 2194	40.091	-75.074	--	83
USGS-400644074590801	PH 1041	40.112	-74.986	2/17/2011	88

* Philadelphia County observation well

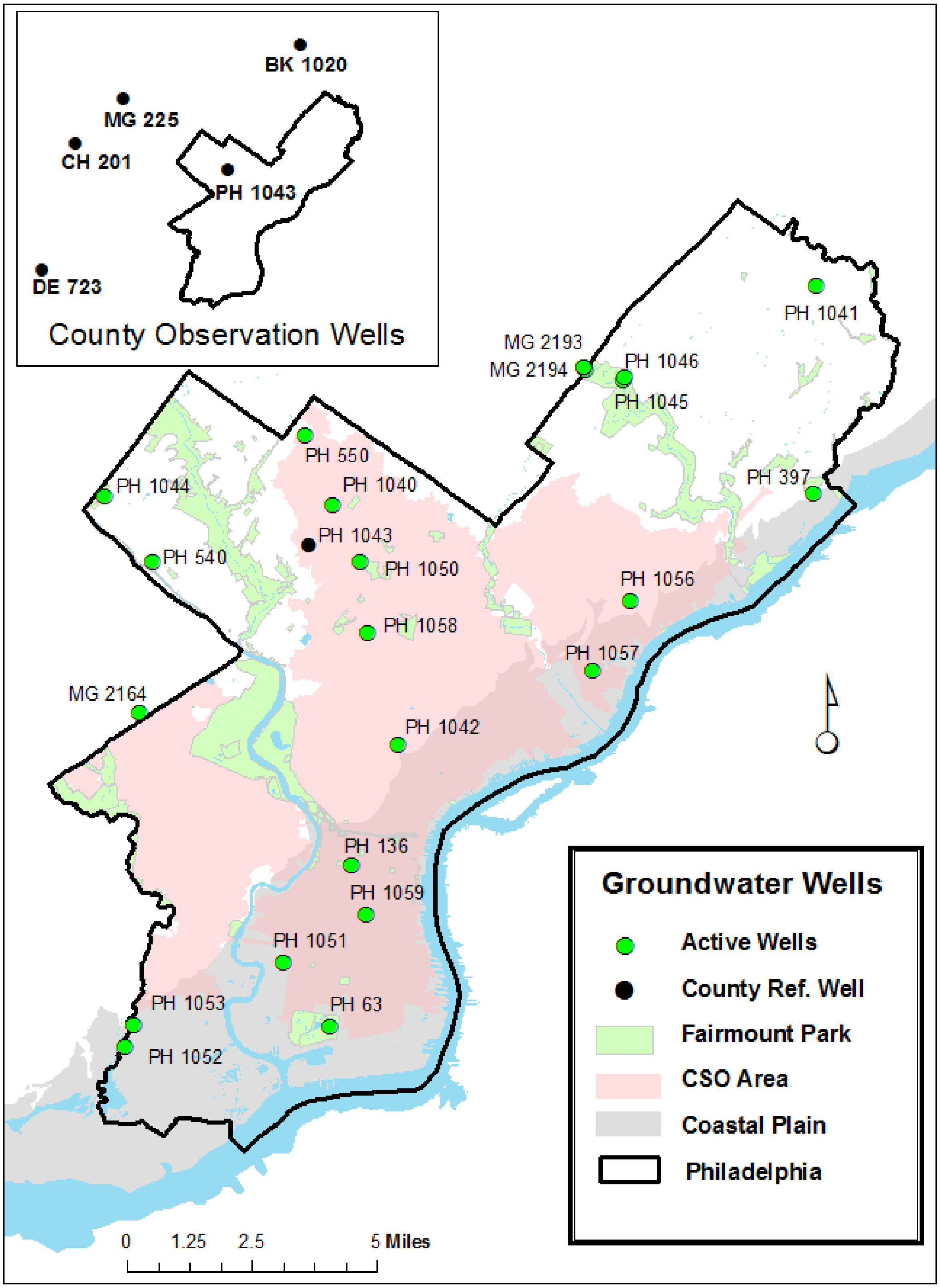


Figure 1. PWD-USGS Groundwater Monitoring Well Network Locations and (inset) County Reference Well Locations.

Wells were also classified according to predominant underlying geology and type of sewer system, *i.e.*, CSO or separate-sewered (Table 2, Figure 1). Another consideration for siting new wells was the potential influence of buried utilities and historic creek beds. During the period of rapid expansion of Philadelphia's grid-like network of streets, historic streams were encased in large brick sewers and buried in order to level and prepare land for development. Recent groundwater mapping and modeling work suggests that these brick sewers strongly influence local groundwater elevations (Paulachok 1991, Maimone et al. 2011).

Table 2. PWD-USGS Groundwater Well Geology and Sewer System Type Classification.

Site ID	Site Name	Sewer Type	Geology
USGS-395353075151501	PH 1052	Separate	Trenton Gravel
USGS-395408075104001	PH 63	Separate	Trenton Gravel
USGS-395416075150301	PH 1053	Separate	Trenton Gravel
USGS-395516075113901	PH 1051	CSO	Magothy Raritan Potomac
USGS-395656075100401	PH 136	CSO	Trenton Gravel
USGS-395859075085401	PH 1042	CSO	Pennsauken and Bridgeton Formation
USGS-395942075144301	MG 2164	Separate	Granitic Gneiss and Granite
USGS-400211075093701	PH 1050	CSO	Wissahickon Formation
USGS-400217075142101	PH 540	Separate	Wissahickon Formation
USGS-400229075104601	PH 1043	CSO	Wissahickon Formation
USGS-400308074592201	PH 397	Separate	Trenton Gravel
USGS-400311075101301	PH 1040	CSO	Wissahickon Formation
USGS-400327075152201	PH 1044	Separate	Wissahickon Formation
USGS-400424075104901	PH 550	CSO	Wissahickon Formation
USGS-400512075033401	PH 1045	Separate	Granitic Gneiss and Granite
USGS-400516075033201	PH 1046	Separate	Granitic Gneiss and Granite
USGS-400527075042801	MG 2193	Separate	Wissahickon Formation
USGS-400527075042802	MG 2194	Separate	Wissahickon Formation
USGS-400644074590801	PH 1041	Separate	Wissahickon Formation
USGS-400132075031001	PH 1056	CSO	Wissahickon Formation
USGS-400001075040301	PH 1057	CSO	Trenton Gravel
USGS-400038075094601	PH 1058	CSO	Pennsauken Formation
USGS-395611075091301	PH 1059	CSO	Trenton Gravel
USGS-395459075140501	PH 797	CSO	Trenton Gravel
USGS-395656075104401	PH 1064	CSO	Trenton Gravel
USGS-395705075135901	PH 1061	CSO	Wissahickon Formation
USGS-395849075134201	PH 1063	CSO	Wissahickon Formation
USGS-400016075102801	PH 1062	Separate	Pennsauken Formation
USGS-400055075122501	PH 1060	Separate	Wissahickon Formation

USGS maintains at least one reference well in most Pennsylvania counties. Reference wells located in neighboring counties (Figure 1, Table 3) may be used as regional reference wells for data analyses. Continuous hourly data are collected at well DE 723 in Delaware County. Reference wells in Chester, Bucks and Montgomery counties are not monitored continuously.

Table 3. Regional County Observation Wells.

Site ID	Site Name	Lat.	Long.	Est.	Observations
USGS-400453075255601	CH 201 Chester County Observation Well	40.136	-75.351	06/19/1978	475
USGS-400808075210401	MG 225 Montgomery County Observation Well	40.199	-75.052	08/15/1956	178
USGS-401157075032001	BK 1020 Bucks County Observation Well	40.081	-75.432	04/13/1968	176
USGS-395512075293701	DE 723 Delaware County Observation Well	39.920	-75.493	1983	201

Data Analysis

USEPA (2009) published detailed guidance on statistical analysis of groundwater contaminant concentrations. In many of the examples, the same logic and techniques could apply to analysis of groundwater levels. In the case of the Philadelphia groundwater monitoring network, the goal is to understand if groundwater levels are changing over time, at either a single well or group of wells. The main statistical tests to be utilized are a) Seasonal Kendall Test, and b) ANOVA. The tests are briefly described below.

The Seasonal Kendall test performs the Mann-Kendall (MK) trend test for individual seasons of the year, where season is defined by the user. It then combines the individual results into one overall test for whether the dependent variable (*i.e.*, groundwater level) changes in a consistent direction (monotonic trend) over time. The magnitude (*i.e.*, slope) of the trend is also determined. The test is nonparametric, therefore non-normal data can be analyzed (Helsel *et al.* 2006). USEPA (2009) advises that at least 10-12 measurements are needed, whereas Helsel and Hirsch (2002) recommends that the product of number of years and number of seasons be greater than 25. Helsel *et al.* (2006) further caution that with more than 10 years of data, adjusted p-values should be calculated to account for the possibility of serial correlation. The Seasonal Kendall test can be applied to data from a single well, not multiple wells. To examine seasonal trends across multiple wells, the Covariance-Sum test is used (Lettenmaier 1988), which is essentially the execution of multiple seasonal Kendall tests and calculation of the covariances between them. To analyze regional trends over time from a group of wells, the Regional Kendall test can be applied. The Regional Kendall test essentially functions the same way as the Seasonal Kendall test, except the data is categorized by region rather than season.

An alternate method to analyze temporal trends on either a single well or group of wells is the analysis of variance (ANOVA). For a single well or group of wells with data subdivided by season, a one-way ANOVA would examine the significance of seasonality as a statistical factor. A two-way ANOVA would be applied to include location or region as a statistical factor. Either form of ANOVA assumes that the datasets are normally distributed with constant variance. Group residuals should be tested for normality and for equality of variance. If the data cannot be

Table 4. PWD-USGS Groundwater Monitoring Well Data 7/2017-6/2018, Depth to Water Level (Feet below Land Surface).

Site ID	J	A	S	O	N	D	J	F	M	A	M	J
395353075151501	15.94	15.93	16.20	16.40	16.62		16.97	16.65	14.92	14.86	14.46	14.37
395408075104001	5.73	5.53	5.47	5.82	5.87	6.00	6.44	6.02	5.34	5.17	4.93	4.92
395416075150301	9.08	9.35	9.62	10.50	10.97	11.51	11.66	10.27	8.20	8.33	7.91	7.75
395459075140501	13.7	13.6	13.6	13.74	13.66	13.8	13.71	13.51	13.5	13.65	13.52	13.46
395516075113901	27.92	28.00	27.70	28.09	27.94	28.67	28.28	28.30	28.08	27.56	27.90	27.74
395611075091301	27.00	26.80	26.82	26.96	27.11	27.36	27.43	27.48	27.02	26.70	26.35	26.12
395656075100401				31.4								
395656075104401	20.43	20.34	20.52	20.57	21.17	21.21	21.28	21.11	20.46	20.35	15.83	20.18
395705075135901	13.37	14.60	14.90	15.40	14.80	15.21	14.31	13.15	12.57	13.66	13.89	13.20
395849075134201	14.74	13.30	13.56	13.81	13.68	14.06	13.71	13.30	12.58	12.94	12.87	12.53
395859075085401	9.16	8.96	8.24	9.43								
395942075144301	20.61	15.98	15.57	16.52	15.70	15.93	15.90	14.00	11.62	14.84	13.45	13.71
400001075040301	15.55	15.12	15.57	16.10	16.27	16.53	16.65	16.11	14.65	14.81	14.89	14.21
400016075102801	10.98	10.87	10.91	10.96	10.96	11.17	10.88	10.85	10.74	10.93	10.75	10.81
400038075094601	18.46	17.73	19.45	20.15	20.15	20.50	20.05	19.73	19.24	19.60	19.53	19.43
400055075122501	15.34	15.72	16.08	16.22	16.07	16.18	15.58	14.61	14.26	14.61	14.57	14.43
400132075031001	20.67	20.56	20.52	20.99	21.00	21.12	21.29	21.12	19.64	19.45	19.55	18.99
400211075093701	13.97	13.88	13.88	14.06	14.17	14.30	14.41	14.27	13.96	13.74	13.60	13.52
400217075142101	32.72	32.65	33.10	34.26	31.85	27.49	30.95	32.14	29.53	29.21	28.84	27.75
400229075104601	16.04	15.78	16.55	17.28		17.21	15.34	13.81	14.13	14.81	14.68	14.68
400308074592201	6.74	7.22	7.49	8.14	8.23	8.39	8.18	6.03	2.87	3.16	3.04	2.47
400311075101301	11.50	11.68	12.35	12.83	12.53	12.61	11.60	8.98	8.78	9.01	9.26	8.36
400327075152201	64.59	71.44	75.26	77.01	78.32	79.23	79.57	68.55	56.56	58.43	58.83	56.12
400424075104901	17.83	18.27	18.86	19.68	20.00	20.35	20.44	19.16	15.70	15.98	15.81	15.88
400512075033401	35.74	35.26	36.10	36.34	36.41	36.78	35.60	33.93	32.84	34.77	34.67	33.77
400516075033201	30.80	30.21	30.21	30.55	30.57	31.01	31.10	31.18	29.73	26.08	26.05	25.97
400527075042801	19.79	19.48	19.75	20.08	19.87	22.25	20.73	19.40	18.84	19.57	19.86	19.30
400527075042802	18.85	16.65	16.92	17.54	16.93	24.07	22.78	16.28	14.85	16.06	17.09	15.45
400644074590801	17.78	17.69	18.05	18.66	18.56	18.60	18.55	17.81	15.80	16.00	16.26	16.13

transformed to a normal distribution, the nonparametric Kruskal-Wallis test can be used instead to detect significance of the specified statistical factor (USEPA 2009).

Well Monitoring Data Summary

Well monitoring data were summarized from July 2017 to June 2018 (Tables 4-5). These data are presented as an update of the program status. Additional data analysis will be completed as part of the groundwater model calibration and groundwater map update reports. Groundwater trends will be analyzed further once a sufficient amount of data has been collected (See Data Analysis section).

Table 5. Regional County Observation Well Data 7/2016 - 6/2017.

Site ID	J	A	S	O	N	D	J	F	M	A	M	J
400453075255601	21.58	21.22	22.36	23.73	23.86	24.27	23.87	19.4	18.19	18.95	18.67	18.02
400808075210401		10.19	12.89					11.69			7.8	9.03
401157075032001		31.27	33.81	34.3			35.06			27.94	26.71	
395512075293701		7.43		8.03			7.65		6.42			6.38

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Appendix J – PWD Wadeable Streams Benthic Macroinvertebrate and Physical Habitat Assessments

PWD Wadeable Streams Benthic Macroinvertebrate and Physical Habitat Assessments

Background

Since 1999, the Philadelphia Water Department (PWD) has been using benthic macroinvertebrate sampling and instream physical habitat assessments in order to characterize watershed conditions and track trends in watershed health. Assessments are performed by the staff of PWD's Bureau of Laboratory Services (BLS) using PADEP Instream Comprehensive Evaluation (ICE) methods. As benthic invertebrates may be exposed to both short and long-duration stressors, data collected through this program are pertinent to all targets of PWD's Integrated Watershed Management Plan (IWMP) Strategy.

Common Acronyms Used in This Report

IBI - Index of Biotic Integrity, a biological assessment tool to indicate the capability of a stream to support a healthy aquatic community.
ICE - Instream Comprehensive Evaluation, a protocol to survey and evaluate wadeable streams.
PTV - Pollution Tolerance Values, a numeric measure of an organism's ability to withstand environmental degradation.
EPT - Ephemeroptera + Plecoptera + Trichoptera, the common names for pollution-sensitive mayflies, stoneflies and caddisflies.

Assessment Study Design

In recent years, agencies tasked with evaluating water quality have attempted to incorporate statistical sampling designs, or a "probabilistic" approach, to selecting sampling sites (Paulsen 2008, Borsuk *et al*. 2001) rather than relying on fixed sites. Statistical sampling design is particularly important when the goal of monitoring is to make an estimate of the percentage of waters affected by pollution. Another advantage of probabilistic study design is that the assessment units are distributed over a larger geographic area. When monitoring efforts are directed at individual watersheds on a rotating basis, as has been the case with PWD programs, the possibility arises that larger scale patterns may be missed. For example, the effects of floods or drought conditions are widespread, but only the watershed that is being monitored within the same time period will have data reflecting these effects. Disadvantages of a probabilistic approach include the technical demands of establishing and randomly selecting from geographic data sets containing all possible sampling locations as well as additional field reconnaissance work when conduct the actual monitoring.

The current PWD monitoring strategy is intended to be a compromise, recognizing the benefits of collecting data from randomly selected sites but also the importance of maintaining a consistent monitoring effort at selected locations over time. This plan is based on a similar monitoring program implemented by USGS in Chester County (Reif 2002, Reif 2004). The plan also reflects the manpower constraints of collecting and processing samples with the PADEP ICE protocol. It is hoped that this compromise approach (Table 1) will achieve some of the benefits of a randomized approach, while providing periodic re-evaluation of our watersheds required to inform the watershed planning process and comply with environmental mandates.

Stream Conditions

This report summarizes results from samples that were collected between March 8 and March 27, 2017. PWD is not aware of any spills, discharges or unusual conditions that would tend to cause misleading results.

Methods

Benthic Macroinvertebrate Sample Collection

Table 1. PWD Proposed Wadeable Streams Assessments Schedule

Period	Monitoring Activity (number of samples)
2011	USGS gage samples (8); Randomly selected sites (16)
2012	Cobbs Creek Assessment (6*); USGS gage samples (9); Random (10)
2013	Tookany/Tacony Creek (10*); USGS gage samples (8); Random (7)
2014	Wissahickon Creek Tributaries (11); USGS gage samples (9); Random (5)
2015	Wissahickon Creek (12*); USGS gage samples (8); Random (2)
2016	Pennypack Creek Tributaries (11); USGS gage samples (9); Random (5)
2017	Pennypack Creek (12*); USGS gage samples (9); Random (4)
2018	Poquessing Creek

* Number of monitoring sites excludes USGS gage sites in target watershed

Using the PADEP Instream Comprehensive Evaluation (ICE) protocol (PADEP 2009), macroinvertebrate samples were collected by placing a handheld D-frame net (500µm) at the downstream portion of a riffle. Stream substrate directly upstream of the D-frame net was then disturbed for approximately one minute to a depth of approximately 10 cm as substrate allowed. This procedure was repeated at other riffle locations of variable flow within the 100-m reach such that the sample at each station was a composite of six riffle samples. Composited samples from each biological monitoring location were then preserved in 95% ETOH (ethyl alcohol) and returned to the laboratory in polyethylene containers.

Benthic Macroinvertebrate Laboratory Procedures

Benthic macroinvertebrate samples were processed according to PADEP ICE protocols (PADEP 2009). Each composited sample was placed into an 18 x 12 x 3.5-inch pan marked with 28 four-square-inch grids. Four grids were randomly selected by drawing numbers. All material was extracted from the selected grids using a four-square-inch circular "cookie cutter," and placed into another identical empty pan. From this second pan, organisms were picked from randomly selected grids or “plugs” until a minimum of 200, but not more than 240, individuals were subsampled. This procedure was a misinterpretation of the actual technique, which stipulates a count of 200 (+/- 20%) individuals. When picking either the four initial “plugs” or additional plugs results in subsampling more than

240 individuals, the PADEP ICE protocol outlines a procedure for redistributing the subsample into a clean, gridded pan and “back counting” grids until a subsample consisting of 200 (+/-20%) is obtained. Invertebrates were identified under magnification, with taxonomic classification following PADEP 2009 guidelines.

Habitat Assessment

After collecting benthic invertebrates, biologists surveyed habitat features within the monitoring station and recorded scores for 12 habitat attributes according to the PADEP ICE protocol (Table 2). Biologists completed the survey independently and then discussed the interpretation of individual habitat attribute scores, averaging individual scores when necessary.

Table 2. PA DEP ICE Protocol Habitat Metrics

Habitat Parameter	Description
Instream Cover (Fish)	Mix of boulder, cobble or other stable habitat
Epifaunal Substrate	Length/width of riffles; characterization of boulders, gravel, cobble
Embeddedness	Presence/absence of fine sediment around boulders, gravel, cobble
Velocity/Depth Regimes	Presence/absence of four velocity/depth regimes
Channel Alteration	Degree of channelization or dredging
Sediment Deposition	Measure of sediment deposits, degree of change at the bottom
Frequency of Riffles	Occurrence of riffles and distance between riffles
Channel Flow Status	Degree to which water fills the available channel
Condition of Banks	Stability of streambanks and presence of erosion or bank failure
Bank Vegetative Protection	Percentage of streambank surface covered by vegetation
Grazing or Other Disruptive Pressure	Degree to which vegetation disrupted by grazing or mowing
Riparian Vegetative Zone Width	Width of riparian zone and determination of impact on vegetation by human activities

Data Analysis

Benthic macroinvertebrate and habitat data were compiled in a Microsoft Access database and queries were used to calculate scoring metrics. Individual metric standardized scores and the PADEP Index of Biotic Integrity (IBI) were calculated using the ICE protocol (Table 3).

Table 3. PADEP ICE Protocol Metrics and Metric Standardization Values

Metric	Standardization Value
Total Taxa Richness	33
EPT Taxa Richness (PTV 0-4)	19
Beck's Index, version 3	38
Hilsenhoff Biotic Index	1.89
Shannon Diversity	2.86
Percent Sensitive Individuals (PTV 0-3)	84.5

Monitoring Locations

Assessments were performed at 8 USGS gage sites, 12 mainstem sites in the targeted Pennypack watershed, and 4 randomly chosen sites from PWD's watershed assessment site network between 3/8/2017 and 3/27/2017 (Figure 1, Tables 4-5). USGS stream gaging stations are used as long-term monitoring points at which streamflow and continuous water chemistry data are collected (refer to PWD-USGS Cooperative Water Quality Monitoring appendix). Water chemistry grab sampling for nutrient and bacterial parameters is also conducted at these USGS gage stations on a quarterly basis (refer to PWD Quarterly Dry Weather Water Quality Monitoring appendix). Combining different forms of monitoring at the same station allows for better integration of information and may enable more sophisticated analyses in the future.

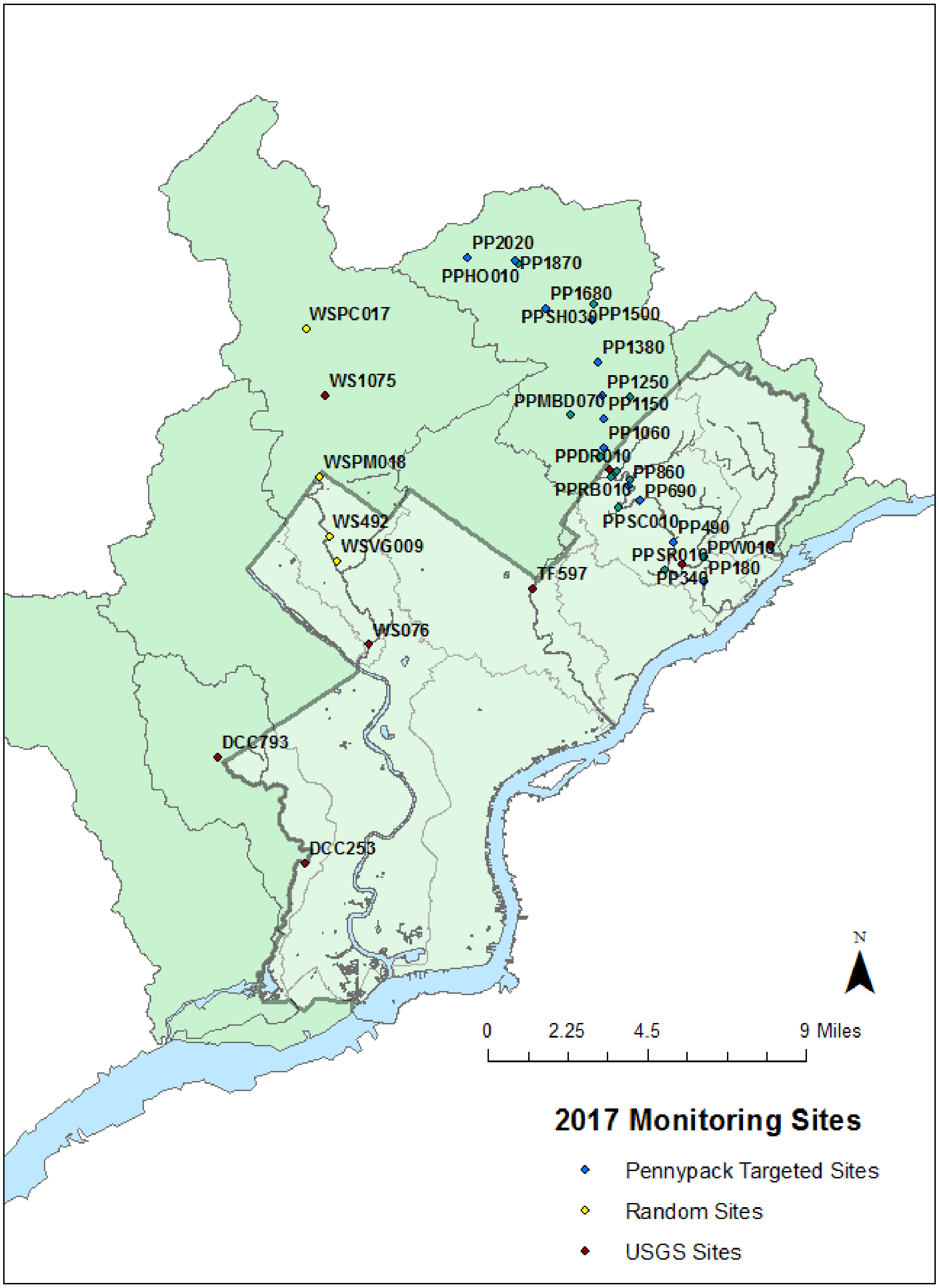

Figure 1. PWD Wadeable Streams Assessment Locations - Spring 2017

Table 4. PWD-USGS Cooperative Monitoring Program Monitoring Locations

Site ID	USGS Gage	Site Description	Drainage Area (mi^2)
DCC253	01475548	Cobbs Creek at Mount Moriah Cemetery	19.78
DCC793	01475530	Cobbs Creek at City Line Ave.	4.60
PP340	01467048	Pennypack Creek at Lower Rhawn St bridge	49.84
PP970	01467042	Pennypack Creek at Pine Rd.	39.34
PQ053	01465798	Poquessing Creek at Holy Family College	21.67
TF324*	01467087	Frankford Creek at Castor Ave.	29.69
TF597	01467086	Tacony Creek below Adams Ave. Bridge	16.25
WS076	01474000	Wissahickon Creek at Ridge Ave.	63.22
WS1075	01473900	Wissahickon Creek at Ft. Washington	40.44

*Site TF324 was inaccessible for 2017 sampling

Table 5. Pennypack Mainstem and Random Monitoring Sites, Spring 2017

Site ID	Site Description	Drainage Area (mi^2)
PP1060	1100 ft US of Moredon Rd, Lorimer Park	36.5
PP1150	1200 ft DS of Huntingdon Pike bridge	35.5
PP1250	300 ft DS of Old Welsh Rd bridge	27.3
PP1380	300 ft US of lower Creek Rd gate	24.5
PP1500	200 ft US of Creek Rd bridge	22.6
PP1680	500 ft US of Davisville Rd bridge	15.4
PP180	350 ft DS of Frankford Ave bridge	54.2
PP1870	1800 ft DS of Briar Mill Rd bridge	3.6
PP2020	100 ft US of Sawmill Ln bridge	2.4
PP490	650 ft US of Holme Ave bridge	46.2
PP690	750 ft DS of Krewstown Rd bridge	44.3
PP860	1000 ft DS of Verree Rd bridge	43.0
WSVG009	500 ft US of Wissahickon conflu.	0.19
WSPM018	900 ft DS of Stenton Ave bridge	2.3
WSPC017	400 ft US of Butler Ave bridge	2.5
WS492	350 ft DS of Rex Ave bridge	54.8

Benthic Macroinvertebrate Monitoring Results - Spring 2017

A total of 5,285 benthic macroinvertebrates from 51 taxa were collected from the 24 sampling sites. When compared to PADEP ICE protocol metric reference conditions, all assessment sites were classified as impaired. Not one of the sites achieved 63% comparability of the reference IBI for attaining the designated use (Figure 2). All sites fell below 50% comparability, meaning that they are not meeting the Aquatic Life Use (ALU) designation. Percent comparability with the standard reference IBI score ranged from 15.3% to 41.9%. All sites were characterized by low taxa richness, low or absent modified EPT taxa, and elevated Hilsenhoff Biotic Index scores (Table 6, Figures 2-5).

Table 6. PADEP ICE Metric Scores

Site ID	Taxa Richness	EPT richness (PTV 0-4)	% Sensitive individuals	Beck's Index	HBI	Shannon Index	IBI score
PP180	11	0	0.913	0	5.92	1.011	20.0
PP340	17	2	2.101	2	5.36	1.644	30.8
PP490	17	1	0.459	1	5.82	1.191	25.5
PP690	13	2	0.481	1	5.74	0.914	22.9
PP860	12	2	2.488	1	5.61	1.088	24.1
PP970	15	3	1.261	2	5.71	1.161	26.9
PP1060	19	2	3.750	2	5.62	1.401	30.1
PP1150	11	1	0.930	1	5.76	0.904	21.0
PP1250	16	1	2.966	2	5.73	1.265	26.6
PP1380	12	1	0.000	0	5.84	0.857	20.5
PP1500	17	2	1.739	2	5.81	1.140	26.8
PP1680	8	0	0.000	0	6.10	0.548	15.3
PP1870	15	2	0.962	0	5.81	1.195	25.1
PP2020	13	2	0.485	0	5.57	1.415	25.8
DCC251	16	1	0.000	0	6.26	1.516	25.5
DCC793	15	2	3.687	3	5.70	1.263	27.6
TF597	10	1	1.843	0	5.84	1.010	20.7
PQ054	13	1	1.702	1	5.87	0.931	22.1
WS076	11	1	0.000	0	5.60	1.251	22.8
WS1075	12	1	0.000	0	5.96	1.188	22.2
WSPM018	9	1	0.000	0	5.47	1.267	22.1
WSPC017	23	2	16.355	3	4.67	2.238	41.9
WS492	19	1	0.000	0	5.56	1.417	27.9
WSVG009	14	2	17.227	6	4.83	1.772	35.8

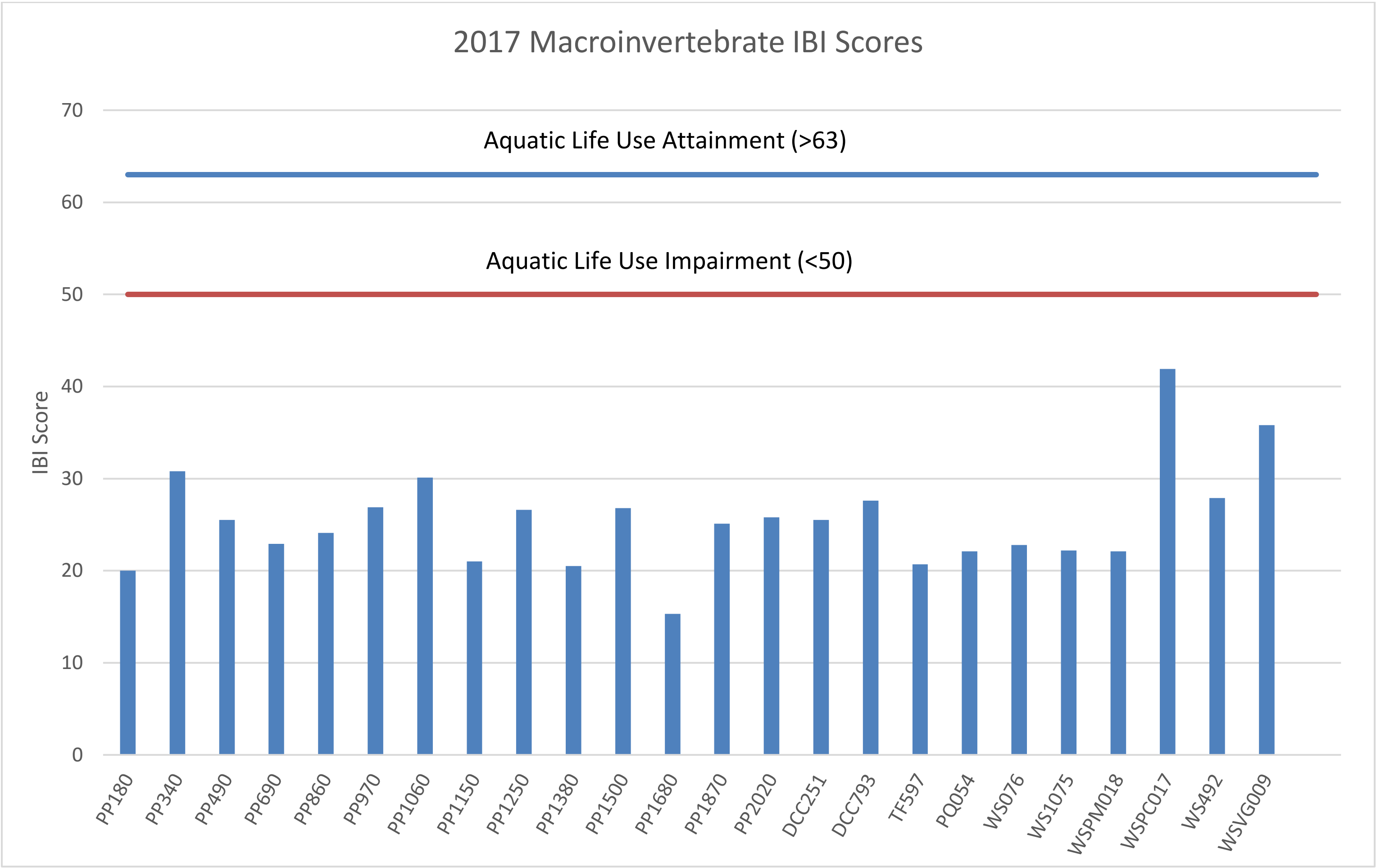

Figure 2. Macroinvertebrate IBI Scores - Spring 2017

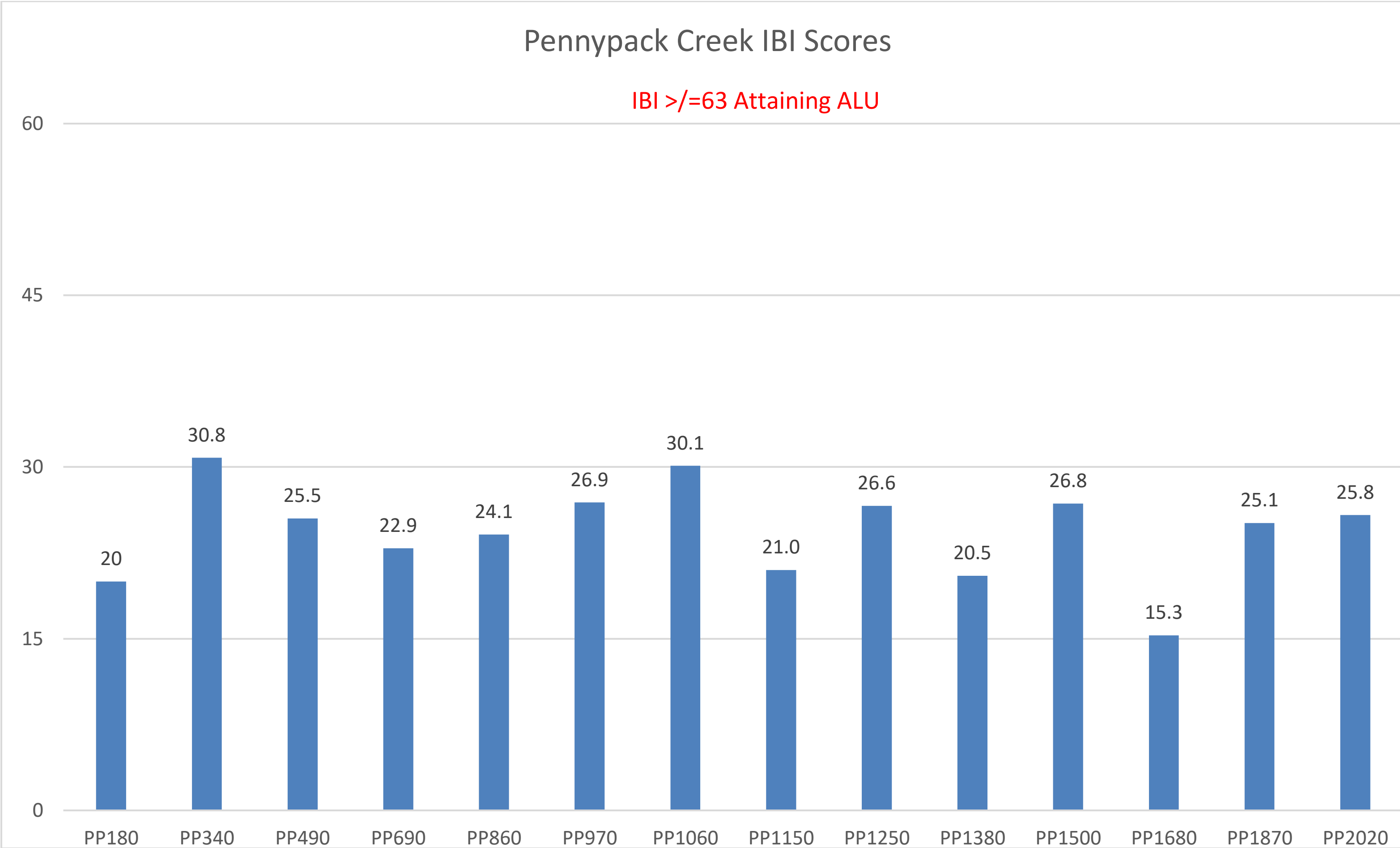

Figure 3. Pennypack Creek IBI Scores – Spring 2017

Very sensitive taxa (pollution tolerance value ≤ 2) were present at 13 of the 24 sites assessed in spring 2017. Site WSVG009 (Valley Green Run, a Wissahickon Creek tributary) had the highest Beck's Index score (n=6) and included two taxa with pollution tolerance values of zero**:** *Diplectrona* (Trichoptera; Hydropsychidae) and *Dolophilodes* (Trichoptera; Philopotamidae). All sites fell below the PADEP reference standard for Percent Intolerant Taxa metric (PTV = 0 to 3) of 84.5%.

Overall diversity was low among all sites. The Shannon Diversity Index scores for all sites ranged from 0.548 to 2.238, compared to the reference metric value of 2.86. The site with the greatest diversity was the Prophecy Creek site WSPC017 (SDI=2.238), with a taxa richness (n=23), EPT taxa richness (n=2), and HBI (4.67).

The Hilsenhoff Biotic Index (HBI) is a metric used to determine the overall pollution tolerance of a site's benthic macroinvertebrate community. This community composition and tolerance metric generally increases with increasing ecosystem stress, resulting in increasing dominance of pollution-tolerant organisms. Oriented toward the detection of organic pollution, HBI scores can range from 0 (very sensitive) to 10 (very tolerant). The average HBI for all sites was 5.67, and scores at the 24 assessment sites ranged from 4.67 to 6.26 (Figure 4).

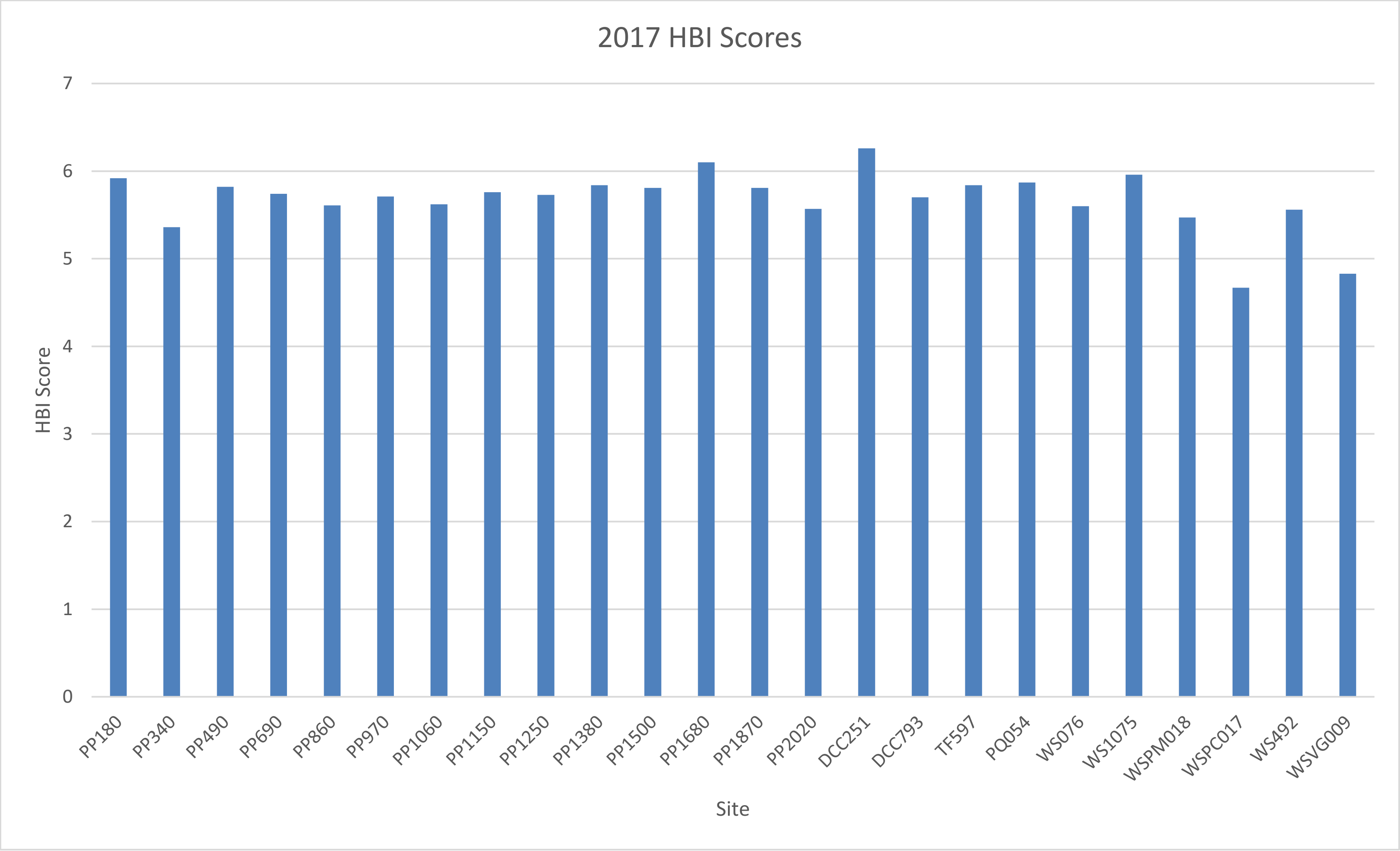

Figure 4. HBI Scores - Spring 2017

In addition to metrics used to classify sites as being impaired with respect to regional or statewide reference conditions, additional attributes of macroinvertebrate community structure were also considered at the Pennypack sites. With regard to trophic structure (*i.e.*, the distribution of feeding strategies), generalist feeders (74.18%) and filterers (12.71%) dominated at all Pennypack assessment sites (Figure 5).

Specialized feeders—a group that is generally more sensitive to perturbation than generalist feeders—were absent or found in low abundance. Scrapers comprised 11.45% of all taxa. The scrapers in question were usually not sensitive insect larvae but rather aquatic snails and *Stenelmis* (Coleoptera; Elmidae). Other functional feeding groups, predators (1.56%) and shredders (0.10%), were observed in the macroinvertebrate assessment but to a much lesser extent. Analysis of the aquatic trophic structure can indicate potential stressors such as sedimentation/siltation and eutrophication, and it may identify food resource limitations. However, it cannot distinguish between the interactions of the two factors.

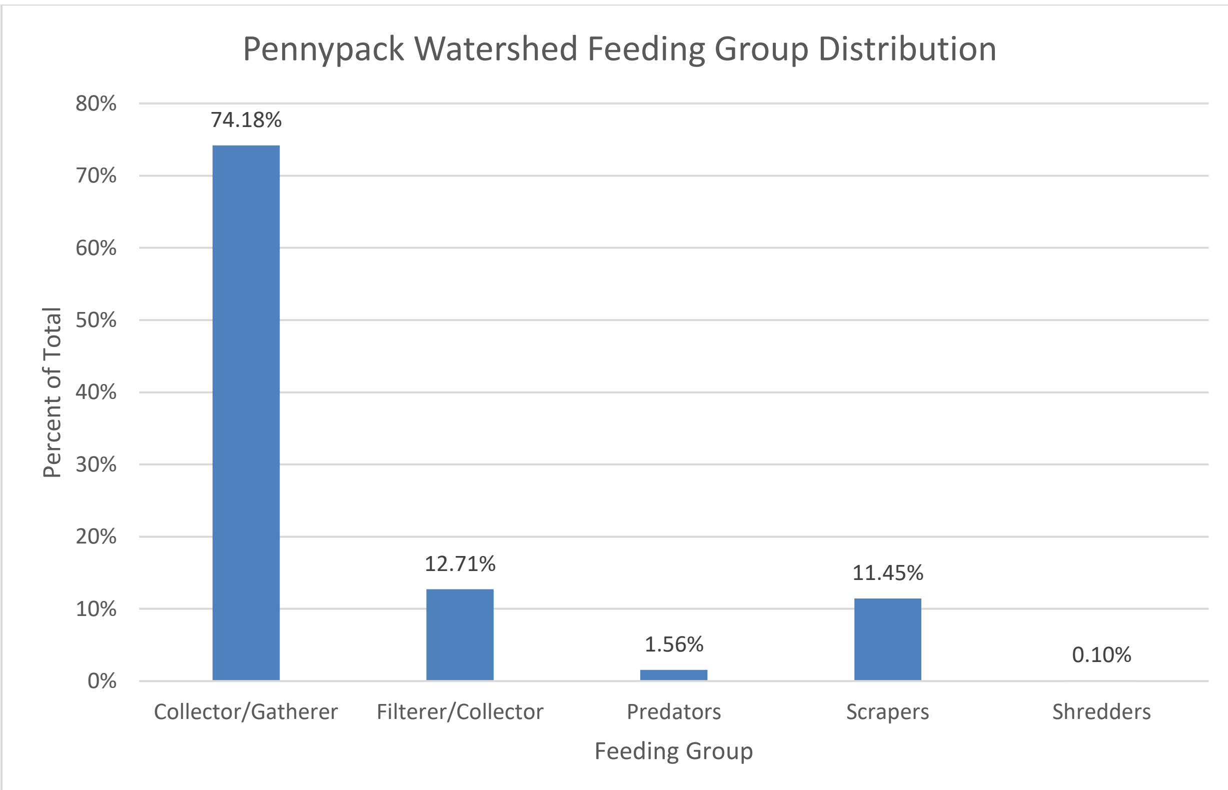

Figure 5. Feeding Group Percent Distribution - Spring 2017

Tolerance/intolerance measures are intended to be representative of relative sensitivity to perturbation and may include numbers of pollution tolerant and intolerant taxa or percent composition (Barbour *et al*., 1999). The proportion of moderately tolerant individuals at all sites averaged 85.73%, with a range of 53.27% to 96.62%. The site with the greatest proportion of moderately tolerant taxa was WS1075, with 96.62% dominance directly related to a high number of Chironomidae (n=143) found within the sorted sample (n=207). Overall, Chironomids (Figure 6) were the dominant taxon at all of the assessment locations. The proportional dominance of Chironomids is evidence of increasingly homogenous community assemblages within the selected monitoring sites. Chironomids and other pollution-tolerant, generalist species increase in proportional dominance with increased disturbance due to the loss of optimal habitat conditions for less tolerant, more specialized species.

Figure 6. Chironomid, or non-biting midge
Photo: Simon Johnston

Tolerant taxa accounted for an average of 2.23% of all taxa, and the proportion of tolerant taxa at each monitoring site ranged from 0% to 11.88%. Intolerant taxa were also poorly represented, averaging 12.04% of all taxa collected at the sites. The proportion of intolerant taxa at each site ranged from 0% to 46.26%.

Sensitive taxa (pollution tolerance values ≤ 3) were collected at 15 of the 25 sites (Table 7). The rarity of sensitive taxa suggests a response to watershed-wide perturbation, such as water quality degradation. Other potential explanations for the rarity of sensitive taxa are habitat degradation caused by fine sediment delivered to the stream channel via bank erosion or stormwater runoff and changes in seasonal base flow and temperature that tend to accompany urbanization. *Antocha* (Diptera; Tipulidae, pollution tolerance value n=3) and *Macronychus* (Coleoptera; Elmidae, pollution tolerance value n=2) were each found at 9 sites and were the most commonly collected sensitive taxa.

Table 7. Sensitive Taxa Collected

Site	Order	Family	Genus	HBI
PP180	Diptera	Tipulidae	*Antocha*	2
PP340	Coleoptera	Elmidae	*Ancyronyx*	4
PP340	Coleoptera	Elmidae	*Macronychus*	1
PP490	Coleoptera	Elmidae	*Macronychus*	1
PP690	Coleoptera	Elmidae	*Macronychus*	1
PP860	Coleoptera	Elmidae	*Macronychus*	2
PP860	Coleoptera	Elmidae	*Microcylleopus*	3
PP970	Coleoptera	Elmidae	*Ancyronyx*	1
PP970	Coleoptera	Elmidae	*Macronychus*	1
PP1060	Coleoptera	Elmidae	*Macronychus*	5
PP1060	Coleoptera	Elmidae	*Ancyronyx*	2
PP1150	Diptera	Tipulidae	*Antocha*	1
PP1150	Coleoptera	Elmidae	*Ancyronyx*	1
PP1250	Diptera	Tipulidae	*Antocha*	1
PP1250	Coleoptera	Elmidae	*Microcylleopus*	1
PP1250	Coleoptera	Elmidae	*Macronychus*	5
PP1500	Coleoptera	Elmidae	*Ancyronyx*	1
PP1500	Coleoptera	Elmidae	*Macronychus*	3
PP1870	Diptera	Tipulidae	*Antocha*	2
PP2020	Diptera	Tipulidae	*Antocha*	1
DCC793	Trichoptera	Glossosomatidae	*Glossosoma*	1
DCC793	Diptera	Tipulidae	*Antocha*	7
TF597	Diptera	Tipulidae	*Antocha*	4
PQ054	Diptera	Tipulidae	*Antocha*	2
PQ054	Coleoptera	Elmidae	*Ancyronyx*	2
WSPC017	Diptera	Tipulidae	*Antocha*	4
WSPC017	Diptera	Simuliidae	*Prosimulium*	24
WSPC017	Coleoptera	Elmidae	*Macronychus*	1
WSPC017	Coleoptera	Elmidae	*Microcylloepus*	1
WSPC017	Ephemeroptera	Heptageniidae	*Stenonema*	5
WSVG009	Trichoptera	Hydropsychidae	*Diplectrona*	26
WSVG009	Trichoptera	Philopotamidae	*Dolophilodes*	15

Table 8. 2017 Benthic Macroinvertebrate Taxa List

Order	Family	Genus
Amphipoda	Crangonyctidae	*Crangonyx*
Amphipoda	Gammaridae	*Gammarus*
Bivalvia	Corbiculida	*Corbicula*
Coleoptera	Elmidae	*Ancyronyx*
Coleoptera	Elmidae	*Dubiraphia*
Coleoptera	Elmidae	*Macronychus*
Coleoptera	Elmidae	*Microcylleopus*
Coleoptera	Elmidae	*Optioservus*
Coleoptera	Elmidae	*Oulimnius*
Coleoptera	Elmidae	*Stenelmis*
Coleoptera	Hydrophilidae	*Berosus*
Coleoptera	Psephenidae	*Psephenus*
Diptera	Ceratopogonidae	*Dasyhela*
Diptera	Chironomidae	*spp*
Diptera	Empididae	*Chelifera*
Diptera	Empididae	*Clinocera*
Diptera	Empididae	*Hemerodromia*
Diptera	Psychodidae	*Psychoda*
Diptera	Simuliidae	*Prosimulium*
Diptera	Simuliidae	*Simulium*
Diptera	Tipulidae	*Antocha*
Diptera	Tipulidae	*Limnophila*
Diptera	Tipulidae	*Limonia*
Diptera	Tipulidae	*Tipula*
Ephemeroptera	Baetidae	*Baetis*
Ephemeroptera	Heptageniidae	*Stenacron*
Ephemeroptera	Heptageniidae	*Stenonema*
Gastropoda	Ancylidae	*sp*
Gastropoda	Lymnaeidae	*sp*
Gastropoda	Physidae	*sp*
Hirudinea		
Hydracarina		
Isopoda	Asellidae	*Caecidotea*
Lepidoptera	Crambidae	*Petrophila*
Odonata / Zygoptera	Coenagrionidae	*Agria*
Odonata / Zygoptera	Coenagrionidae	*Enallagma*
Oligochaeta		
Ostracoda		
Plecoptera	Nemouridae	*Amphinemura*
Trichoptera	Glossosomatidae	*Glossosoma*
Trichoptera	Hydropsychidae	*Cheumatopsyche*
Trichoptera	Hydropsychidae	*Diplectrona*
Trichoptera	Hydropsychidae	*Hydropsyche*
Trichoptera	Hydroptilidae	*Hydroptila*
Trichoptera	Hydroptilidae	*Leucotrichia*
Trichoptera	Philopotamidae	*Chimarra*
Trichoptera	Philopotamidae	*Dolophilodes*
Trichoptera	Polycentropodidae	*Polycentropus*
Turbellaria	Nematoda	*sp*
Turbellaria	Nemertea	*sp*
Turbellaria	Planariidae	*spp*

Physical Habitat Monitoring Results - Spring 2017

Habitat impairments such as hydrologic extremes (*i.e.*, low base flow and accentuated flow during storm events), physical obstructions, and sedimentation/siltation appear to be the major environmental stressors on the aquatic ecosystem. Accumulation of sediment in the interstitial spaces of riffles has been shown to limit available habitat and possibly smother benthic invertebrate life stages (Runde and Hellenthal, 2000). Only one site (PP2020) received an optimal score for embeddedness, and no sites received optimal status for sediment deposition for habitat (Table 9). The Wissahickon tributary site WSVG009 (Valley Green tributary) had the worst total habitat scores of all sites, while Wissahickon mainstem site WS492 and Pennypack mainstem site PP2020 had the best scores for all sites (Table 9, Figure 7).

Table 9. Physical Habitat Scores at All Monitoring Sites - Spring 2017

Site ID	Instream	Epifaunal	Embed	Veldep	Chanalt	Seddep	Riffreq	Chanflo	Bankcond	Vegpro	Graze	Ripveg	Total Score
DCC253	8.5	8.5	5.5	11	13	10	9.5	14.5	9	16	14	13	132.5
DCC793	16.5	16	11.5	14	17	13.5	13.5	12	10.5	16.5	17	16.5	174.5
PP180	14.5	12	7	14	15	9.5	8	9	10	17	17	14.5	147.5
WS076	12	11.5	9	16.5	9.5	13	8	15	14.5	5.5	13	9	136.5
PP340	9.5	11	8	11	13.5	9.5	11.5	9.5	11.5	16.5	17	16	144.5
PP970	17	15.5	11.5	16.5	18.5	6.5	14	8.5	5	16.5	11.5	9.5	150.5
PQ053	9.5	11.5	8	9	15.5	8	8	9	5	13.5	16	10.5	123.5
TF597	7.5	7.5	6.5	12	9	7	6.5	10	11.5	13.5	14.5	14.5	120
WS1075	10	9	7.5	9.5	14.5	7.5	6.5	15	9	16	17	16	137.5
PP490	15	11.5	9	16.5	14	10	7	15	4	15	17.5	18	152.5
PP690	17.5	11	11	17	14.5	11	7	14.5	13.5	16.5	17.5	17	168
PP860	17	16.5	12.5	17	17	17	8.5	17	12	15	18	18	185.5
PP1060	16	11.5	12	14	15	9	8	14	13	18	17	17	164.5
PP1150	16.5	14.5	14	17.5	14	14	13	17	12	17	16.5	17	183
PP1250	15	13.5	16	16.5	14	12	16.5	10	11.5	17	13.5	9.5	165
PP1380	14	10	9.5	16.5	15	12	12	17	9	17	18	16	166
PP1500	17	11	13	16.5	15	9.5	9.5	14.5	9.5	17	12	14.5	159
PP1680	13.5	10	14.5	16	16	9.5	9.5	14.5	7	14.5	10.5	11	146.5
PP1870	9	11.5	9.5	12	16	11	11.5	15	6.5	14.5	9.5	10	136
PP2020	16.5	16.5	16.5	14.5	18	15	16.5	15	12	18.5	16	15	190
WSPM018	6.5	7.5	6.5	7	15.5	6.5	7	8	10	13	6	13	106.5
WS492	17.5	16.5	14.5	18	16.5	14.5	14.5	16	12.5	15.5	17	17	190
WSVG009	9.5	8	8	10	6	6.5	9	8.5	3.5	11.5	14.5	9.5	104.5
WSPC017	14	13.5	11.5	13.5	18.5	9	12.5	13	8	18.5	18.5	18.5	169

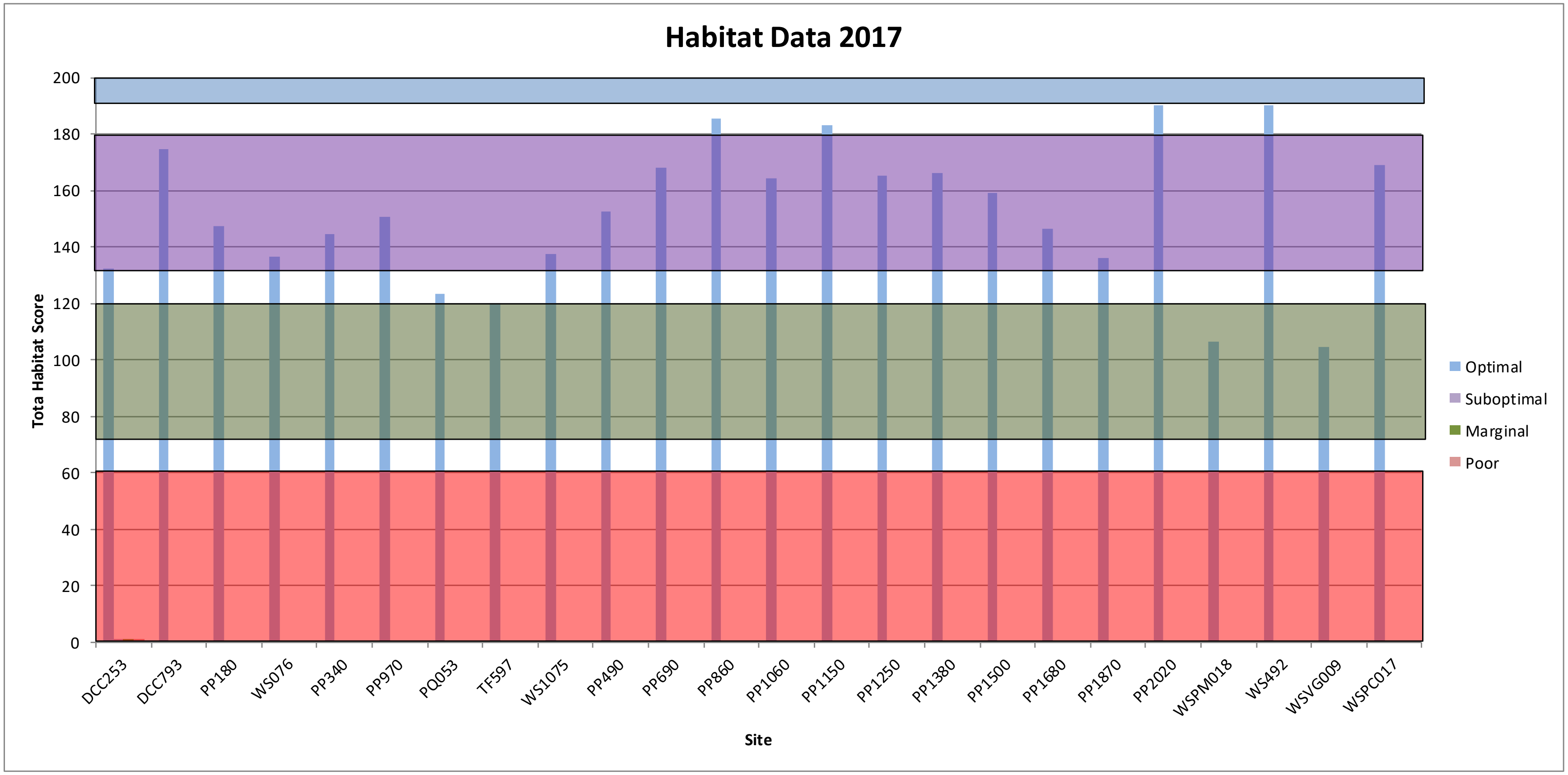

Figure 7. Habitat Scores, Spring 2017

Although it is much too early to draw conclusions regarding trends at the eight long-term PWD-USGS cooperative monitoring sites, embeddedness and sediment deposition results are shown below (Figures 8-9). Many factors contribute to interannual variability in the data, and it is hoped that future work will provide some insight into long-term trends.

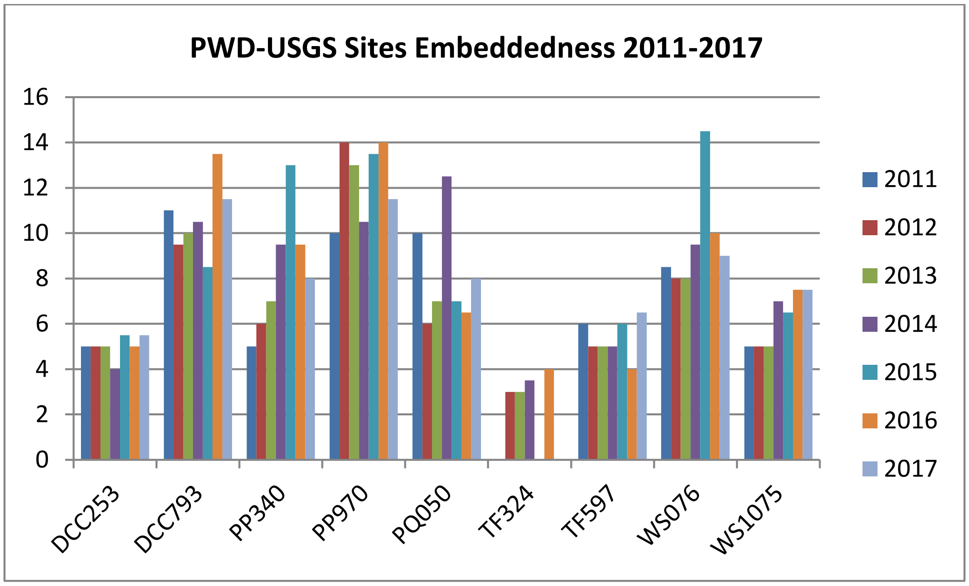

Figure 8. Comparison of PWD-USGS Sites Embeddedness Scores, 2011-2017*

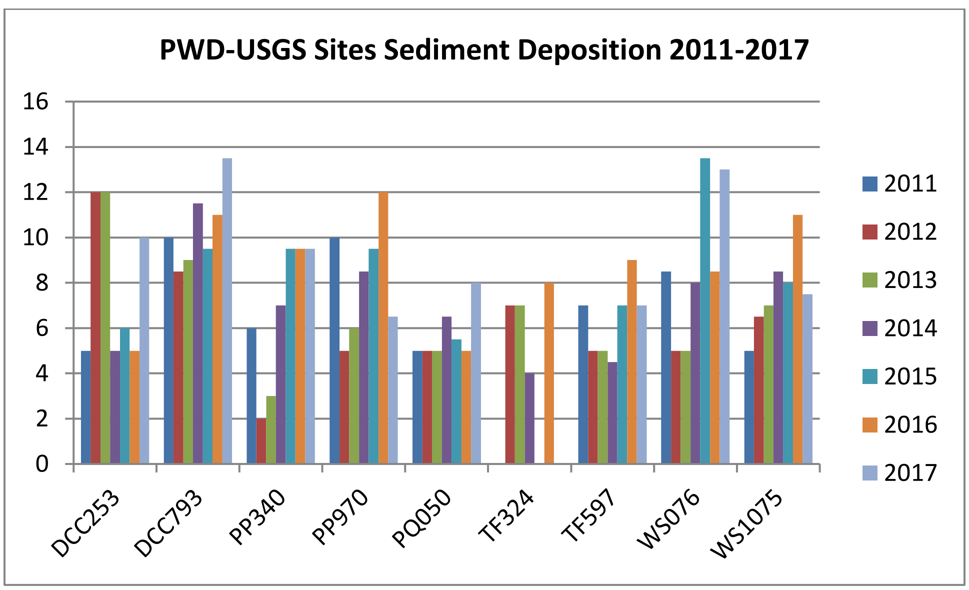

Figure 9. Comparison of PWD-USGS Sites Sediment Deposition Scores, 2011-2017*

*In 2013, samples for TF324 were taken from nearby site TF328. TF324 was not sampled in 2015 and 2017.

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Appendix K – NPDES Industrial Stormwater Permitted Sites – Philadelphia County

Authority ID	Permit Type	Site Name	Program Description	Site Address
PAG-03 General				
961161	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ABF FREIGHT SYS	Clean Water	4000 RICHMOND ST, PHILADELPHIA, PA 19137
1154204	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ADVANSIX INC	Clean Water	MARGARET & BERMUDA STS, PHILADELPHIA, PA 19137
1100082	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ALLEGHENY IRON & METAL TACONY ST FAC	Clean Water	TACONY ST & ADAMS AVE, PHILADELPHIA, PA 19124
329442	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	AMER AUTO PARTS 61ST STREET FAC	Clean Water	3501 S 61ST ST, PHILADELPHIA, PA 19153
878137	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ARDEX LAB	Clean Water	2050 BYBERRY RD, PHILADELPHIA, PA 19116
1016261	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ATLANTIC AVIATION ENTERPRISE AVE FAC	Clean Water	8375 ENTERPRISE AVE, PHILADELPHIA, PA 19153
1032035	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ATLANTIC USED AUTO PARTS ESSINGTON AVE FAC	Clean Water	6544 ESSINGTON AVE, PHILADELPHIA, PA 19153
1041802	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	B & L AUTO PARTS 61ST STREET FAC	Clean Water	3404 S 61ST ST, PHILADELPHIA, PA 19153
1039992	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	BIG HEAD AUTO SALVAGE CORP	Clean Water	3511 S 61ST ST, PHILADELPHIA, PA 19153
1081872	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	BILL'S AUTO PARTS PASSYUNK AVE FAC	Clean Water	6235 PASSYUNK AVE, PHILADELPHIA, PA 19153

Authority ID	Permit Type	Site Name	Program Description	Site Address
856840	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	BRITTON IND INC	Clean Water	8901 TORRESDALE AVE, PHILADELPHIA, PA 19154
325198	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	BUDD PHILA PLT	Clean Water	2450 HUNTINGPARK AVE, PHILADELPHIA, PA 19129
1041005	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	C&E AUTO PARTS ESSINGTON AVE	Clean Water	6796 ESSINGTON AVE, PHILADELPHIA, PA 19153
1137392	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CARTEL AUTO PARTS W PASSYUNK AVE FAC	Clean Water	6330 W PASSYUNK AVE, PHILADELPHIA, PA 19153
1102641	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CLEAN EARTH OF PHILA FAC	Clean Water	3201 S 61ST ST, PHILADELPHIA, PA 19153
1100654	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CONRAIL - ANN STREET YARD	Clean Water	2801 E ANN STREET, PHILADELPHIA, PA 19134
1100667	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CONRAIL - FRANKFORD JUNCTION YARD	Clean Water	2110 E BUTLER ST, PHILADELPHIA, PA 19124
1100662	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CONRAIL - SOUTH PHILLY YARD	Clean Water	11TH ST & TERMINAL RD, PHILADELPHIA, PA 19112
1165282	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CONTANDA TERMINALS	Clean Water	2900 E ALLEGHENY AVE, PHILADELPHIA, PA 19134
1002506	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	CSX INTERMODAL CHRISTOPHER COLUMBUS AVE FAC	Clean Water	3400 S CHRISTOPHER COLUMBUS BLVD, PHILADELPHIA, PA 19148
1020028	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	DAVE'S DELAWARE VALLEY TOWING PASSYUNK AVE FAC	Clean Water	6159 PASSYUNK AVE, PHILADELPHIA, PA 19153

Authority ID	Permit Type	Site Name	Program Description	Site Address
577993	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	DHL EXPRESS COLUMBUS BLVD FAC	Clean Water	1101 N CHRISTOPHER COLUMBUS BLVD, PHILADELPHIA, PA 19125
973172	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	DHL EXPRESS HOLSTEIN AVE FAC	Clean Water	7600 HOLSTEIN AVE, PHILADELPHIA, PA 19153
1161694	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	DUFFEY OIL TERM	Clean Water	2700 ROBERTS AVE, PHILADELPHIA, PA 19129
1086796	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ECO ENERGY PHILLY	Clean Water	3400 S CHRISTOPHER COLUMBUS BLVD, PHILADELPHIA, PA 19148
1033602	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ESSINGTON AVE AUTO PARTS FAC	Clean Water	6746 ESSINGTON AVE, PHILADELPHIA, PA 19153
1138130	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	EXELON RICHMOND GENERATING STA	Clean Water	3901 N DELAWARE AVE, PHILADELPHIA, PA 19137
970846	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	FC HAAB SCHUYLKILL AVE TERM	Clean Water	SCHUYLKILL AVE & MORRIS ST, PHILADELPHIA, PA 19145
383091	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	FEDEX GREYS FERRY AVE FAC	Clean Water	3600 GRAYS FERRY AVE, PHILADELPHIA, PA 19146
1029239	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	FEDEX TOWNSEND RD FAC	Clean Water	14300 TOWNSEND RD, PHILADELPHIA, PA 19154
329466	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	FIORES AUTO PARTS 61ST STREET FAC	Clean Water	3300 S 61ST ST, PHILADELPHIA, PA 19153
1222888	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	FIRST TRANSIT	Clean Water	2500 WHEATSHEAF LN, PHILADELPHIA, PA 19137

Authority ID	Permit Type	Site Name	Program Description	Site Address
1008654	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	GREENWICH TERM S COLUMBUS BLVD FAC	Clean Water	3301 S COLUMBUS BLVD, PHILADELPHIA, PA 19148
813532	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	HAROLDS USED AUTO PARTS WHITBY AVE FAC	Clean Water	5347 WHITBY AVE, PHILADELPHIA, PA 19143
1229735	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	IVC LLC	Clean Water	10101 ROOSEVELT BLVD, PHILADELPHIA, PA 19154
1047066	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	JACK'S AUTO PARTS S 61ST ST FAC	Clean Water	3517-3555 S 61ST ST, PHILADELPHIA, PA 19153
1033629	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	JIM'S AUTO RECYCLING W PASSYUNK AVE FAC	Clean Water	6299 W PASSYUNK AVE, PHILADELPHIA, PA 19153
1098554	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	JT'S USED AUTO PARTS S 61ST ST FAC	Clean Water	3505 S 61ST ST, PHILADELPHIA, PA 19153
1056063	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	KANCO METALS INC	Clean Water	4601 BATH ST, PHILADELPHIA, PA 19137
1137723	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	KINDER MORGAN POINT BREEZE TERM	Clean Water	6310 W PASSYUNK AVE, PHILADELPHIA, PA 19153
1035983	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	LKQ VENICE AUTO PARTS	Clean Water	3350 SOUTH 61ST STREET, PHILADELPHIA, PA 19153
21593	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	METRO MACH OF PA SHIP REPAIR FAC	Clean Water	FOOT OF MORTON AVE, PHILADELPHIA, PA 19013
1043263	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	NAVAL FOUNDRY AND PROPELLER CTR	Clean Water	1701 KITTY HAWK AVE, PHILADELPHIA, PA 19112

Authority ID	Permit Type	Site Name	Program Description	Site Address
781605	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	NDV RECYCLING N 2ND ST FAC	Clean Water	3630 N 2ND ST, PHILADELPHIA, PA 19140
1133700	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	NORTHEAST PHILADELPHIA AIRPORT (PNE)	Clean Water	9800 ASHTON RD, PHILADELPHIA, PA 19114
1088603	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	ORTHODOX AUTO UNRUH AVE FAC	Clean Water	5247 UNRUH AVE, PHILADELPHIA, PA 19135
1070573	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	OSCAR'S AUTO PARTS PASSYUNK AVE FAC	Clean Water	6145 W PASSYUNK AVE, PHILADELPHIA, PA 19153
326557	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PAARNG FT MIFFLIN FAC	Clean Water	BLDG 56 FORT MIFFLIN, PHILADELPHIA, PA 19153
326472	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PAARNG OGONTZ OMS 14A	Clean Water	5350 OGONTZ AVE, PHILADELPHIA, PA 19141
326466	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PAARNG SOUTHAMPTON FAC	Clean Water	2734 SOUTHAMPTON RD, PHILADELPHIA, PA 19154
887155	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PASCO PASCHALL AVE FAC	Clean Water	7250 PASCHALL AVE, PHILADELPHIA, PA 19142
1135947	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PEPSI BOTTLING ROOSEVELT BLVD PLT	Clean Water	11701 ROOSEVELT BLVD, PHILADELPHIA, PA 19154
1101644	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PHILA GAS WORKS PASSYUNK AVE PLT	Clean Water	3100 PASSYUNK AVE, PHILADELPHIA, PA 19145
459823	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PHILA WATER DEPT NE WPCP	Clean Water	3895 RICHMOND ST, PHILADELPHIA, PA 19137

Authority ID	Permit Type	Site Name	Program Description	Site Address
459790	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PHILA WATER DEPT SE WPCP	Clean Water	25 PATTISON AVE, PHILADELPHIA, PA 19148
459812	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	PHILA WATER DEPT SW WPCP	Clean Water	8200 ENTERPRISE AVE, PHILADELPHIA, PA 19153
1223833	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	RECLEIM PA LLC PHILA PLT	Clean Water	4301 N DELAWARE AVE, PHILADELPHIA, PA 19137
929399	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	REPUBLIC SVC OF PA PORT RICHMOND HAULING FAC	Clean Water	3000 E HEDLEY ST, PHILADELPHIA, PA 19137
931796	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	REPUBLIC SVC QUICKWAY TRANSFER STATION	Clean Water	2960 ORTHODOX ST, PHILADELPHIA, PA 19137
1218996	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	RHOADS BUILDING 1028	Clean Water	4703 BASIN BRIDGE ROAD, PHILADELPHIA, PA 19112
1084018	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	RICHARDSAPEX MAIN ST FAC	Clean Water	4202-24 MAIN ST, PHILADELPHIA, PA 19127
1102712	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	S D RICHMAN SONS WHEATSHEAF LN FAC	Clean Water	2435 WHEATSHEAF LANE, PHILADELPHIA, PA 19137
1087333	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	SAVAGE SVC E OREGON AVE FAC	Clean Water	52 E OREGON AVE, PHILADELPHIA, PA 19148
1021396	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	SEPTA ROBERTS AVE FAC	Clean Water	2705 ROBERTS AVE, PHILADELPHIA, PA 19129
1161890	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	SPC PENROSE AVE FAC	Clean Water	26TH ST & PENROSE AVE, PHILADELPHIA, PA 19145

Authority ID	Permit Type	Site Name	Program Description	Site Address
1044986	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	STEVE'S AUTO PARTS II S 61ST ST FAC	Clean Water	3331 S 61ST ST, PHILADELPHIA, PA 19153
1081910	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	SUN CHEM HUNTING PARK AVE PLT	Clean Water	3301 HUNTING PARK AVE, PHILADELPHIA, PA 19132
1107170	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	SWEET OVATIONS TOMLINSON RD FAC	Clean Water	1741 TOMLINSON RD, PHILADELPHIA, PA 19116
1107531	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	TASTYKAKE	Clean Water	2801 HUNTING PARK AVE, PHILADELPHIA, PA 19129
1017690	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	THE VANE BROTHERS CO PHILLY LAUNCH	Clean Water	4700 BASIN BRIDGE RD, PHILADELPHIA, PA 19112
1008765	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	TJ COPE NORCOM RD FAC	Clean Water	11500 NORCOM RD, PHILADELPHIA, PA 19154
944198	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	TRANSFLO TERM SVC MOORE ST FAC	Clean Water	36TH & MOORE ST, PHILADELPHIA, PA 19145
1011879	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	TRANSRIVER PHILADELPHIA S 26TH ST FAC	Clean Water	3600 SOUTH 26TH ST, PHILADELPHIA, PA 19145
886506	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	TRC TRANSFER STATION COLUMBUS BLVD FAC	Clean Water	2904 S CHRISTOPHER COLUMBUS BLVD, PHILADELPHIA, PA 19148
1032066	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	UNITED METAL TRADERS COMLY ST FAC	Clean Water	5240 COMLY ST, PHILADELPHIA, PA 19135
921671	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	US POSTAL SVC LINDBERGH BLVD FAC	Clean Water	7500 LINDBERGH BLVD, PHILADELPHIA, PA 19176

Authority ID	Permit Type	Site Name	Program Description	Site Address
1011743	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	VANE LINE BUNKERING FT MIFLIN RD FAC	Clean Water	4925 FT MIFLIN RD, PHILADELPHIA, PA 19153
1152621	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	WASTE MGMT BLEIGH AVE FAC	Clean Water	5109 BLEIGH AVE, PHILADELPHIA, PA 19136
1084122	PAG-03 Discharge of Stormwater Assoc w Industrial Activities	WASTE MGMT OF PA GRAYS FERRY AVE FAC	Clean Water	3605 GREYS FERRY AVE, PHILADELPHIA, PA 19146
No Exposure				
1109160	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	API TECH CORP - PHILA OPS	Clean Water	2707 BLACK LAKE PLACE, PHILADELPHIA, PA 19154
1108533	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	COILPLUS BLEIGH AVE FAC	Clean Water	5135 BLEIGH AVE, PHILADELPHIA, PA 19136
1142051	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	EFORCE COMPLIANCE	Clean Water	3115 WHARTON ST, PHILADELPHIA, PA 19146
1098231	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	FIBREFLEX PACKING & MFG UMBRIA ST FAC	Clean Water	5101 UMBRIA ST, PHILADELPHIA, PA 19128
1011650	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	HILLOCK ANODIZING MFG FAC	Clean Water	5101 COMLY ST, PHILADELPHIA, PA 19135
1011652	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	HILLOCK ANODIZING TULIP ST	Clean Water	7363A TULIP ST, PHILADELPHIA, PA 19136
1078315	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	INNOVATION PRINTING & COMMUNICATION	Clean Water	11601 CAROLINE RD, PHILADELPHIA, PA 19154
1228873	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	JOWITT & RODGERS STATE RD FAC	Clean Water	9400 STATE RD, PHILADELPHIA, PA 19114

Authority ID	Permit Type	Site Name	Program Description	Site Address
1147383	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	LANNETT	Clean Water	9000 STATE ROAD, PHILADELPHIA, PA 19136
1147387	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	LANNETT CO INC	Clean Water	9001 TORRESDALE AVE, PHILADELPHIA, PA 19136
1147388	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	LANNETT CO INC	Clean Water	13200 TOWNSEND RD, PHILADELPHIA, PA 19154
1160143	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	LSC COMMUNICATIONS INC ROOSEVELT BLVD FAC	Clean Water	11311 ROOSEVELT BLVD, PHILADELPHIA, PA 19154
1078748	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	MUTUAL PHARM CO INC	Clean Water	7722 DUNGAN RD, PHILADELPHIA, PA 19111
758806	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	MUTUAL PHARMACEUTICAL ORTHODOX ST FAC	Clean Water	1100 ORTHODOX ST, PHILADELPHIA, PA 19124
1078353	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	PACKAGING COORDINATORS INC	Clean Water	3001 RED LION RD, PHILADELPHIA, PA 19114
591838	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	PEARL PRESSMAN LIBERTY	Clean Water	7625 SUFFOLK AVE, PHILADELPHIA, PA 19153
1015925	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	PENN MAID DUTTON RD PLT	Clean Water	10975 DUTTON RD, PHILADELPHIA, PA 19154
1210830	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	RR DONNELLEY GANTRY RD FAC	Clean Water	9985 GANTRY RD, PHILADELPHIA, PA 19115
1023590	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	SANDMEYER STEEL	Clean Water	10060 SANDMEYER LN, PHILADELPHIA, PA 19116

Authority ID	Permit Type	Site Name	Program Description	Site Address
1144476	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	SMITH EDWARDS DUNLAP	Clean Water	2867 E ALLEGHENY AVE, PHILADELPHIA, PA 19134
1073324	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	SOUTHERN GRAPHIC SYS ROBERTS AVE FAC	Clean Water	2781 ROBERTS AVE, PHILADELPHIA, PA 19129
874849	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	SPECTRUM MICROWAVE PHILADELPHIA OPERATIONS	Clean Water	2707 BLACK LAKE PLACE, PHILADELPHIA, PA 19154
1086399	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	USPS PHILA VEHICLE MAINTENANCE FACILITY	Clean Water	3201 SOUTH 74TH ST, PHILADELPHIA, PA 19153
1049958	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	USPS VEHICLE MAINTENANCE FAC	Clean Water	1900 BYBERRY RD, PHILADELPHIA, PA 19116
711143	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	VEOLIA ENERGY SCHUYLKILL GEN STA	Clean Water	2800 CHRISTIAN ST, PHILADELPHIA, PA 19146
1027714	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	VEOLIA ENV SVC HEDLEY ST FAC	Clean Water	3100 HEDLEY ST, PHILADELPHIA, PA 19135
1135081	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	WUXI APPTEC	Clean Water	4751 LEAGUE ISLAND BLVD, PHILADELPHIA, PA 19112
1137663	No Exposure Certification, Discharge of Stormwater Assoc w Ind Activities, PAG-03	WUXI APPTEC INC	Clean Water	4000 S 26TH ST, PHILADELPHIA, PA 19112
Individual				
921879	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	AMTRAK 30TH STREET STATION	Clean Water	2955 MARKET ST, PHILADELPHIA, PA 19104
1131042	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	JDM MATERIALS CO BARTRAM BATCH PLT	Clean Water	PENROSE FERRY RD, PHILADELPHIA, PA 19153

Authority ID	Permit Type	Site Name	Program Description	Site Address
1131054	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	JDM MATERIALS GRANT AVE PLT	Clean Water	2750 GRANT AVE, PHILADELPHIA, PA 19114
1097211	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	NE ENERGY TERMINAL COLUMBUS AVE	Clean Water	4101 S CHRISTOPHER COLUMBUS BLVD, PHILADELPHIA, PA 19148
1129360	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	PBF LOGISTICS PRODUCTS TERMINALS LLC	Clean Water	1630 S 51ST ST, PHILADELPHIA, PA 19154
1129339	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	PBF LOGISTICS PRODUCTS TERMINALS LLC	Clean Water	6850 ESSINGTON AVE, PHILADELPHIA, PA 19153
853323	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	PHILA ENERGY SOLUTIONS REFINING & MKTG LLC	Clean Water	3144 W PASSYUNK AVE, PHILADELPHIA, PA 19145
1192681	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	PHILA INTL AIRPORT	Clean Water	DIV AVIATION/INTL AIRPORT, PHILADELPHIA, PA 19153
901759	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	PHILLY SHIPYARD INC	Clean Water	2100 KITTY HAWK AVE, PHILADELPHIA, PA 19112
963494	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	ROHM & HAAS PHILADELPHIA PLT	Clean Water	5000 RICHMOND ST, PHILADELPHIA, PA 19137
18834	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	SEPTA VICTORY AVE TERM	Clean Water	110 & 103 VICTORY AVE, PHILADELPHIA, PA 19082
1072512	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	SUNOCO PARTNERS MKT & TERM FT MIFFLIN TERM	Clean Water	HOG ISLAND RR 4, PHILADELPHIA, PA 19153
985409	NPDES Pmt Stormwater Industrial Site Runoff (Individual)	WHITE PINES PARTNERS GC	Clean Water	1 RED LION RD, PHILADELPHIA, PA 19115

Appendix L – Defective Connections Group FY18 Report

Sewer Maintenance Unit

Defective Connections Group

Fiscal Year 2018 Annual Report

I. BACKGROUND INFORMATION

A. Phase I Stormwater Regulations

In 1990, the Environmental Protection Agency (EPA) promulgated Stormwater Regulations that required National Pollutant Discharge Elimination System (NPDES) permits for stormwater discharges from large (populations in excess of 250,000) and medium-sized (populations between 100,000 and 250,000) municipalities with separate storm sewer systems, (MS4)[1]. The City of Philadelphia with a 1990 population of 1.4 million was one of two NPDES Stormwater Phase I permittees in Pennsylvania. The other permittee was the City of Allentown.

B. NPDES Permit for Stormwater

The City of Philadelphia received its first NPDES Stormwater Permit under the 1990 Federal Regulations as issued by the Pennsylvania Department of Environmental Protection (PA DEP) in September 29, 1995. This permit had a 5-year term. Among other requirements, the permit required the city to reduce stormwater based pollution of local streams, creeks and rivers, from (1) residential and commercial areas, (2) construction sites, (3) industrial sites and (4) defective lateral connections.

The renewal of the NPDES Stormwater Permit that expired in September 2000 was approved by the PA DEP on September 30, 2005. The new permit provides for the same scope and requirements for the Defective Laterals Detection and Abatement Program as the previous permit and incorporates some provisions from the Consent Order and Agreement (COA) of July 1998 although the COA was successfully completed on March 18, 2004.

With the Water Department's internal reorganization and creation of the Office of Watersheds (OOW) in January 1999, the responsibilities numbered (1) through (3) above, along with the periodic reporting thereon was transferred to the OOW. The Defective Connections group (DCG) continues to pursue the 4th objective of NPDES Permit, namely the detection of defective laterals that cause sanitary wastewater to be carried to the local streams and rivers.

DCG field investigations began in March 1994.

II. DEFECTIVE LATERALS DETECTION AND ABATEMENT PROGRAM

A. Scope of Investigations

The MS4 impacts the areas of the city where there are two separate sewers in the street. The sanitary sewer system, which consists of a network of pipes of smaller diameter, carries domestic wastewater to the City's three Water Pollution Control Plants located in the Northeast, Southeast and Southwest sections. The storm sewer system consists of pipes of larger diameter but significantly shorter lengths and transports the stormwater to the nearest natural waterways. In general, the relatively newer sections of the city in the northeast, northwest and southwest are served by a MS4.

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[1] Municipal Separate Storm Sewer System

Due to problems generally attributed to improper installation or lack of oversight during construction, sanitary wastewater from some properties can be transported into the storm sewers and from there, to the streams and rivers. This intrusion of sanitary wastewater causes pollution of the streams and rivers, which are the source of city's water supply. The polluted streams and rivers also endanger the physical health and safety of residents and users of the streams. The NPDES Permit requires the city to identify and abate the plumbing connections (defective laterals) that cause the sanitary wastewater to drain into the streams.

The **investigations** of stream pollution are triggered by the presence of a dry weather discharge from the storm sewer outfalls into the streams. There are over 400 stormwater outfalls in city's MS4 system of which some 220 have exhibited some dry weather flow.

It should be mentioned however, that not all dry weather discharge from an outfall comes from sanitary wastewater incursion; some may come from underground natural streams or from groundwater inflow. Additional testing of chemical and biochemical composition of samples collected from the outfalls determines whether or not stream pollution may be caused by defective laterals.

B. Outfall Inspections and Sampling

A systematic sampling of the quality of dry weather flow from the 200 plus wet outfalls was performed in 1991 as part of the initial NPDES permit application process. This program attempted to document the amount of flow (gph) and in many cases, fecal coliform count (number of fecal colonies per ml of water). The outfall sampling results were updated in 1998 when additional observations of fluoride levels (mg/l) were included to provide some indication of the origin of water seen in the outfalls. This is based on the fact that the natural water coming from streams or ground water seepage does not contain any significant fluorides, but the City water contains 0.7 mg/l of fluorides.

The more likely outcomes of fluoride and fecal count analyses are interpreted as follows:

i. **High fluoride level with high fecal count:** possible intrusion of sanitary wastewater into the storm sewer
ii. **Low fluoride level with high fecal count:** possible transport of surface contamination in the non-domestic discharge
iii. **High fluoride with low fecal count**: possible drinking water source

As a part of the MS4 permit, all stormwater outfalls are to be inspected once every five years. If there is dry-weather flow present then the outfall is to be sampled and tested for fecal presence and fluoride levels. In addition, the priority outfalls of the watersheds are to be sampled on a quarterly basis. Outfall inspections and sampling are handled by the Industrial Waste unit. Laboratory analysis is completed by the Bureau of Laboratory Services.

During FY2018, 41 outfall inspections were conducted and 37 samples were taken due to observed dry-weather flow as part of the Priority Outfall Sampling program. During FY2018, 117 outfall inspections were conducted and 57 samples were taken due to observed dry-weather flow as part of the Permit Inspection program.

C. Field Screening

The object of **field screening** is to identify the areas in a sewershed that are suspected of contributing to stream pollution through defective laterals. The field screening begins systematically at an outfall that shows a dry weather flow[2].

Proceeding upstream from the outfall, the storm sewer manholes are successively opened and observed for the presence of flow. The term "**flow**" has been widened to include "**wet**" stormwater manholes on the assumption that the wetness was caused by earlier active flow. These observations are continued upstream along a specified sewer line and stop when a stormwater manhole no longer exhibits any flow or wetness. The field screening is then continued along another tributary sewer and eventually through the entire sewershed of the outfall.

D. Identification of Defective Laterals

1) Dye Tests

Dye testing is a process by which a cross-connected lateral at a property that carries sanitary wastewater to a storm sewer is identified.

(a) Initial Dye Test

Before a test is conducted, the fresh air inlets (FAIs) located at the curbside of the property are identified as being the sanitary or storm FAIs. In Philadelphia, the sanitary lateral is located downstream of the stormwater lateral in relation to the flow of the main sewer[3]. The dye test protocol adopted by the City requires the presence of two properly functioning FAIs for successful initial tests. If one or no FAI is seen at a property or one or both of the FAIs are clogged or damaged, the initial dye test is aborted with a notation "**Inconclusive**".

During the initial dye test, a water-soluble fluorescent dye is placed in the fresh air inlets (FAIs). The dye is then washed down with water.

In the case of a **"Camera Assisted Dye Test"** the emergence of the dye is observed in the **storm sewer** by a closed circuit television camera positioned in the storm sewer in front of the stormwater lateral connection of the property. Possible observations include:

(i) Green dye placed in storm FAI is seen in the storm sewer
(ii) Green dye paced in storm FAI is not seen in the storm sewer
(iii) Red dye placed in the sanitary FAI is seen in the storm sewer
(iv) Red dye placed in the sanitary FAI is not seen in the storm sewer.

The above observations are interpreted as follows:

1) Combination of (i) and (iv): **Proper Connection**
2) Combination of (i) and (iii): **Probable Cross Connection**
3) Combination of (ii) and (iv): **Inconclusive**
4) Combination of (ii) and (iii): **Probable Cross Connection**

---

[2] A dry weather flow is defined as one that is detected after an elapse of 72 hours of a continuous dry spell from the previous rainfall event.

[3] As discussed in Section D. House Lateral Design, pages 5-3 and 5-4, in the PWD Water and Sewer Design Manual (2nd Edition) 2011.

In certain cases, the use of the closed circuit television camera is not possible. In such cases, the initial tests are conducted with a **"Manual Dye Test"**. Possible observations include:

In a **"Manual Dye Test"**, a green dye is placed in the storm FAI and observed in the **storm sewer**. At the same time, a red dye is placed in the sanitary FAI and observed in the **sanitary sewer**. If the red dye appears in the sanitary sewer, whether or not the green dye appears in the storm sewer, the conclusion arrived at is "**Proper Connection**".

If the red dye is not seen in the sanitary sewer, the test is repeated by placing more red dye in the sanitary FAI and observed in the **storm sewer**. If the red dye appears in the storm sewer, this result signifies the presence of a "**Probable Cross Connection**".

If dye is not seen in the sanitary and storm sewers the observation is "**Inconclusive**".

The initial dye tests, whether conducted manually or by a camera are intended to be least intrusive to the water customers. During these initial tests, no entry into the home is involved. In order to provide water for dye tests at the FAIs, field crews use portable water equipment. The Defective Connections group has two vehicles each retrofitted with water supply tanks.

(b) Confirmation Dye Test

A confirmation dye test is conducted in case of an Inconclusive test or a Probable cross connection. This test is conducted after a second notification to the customer has been sent. This test is **intrusive**; admission inside the home is required to conduct the testing.

The confirmation dye test is conducted **manually** by placing and flushing the fluorescent dye in household plumbing fixtures, such as a toilet[4]. The emergence of the dye is then observed in the **sanitary sewer**.

If the dye does appear only in the sanitary sewer, it is concluded that the property tested has a "**Proper Connection**." If the dye from the household plumbing does not appear in the sanitary sewer, then observation is made in the storm sewer. The presence of the dye in the storm sewer confirms the existence of a "**Cross Connection.**"

(c) Notification of Defective Lateral

When a confirmation dye test indicates that there exists a cross connection at the subject property, the property owner is advised that if the property qualifies as a residential property (with no more than 4 units in one of which the owner has his/her residence), the city will make repairs to the defective lateral(s) at no cost to the property owner. If later on it is discovered that the property does not fall within this category, the customer is informed by a follow up notice of his responsibility to repair the defect at their cost.

The Plumbing Repair Programs unit handles customer communications and is responsible for the abatement of these defects.

2) Customer Notifications

[4] This step was modified in CY2001 to conduct the tests from all plumbing fixtures, including any in the basement in order to identify the existence of an internal cross connection, where all fixtures but one are properly connected to the sanitary sewer, with one offending connection to the storm sewer.

(a) Initial Notification

The identification of the defective laterals begins after delineating the parts of a sewershed suspected of contributing dry weather flow to the MS4 system, after field screening. All property holders in the specified area receive an initial notification letter, generated through the Oracle-based DLS computer program. The notification provides an introduction of the program and requests the customer's cooperation in enabling **dye tests** at their property. A dye test is conducted after an initial notification is sent out to a customer. There are three possible outcomes of a dye test:

(i) A test is conducted and no cross connection is found. In this case, a result of "No Cross Connection" is entered in the database and the case is closed.

(ii) A test is conducted and it is concluded that there might exist a cross connection that results in the transport of sanitary wastewater into the storm sewer. This condition requires additional tests to confirm the existence of a cross connection.

(iii) A test cannot be conducted due to any of a variety of reasons, such as FAIs were not conclusively identified, were clogged, etc. This situation also warrants additional tests to conclude whether or not a cross connection exists.

(b) Confirmation Notification

In either of case (ii) or (iii) above, a follow up notification is sent out to the customer, informing them of the results of the previous attempt and requesting them to be available at a specified date for additional "Confirmation" tests at their property. Of course, if the date provided by the City is not suitable to the customer, they can schedule an alternative appointment that suits them.

Dye tests are then conducted at the property from within the customer's premises as described earlier. The results of the tests, (a) a Proper Connection or (b) a Cross Connection, are entered in the DLS computer program.

(c) Water Shutoff Notification

Not all dye tests are completed as a result of confirmation notifications. Some customers ignore the scheduled date and fail to make an alternative appointment. In such cases an informatory note is left at the property and a follow up attempt for tests is made. If this also results in no test, another notification is sent out informing the customer that if they do not make a firm appointment by a specified date (usually within two calendar weeks of the notification date), their water service would be scheduled to be turned off by the Customer Service unit. Of course if the customers do respond and make an appointment for dye tests, the service shutoff is withdrawn and tests are completed as soon as possible.

(d) Miscellaneous Closures

In some cases, where there was no response to dye test requests or water service shutoff notifications due to properties being vacant or abandoned, the cases were closed with a notation "**Miscellaneous Closure**". A miscellaneous closure is activated because of any of the following reasons:

- No active water service to the premises
- Property abandoned, empty or unoccupied
- No billing to the property per Revenue Department
- No sewer connection

From time to time, the miscellaneously closed accounts are revisited. If we find that the reason that caused the account to be originally closed is no longer valid, a dye test is conducted and the property is then re-classified according to the test results.

III. PRIORITY SCORE LIST OUTFALLS

The emphasis of the Defective Laterals Detection and Abatement program is on outfalls on the Priority Score List. The Priority Score List ranks all outfalls sampled with dry-weather flow based on a preset formula that includes the fecal coliform results, the estimated volume of flow, whether the outfall discharges to a drinking water source water, and a complaint factor. The Priority Score List is periodically updated based on the results of the (Permit) Outfall Inspection and Sampling Program described earlier. This list was updated in July 2013.

IV. SUMMARY OF DYE TESTS AND ABATEMENTS

Table 1 provides a summary of the work performed in detecting and abating defective laterals. It shows the cumulative numbers since the inception of the project in 1994, and the progress that was attained during FY2018.

Table 1.
Updated Progress on Dye Tests in Philadelphia MS4 Area

	Since Inception of the Program	**During Fiscal 2018**
Dye Tests Initiated	62,925	2,060
No Cross Connections Found	60,206	1,832
Cross Connections Identified	1,576	136
Completed Tests	61,782	1,968
Abatements Completed	1,479	63

Of the 63 abatements above (in FY2018), 56 were residential properties. The cost for these abatements was $ 544,947.33. Additionally, 7 commercial properties were abated at a cost of $ 17,800.00.

V. MISCELLANEOUS

Estimates of Pollution Removed

The following data provides a rough measure of the effectiveness of the Defective Connections group's positive contribution to improving the local environment:

- Number of Cross Connections Abated

Since Inception of the Program	1,479
During FY2018	63

- Estimated gallons of Polluted Water Prevented from entering the stormwater outfalls[5]

Since Inception of the Program	207.8 million gallons per year
During FY2018	8.9 million gallons per year

VI. STAFF LEVELS

Because of the high priority assigned to the Defective Connections group, the availability of manpower is extremely important. The sanctioned personnel for the unit is as follows:

One **Water Conveyance Supervisor**

Two **Field Representative Supervisors**

Four **SM Crew Chief Is / Science Technicians**

Eight **Utility Representatives**
Two positions vacant

One **Data Services Support Clerk**

The above field and office staffs are organized under the Water Conveyance Supervisor. This position is responsible for all aspects of the unit. The two Field Representative Supervisors are each responsible for two field crews, four crews in all. Each crew is led by a SM Crew Chief I / Science Technician and has two Utility Representatives.

In addition to the field staff, the Defective Connections group has the following position which provides general support:

Data Services Support Clerk: The DSSC handles the intricacies of the DLS database, creation of various correspondences related to dye tests, and follows-up with the field staff.

The DSSC also handles a variety of communications with the customers, makes appointments, and follows-up with delinquent customers. They also maintain the record of water shutoff warnings and miscellaneous closures.

At the end of FY2018, 14 of the 16 approved positions in the Defective Connections group were filled.

[5] Based on an average use of 110 gallons per capita per day, over a family size of 3.5 persons.

Appendix M – City of Philadelphia Snow and Ice Operations Plan Winter 2017-2018

Streets Department
1401 JFK Blvd, 7th Floor
Philadelphia, PA 19102
(215) 686-5460

City of Philadelphia

Streets Department
Winter 2017 – 2018

Snow and Ice Operations Plan

December 10, 2017

TABLE OF CONTENTS

Section 1
Snow & Ice Removal Operations Plan

Snow & Ice Removal Operations Plan

Plan Summary

Philadelphia, like many other northeastern cities in the United States, often faces winter storms that bring potentially dangerous accumulations of ice, sleet, freezing rain, and snow.

In order to provide roadway conditions that are safe for traffic on primary, secondary, and tertiary (residential) streets throughout the entire City of Philadelphia, the Streets Department has prepared a Snow and Ice Removal Operations Plan outlining the City's response to adverse winter weather conditions. This document outlines procedures and responsibilities for responding to winter weather emergencies.

The goal of the Plan is to ensure a continuity of City services by reducing, if not eliminating, the occasions when the City government will have to close or reduce City services due to severe winter weather, particularly with regards to curbside trash & recycling collection. The chief objective for the City in all severe winter weather is to allow all Philadelphians to return to their normal daily activities as quickly as possible.

The Plan prioritizes route systems, indicates the appropriate distribution of resources, and identifies the duties and responsibilities of all personnel engaged in the response. Also, the Plan delineates necessary linkages with other City departments and agencies including but not limited to, the Office of Fleet Management and the Office of Emergency Management.

In addition, the Plan outlines areas requiring planning before, during, and after a winter weather event, understanding that the severity of storms and the resulting conditions vary depending on many environmental factors, the plan allows for flexibility in the department's response. A matrix (see: Chart A, page 3) indicating the storm type with a brief description and resources required to respond to the emergency is provided. An in depth description of resources required to respond to each storm type is provided in subsequent sections of the plan.

Chart A - RESOURCE DEPLOYMENT WINTER Event

POST STORM FORECAST: ABOVE FREEZING TEMPERATURES

	STORM TYPE	HIGHWAY DIVISION	SANITATION DIVISION	NEIGHBORHOOD OPERATIONS	BRINE APPLICATION*	CONTRACTORS	LIFT SETS*
1	SLEET / FREEZING RAIN LESS THAN 1 INCH OF SNOW	X			X		
2	1 - 3 INCHES OF SNOW	X		Partial clearing focusing on higher terrain (15 routes)	X	X	
3	3 - 5 INCHES OF SNOW	X		Partial clearing focusing on higher terrain	X	X	
4	ABOVE 5 INCHES OF SNOW	X	X	Full Deployment (135 routes)	X	X	X

POST STORM FORECAST: BELOW FREEZING TEMPERATURES

	STORM TYPE	HIGHWAY DIVISION	SANITATION DIVISION	NEIGHBORHOOD OPERATIONS	BRINE APPLICATION*	CONTRACTORS	LIFT SETS*
5	SLEET / FREEZING RAIN LESS THAN 1 INCH OF SNOW	X		Partial clearing focusing on higher terrain (15 routes)			
6	1 - 3 INCHES OF SNOW	X		Partial clearing focusing on higher terrain	X	X	
7	3 - 5 INCHES OF SNOW	X	X	Partial clearing focusing on higher terrain	X	X	
8	ABOVE 5 INCHES OF SNOW	X	X	Full Deployment (135 routes)	X	X	X

* For pre-storm forecasts of rain to snow, brine will not be pre-applied. It will wash away.

* Lift sets are generally in Center City.

* Full Deployment may be deployed when the National Weather Service issues a winter storm warning.

Essential Staff

A. Purpose

The Streets Department is the primary response agency for the City in winter weather events such as snow and ice storms. As such, it is essential the Department maintain an adequate workforce in such emergencies.

B. Definitions

Weather Event – Includes all weather emergencies as declared by the Managing Director's Office (OTIS and OEM), in consultation with the Mayor's Office, and any weather event that requires the mobilization of staff to maintain clear roadways.

***Essential Staff* – All Department employees and any employees assigned to Streets Department Operations during a weather event are deemed essential, and must report to work unless otherwise instructed by the appropriate supervisor. (see: Streets Order No. 100 – Change #6, page 6)**

C. Policy Statement

When a weather emergency occurs, all personnel, as determined essential by the appropriate supervisor, will be required to report to their assigned functions. Since there are significant differences in the size and severity of weather events, those employees required to report may vary from event to event. When possible, employees will be notified by the appropriate supervisor/manager as to their status prior to an event. However, since such notification is not feasible in all situations, employees should report for duty unless otherwise instructed.

During weather events all employees should monitor local news broadcasts for information, and should contact their work location to obtain direction on their work status.

Employees who are not instructed to report for duty during a weather event shall be authorized to utilize accrued vacation, comp, or AL leave during weather events. Employees not engaged in storm operations may be required to report to work, at the discretion of their supervisor, if the nature of their regular work assignments has become critical.

Employees may be assigned shift work as required by the event response plan.

D. Responsibilities

Streets Commissioner: The Commissioner will serve as incident commander for snow and ice operations. These duties include supervising the logistical response of the Streets Department to winter storm events, and consulting with the Managing Director regarding the declaration of a Snow Alert, or the declaration of a Snow Emergency and the activation of the Emergency Operations Center (EOC).

The decision to activate the EOC will be made by the Managing Director's Office.

The Streets Commissioner, MDO, and the EOC will coordinate with the Philadelphia School District and the Philadelphia Archdiocese regarding winter storm events.

Chief Highway Engineer: will develop and maintain a comprehensive snow plan that defines required staffing levels during weather events, and identifies specific job positions and functions. Direct all field operations during winter weather events. In addition, will coordinate (or delegate) with all other support Departments and external partners (ie: SEPTA, PPA, PennDOT)

Supervisors: will maintain a list of employees and phone numbers, and notify those employees assigned to snow operations as required by this policy. Supervisors are to grant leave time only as prescribed in this policy statement, or in the event of extraordinary circumstances.

Human Resource Division: will communicate the Essential Staff Policy to all employees prior to the winter season.

Residential Snow Coordinator: under direction of the Chief Highway Engineer, coordinate all residential snow activity.

Snow Contractor Liaison: will maintain a list of contracted snow and ice removal vendors and order their services when necessary. The liaison also monitors contractors' performance and services rendered and authorizes payment for services.

Field Staff: All personnel, including all supporting departments, will be under the direction of the Streets Department personnel. In the interest of public safety, all personnel will report directly to Streets Department supervisors, and will not be released until directed by the Chief Highway Engineer. All are expected to be in place, on time, and ready to perform the duties for which they have been trained. Exceptions will be at the Streets Commissioner's or Managing Director's discretion through the Chief Highway Engineer.

Department of Streets
Office of the Commissioner
City of Philadelphia

October 2, 2006

Streets Order No. 100 – Change #6

Subject: Essential Staff Policy

General

The City of Philadelphia Streets Department's mission is to maintain clean and safe streets. The Department delivers a number of City services that are critical to maintaining public health and safety in our communities. These essential services include, but are not limited to, maintaining all traffic control devices and street lighting, the safe operation and maintenance of our roads and bridges, timely and consistent removal of trash and debris, and during winter weather events the plowing and salting of City streets. In the performance of such functions, it is essential that employees of the Department report to work on time when scheduled to provide services to the public. Since each division has varying needs, each division head is responsible for implementing staffing policies to effectively manage the number of employees required for duty on a mandatory basis, to insure that these essential services are delivered and that public health and safety are maintained in communities at all times.

To maintain the essential services identified above, employee leave may be cancelled as determined necessary by the division head. In addition, employees assigned to essential services are required to continue their assignments until properly relieved.

Winter Weather Events

During a winter weather event, all Streets Department employees are expected to report to work at their regularly scheduled time unless notified to report to a different location and/or at a different time. All employees with a valid Pennsylvania Commercial Driver's License (CDL) shall be considered essential during a winter weather event. Any employee holding a valid Pennsylvania Driver's License will be considered essential if notified of such by the Department. During an event, the times and location of reporting may vary significantly depending upon the nature of the event. The Department will notify, in a timely manner, essential employees whose starting time and location are modified. However, all employees should monitor weather conditions and are expected to report for duty during winter weather events or snow emergencies.

Since there are significant variations in the time, nature and intensity of events, the assignments of employees will vary. Some employees may be excused from reporting during an event. Those employees excluded from reporting shall be granted exemptions on a case by case basis provided their assigned function will not be required as dictated by the event, and if the Department Head, or designee, grants such exception.

Compliance

The Streets Department cannot successfully deliver core services without the participation of its entire team. Due to the critical nature and importance of the work to be performed, an employee who does not work his or her assigned hours may be subject to disciplinary action up to and including discharge.

CITY OF PHILADELPHIA

DEPARTMENT OF STREETS
ADMINISTRATION DIVISION
730 Municipal Services Building
1401 John F. Kennedy Blvd.
Philadelphia, PA 19102-1676

DAVID J. PERRI, P.E.
Streets Commissioner

TO	:	Streets Department Deputies and Division Directors
FROM	:	David J. Perri, P.E, Commissioner, Streets Department DJP
DATE	:	November 27, 2015
SUBJECT	:	Directive Prohibiting Preferential Snow/Ice Removal Activities

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The Streets Department's mission is to maintain clean, green and safe streets. A critical component of this mission includes our snow and ice removal operations in order to maintain clear roadways and provide safe traffic flow for citizens and businesses. This is an essential public function that must be performed in a comprehensive, efficient and effective manner without any appearance of impropriety.

In that regard, Streets Department employees must perform all snow and ice removal activities consistent with operational standards and planning requirements. Employees are strictly prohibited from performing preferential snow and/or ice removal activities for their own benefit or for the benefit any departmental staff, including line employees, supervisors, managers, division directors, deputy commissioners and the commissioner. Examples of this prohibited activity include the plowing of private driveways or parking spaces or the plowing or salting of streets in a manner that is not consistent with the overall snow fighting plan for City streets.

Please ensure you communicate this directive to your staff and that you make them aware that failure to abide by this requirement will be considered gross insubordination and subject to disciplinary action.

Goals

The Streets Department is the lead City agency for development and implementation of Philadelphia's snow and ice removal program. The goal of the program is to maintain safe egress for citizens throughout the duration of a storm and to return the City to normal operations as soon as possible after the event has ceased. The Department works closely with other City & external agencies to clear and make safe more than 2,500 miles of streets and roadways. This allows businesses, SEPTA and City agencies to maintain their normal operations during most events. Significant resources in the form of vehicles, materials, and staff are dedicated to the operation. As in similar emergency response plans, priority is given to major thoroughfares, our primary route system; however, the plan also addresses the needs of all streets within the City limits.

Sanitation service is a critical function for the citizens of Philadelphia; as such an important component of the plan is to maintain trash and recycling collections. To minimize the need to mobilize the Sanitation fleet, and the subsequent cessation of this service, the current plan augments the Streets Department's current resources with a reserve snow fighting fleet of vehicles from various departments. The Streets Department and supporting agencies are committed to providing the most efficient and effective snow and ice removal operations as possible and are continually evaluating new methods and processes.

Scope

The Roadway System

There is a network of approximately 2,575 miles of City and State roads within the boundaries of the City of Philadelphia. The responsibility for maintaining these roadways during winter storms is split among the Pennsylvania Department of Transportation (PennDOT), the Streets Department, and the Department of Parks & Recreation. Of the 360 miles of state roads, PennDOT maintains 50 miles of limited access state highways. These include I-95, the Schuylkill Expressway(I-76), The Vine Street Expressway (I-676), Roosevelt Blvd Extension (Rt-1), Woodhaven Rd extension (Rt-63), all on & off ramps, and Gustine Lakes interchange. 310 miles are state roads that PennDOT contracts with the City for snow and ice removal. This amounts to a total of 2,525 miles of City and State roads that the City maintains.

The Department of Parks & Recreation de-ices 35 miles of Park roads, including but not limited to B.F. Parkway Lincoln Drive, Kelly Drive and Martin Luther King Drive. Snow and ice removal on the remaining 2,490 miles of City streets is the responsibility of the

Streets Department. The Highway Division maintains general responsibility for the organization and deployment of City forces during winter storm operations. In storms of large accumulation, the Sanitation Division will be mobilized to supplement the snow removal effort with vehicles outfitted with plows. Finally, private contractors supplement City forces in storms of significant magnitude.

In order to provide effective service during winter storms, the City's street system is divided into primary, secondary, and tertiary route systems. The primary route system encompasses 665 miles, including 110 miles of Snow Emergency Routes. The secondary route system includes another 700 miles of streets (both systems exclude the roadway maintained by the Department of Parks & Recreation). The balance of City streets falls into the tertiary street system, covering approximately 1,125 miles of streets, 25 miles of which are private streets where the residents or Home Ownwer Associations contract for private snow removal.

Route Priority

When a Snow Emergency is declared, Snow Emergency *and Primary* Routes become the first priority for snow removal efforts. *The Snow Emergency route System is clearly marked and consists of the major street network within the City.* Primary routes include major access roads through the central business district, and in and out of neighborhoods. The majority of primary routes encompass major and minor arterials, which serve the highest traffic volumes and distribute traffic throughout the City.

The secondary route system, which includes other streets that primarily convey traffic within neighborhoods, is the second focus of snow removal efforts. Most SEPTA routes fall within the boundaries of the primary and secondary route system.

The tertiary system includes most local residential streets. These streets are cleared based upon storm type as defined in this document.

The primary and secondary route systems are salted as soon as significant moisture has accumulated on roadways, thereby minimizing travel conditions that are potentially dangerous. Certain roads may also be pre-treated with salt brine when conditions warrant. Plowing begins when there is such a sufficient build-up of snow that salting is no longer effective. Plowing and salting will occur on local and residential streets as defined in this document.

Residential streets that are inaccessible for snow and ice removal efforts due to illegally parked or abandoned vehicles cannot be treated until those vehicles are removed by the owner, or ticketed and subsequently towed.

Snow Emergency Declaration

The Mayor, Managing Director, Deputy Managing Director of Emergency Management (DMD-EM) and the Commissioner of Streets will consult to determine if a declaration of a Snow Emergency is necessary.

A snow emergency declaration allows curb to curb plowing on designated snow emergency routes (see: Section 2 for Snow Emergency Route Listings). No parking is allowed on snow emergency routes during a snow emergency. The Philadelphia Parking Authority and Police Department are responsible for ticketing and towing vehicles parked on snow emergency routes.

Signs are posted on the Snow Emergency Routes by the Traffic Engineering Division. The signs are MUTCD approved accept for the 686-SNOW phone number. This number is answered by the Police Communications.

Winter Weather Action Outline

Snow and ice removal operations are divided into three elements:

Planning

The Deputy Commissioner for Transportation, the Chief Highway Engineer and the Deputy Commissioner of Sanitation, under direction of the Streets Commissioner, are responsible for developing a comprehensive winter response plan. The planning activity will include all other support departments such as Fleet, Parks and Recreation, Water and others. Planning will encompass continuing communications with the Office of Fleet Management to ensure that vehicles are properly maintained and outfitted for salting and snow removal. Further, the plan includes periodic reviews of the Snow and Ice Operations and the route structures.

During this phase, responsibilities are outlined, key positions are identified, and crews are trained. In addition, materials are requisitioned, received, and stockpiled; equipment is repaired and readied, and snow routes and route maps are reviewed and revised as needed.

Operations

The operations phase begins when the forecast is for temperatures consistent with snow, ice, sleet or freezing rain, with at least a 50 percent chance of precipitation. The Highway District, the Residential Snow Coordinator, and Fleet Management are notified of the possibility of precipitation.

The Highway Division directs all anti-icing and de-icing efforts undertaken by the Streets Department. The Division operates under the supervision of the Chief Highway Engineer, and is divided into six regional Highway Districts, supervised by District Highway Engineers. The District Highway Engineers and the Residential Snow Coordinator, in consultation with the Snow Headquarters, located at the Bridge Maintenance Office at Whitaker Avenue and Luzerne Street, direct the winter weather operations.

The 6 Highway District yards are at the following locations:

Highway District 1 --	48th Street and Parkside Avenue
Highway District 2 --	63rd Street and Essington Avenue
Highway District 3 --	22nd Street and York Street
Highway District 4 --	Stenton Avenue and Sylvania Street
Highway District 5 --	Whitaker Avenue and Luzerne Street
Highway District 6 --	State Road and Ashburner Street

The 6 Residential District Headquarters are at the following locations:

District 1 --	Belmont & Concourse Dr. – Carousel house
District 2 --	3033 63rd St. (63rd St & Essington). Trailer next to dome
District 3 --	Gustine Lakes Rec. Center 4700 Ridge Ave.
District 4 --	4501 G St. (G & Ramona Ave.) Street Lighting Shop
District 5 --	4040 Whitaker Ave. (Whitaker & Luzerne) 2nd Floor
District 6 --	8401 State Road (State & Ashburner) – Training Center

Resources are deployed as needs dictate, however, operations generally follow a set pattern. Once the storm arrives and precipitation is falling creating icy or snow-covered streets, salting operations begin. Certain roads may also be pre-treated with salt brine when conditions warrant. In additions, some trucks are equipped with a pre-wet system that will brine the salt before it is spread Salt trucks are deployed to cover the route structure. Salting will continue until it is no longer necessary or has become ineffective.

As snow continues to fall and build up on the streets, plows are deployed to the routes. Plowing will continue until the streets are passable and safe for use by vehicular traffic. At this time, individual complaints are addressed.

Cleanup and Assessment

Following each storm, the snow removal equipment is cleaned (including the pre-wet system); spreaders and plows are removed and stored; personnel are released from snow duty; and final reports are submitted. At this time, after action reviews are undertaken. If contractors are used, all paperwork will be submitted and prepared for billing before the shift is over and Managers are released. All vehicles are post-checked and reported to Fleet for repairs.

All Highway Districts shall notify the Assistant Chief Highway Engineer as to how much salt so replenishment orders can be made following the event. An assessment of the salt dome at Domino Lane will also be done.

Participating Organizations – Assignments & Responsibilities

Assignments and Reporting Structure

All personnel involved in winter weather operations will be under the direction of Streets Department. ***Once deployed to snow operations, they will be relieved from their respective daily assignments and will not be released, except for emergency, to their respective operating departments without approval of Streets Department snow headquarters. It is the responsibility of the employee to notify their supervisor that they will be working snow operations.***

Streets Department

The Streets Commissioner is the incident commander for all winter weather operations The Highway Division coordinates the citywide program for snow removal from the City street system and is directly responsible for salting and plowing the primary, secondary, and tertiary route structures. In addition, the Chief Highway Engineer is responsible for the supervision and organization of all de-icing efforts. With the approval of the Streets Commissioner, the Chief Highway Engineer is responsible for mobilizing necessary plowing and lifting operations. These operations may require the suspension of normal Sanitation Division operations under certain conditions, and the conversion of Sanitation vehicles for plow operations. However, the Department’s goal is to minimize the impact on Sanitation operations and avoid the delay or interruption of curbside collection services. In addition, private contractors may be called in to supplement the efforts as conditions dictate. Sanitation personnel, Highway personnel, other Departmental personnel and contractors are responsible for de-icing under the direction of the Highway Division.

Department of Parks and Recreation

The Department of Parks and Recreation maintains a portion of the roadways in and around the Park system.   The Benjamin Franklin Parkway, Kelly Dr, MLK Dr, Lincoln Dr are the primary routes that are de-iced in all events. When full residential is deployed, they are assigned some residential grids. In addition, they are responsible for the trail system for treating the sidewalks and parking lots at parks and recreation centers. Since the residential program uses two of their facilities (Carousel House and Gustine Lakes), the residential manager will have those parking lots treated. The Chief Highway Engineer & the Parks & Rec winter coordinator will discuss and communicate throughout the event.

Office of Fleet Management

The Office of Fleet Management is responsible for the maintenance and repair of all vehicles in the City's fleet is responsible for opening fuel sites (see: Fuel Site Locations Table) during winter weather events, providing and installing chains, and where necessary, assisting with the installation of plows, with the exception of the Sanitation Division, which installs chains and plows on compactors. The Chief Highway Engineer and Fleet Management Liaison will discuss the event. This discussion will include Brine Salt, Plow, shifts, shop openings, and post event issues.

Fuel Site Location

Site #	Operating Hours	Departments	Site Name	Street Address	ZIP	Contact #	Fuel Type	UNLEADED TANK CAP	DIESEL TANK CAP
02	24 / 7	Police Department	24th & Wolf	2301 S. 24th Street	19145	686-3010	U	10,000	N/A
03	24 / 7	Police Department	11th & Wharton	1100 Wharton Street	19147	686-3030	U	10,000	N/A
R 05	MON - FRI 7:30-3:00	Philadelphia Water Department	8200 Enterprise	8200 Enterprise Avenue	19153	685-4047	U / D	2500	2500
06	MON - FRI 7:30-3:00	Commerce / Division Of Aviation	International Airport	8500 Essington Avenue	19153	492-3056	U / D	8,000	8,000
07	24 / 7	Streets Department	51st & Grays	5014 Grays Avenue	19143	685-2612	D	N/A	10,000
08	24 / 7	Police Department	55th & Pine	5524-30 Pine Street	19143	686-3180	U	10,000	N/A
09	24 / 7	Police Department	61st & Thompson	6059 Haverford Avenue	19151	686-3190	U	6,000	N/A

11	MON - FRI 7:00 /3:30	Office of Fleet Management	25th & Tasker	2500 Tasker Street	19145	952-6201	U / D	20,000	10,000
13	24 / 7	Police Department	Girard & Montgomery	611-17 E. Girard Avenue	19125	686-3260	U	10,000	N/A
14	24 / 7	Police Department	21st & Pennsylvania	401 N. 21st Street	19130	686-3090	U	10,000	N/A
15	MON - FRI 7:00 - 10:00	Streets Department	26th & Glenwood	2601 Glenwood Avenue	19121	685-3978	U / D	10,000	10,000
17	MON - FRI 7:00 -3:00	Philadelphia Water Department	7800 Penrose	7800 Penrose Ferry Road	19145	685-4068	U / D	10,000	20,000
18	MON - FRI 7:00 -3:00	Philadelphia Water Department	3900 Richmond	3899 Richmond Street	19137	685-1336	U / D	6,000	4,000
19	MON - FRI 7:00 -3:00	Streets Department	Delaware & Wheatsheaf	3101 Castor Avenue	19134	685-1364	U / D	2EA/1,500	10,000
21	24 / 7	Office of Fleet Management	Front & Hunting Park	100 East Hunting Park Avenue	19124	685-9100	U / D	10,000	10,000
23	MON - FRI 8:00 - 4:30	Philadelphia Water Department	29th & Cambria	2900 N. 29th Street	19132	685-9633	U / D	20,000	10,000
24	24 / 7	Police Department	22nd Hunting Park	2201 W. Hunting Park Avenue	19124	686-3390	U	10,000	N/A
25	24 / 7	Police Department	Harbison & Levick	2809 Levick Street	19149	686-3150	U	10,000	N/A
26	24 / 7	Police Department	Broad & Champlost	5960 N. Broad Street	19141	685-2862	U	10,000	N/A
28	24 / 7	Police Department	Germantown & Haines	39-43 Haines Street	19126	686-3140	U	10,000	N/A
29	24 / 7	Police Department	Ridge & Cinnaminson	6666 Ridge Avenue	19128	686-3050	U	6,000	N/A
31	MON - FRI 7:00 - 11:00	Streets Department	Domino & Umbria	200 Domino Lane	19128	685-2580	U / D	10,000	10,000
32	MON - FRI 7:00 - 11:00	Office of Fleet Management	State & Ashburner	8401 State Road	19136	685-8977	U / D	10,000	20,000
33	24 / 7	Police Department	Academy & Red Lion	3100 Red Lion Road	19114	686-3080	U	10,000	N/A
34	24 / 7	Police Department	Bustleton & Bowler	1701 Bowler Street	19115	686-3070	U	10,000	N/A
35	24 / 7	Police Department	17th & Montgomery	1727 N. 17th Street	19121	686-3230	U	10,000	N/A

38	24 / 7	Fire Department	Germantown & Carpenter	6800 Germantown Avenue	19119	685-2225	U / D	600	2,500
39	24 / 7	Fire Department	3rd & Spring Garden	276 Spring Garden Street	19123	686-1372	U	6,000	N/A
40	MON - FRI 7:00 - 5:00	Philadelphia Water Department	Fox & Abbottsford	3201 Fox Street	19129	685-2054 685-2024	U / D	10,000	10,000
41	MON - FRI 6:00 - 11:00	Streets Department	4040 Whitaker	4040 Whitaker	19124	685-9800	U / D	6,000	10,000
43	24 / 7	Fire Department	28th & Thompson	1301 N. 28th Street	19121	685-3889	D	N/A	1,000
44	24 / 7	Fire Department	Cottman & Loretta	1900 Cottman Avenue	19111	685-0591	D	N/A	1,000
45	24 / 7	Fire Department	Pennypack Circle	8205 Roosevelt Blvd	19152	685-8891	D	N/A	1,000
46	24 / 7	Fire Department	Broad & Fitzwater	711 S. Broad Street	19147	685-6897	D	N/A	1,000
47	24 / 7	Fire Department	4th & Snyder	414 Snyder	19148	685-1792	D	N/A	1,000
48	MON - FRI 7:00 - 3:30	Parks and Recreations	Chamounix (Parks/Recreati on)	715 Chamounix Drive	19131	685-0110	U / D	10,000	10,000
49	24 / 7	Fire Department	63rd & Lancaster	1913 N. 63rd Street	19151	685-0068	D	N/A	1,000
50	MON - FRI 7:00 -6:00	Streets Department	48th & Parkside	4804-48 Parkside Avenue	19131	685-0164	D	N/A	2,000
51	24 / 7	Fire Department	10th& Cherry	133 N. 10th Street	19107	686-1350	D	N/A	1,000
52	24 / 7	Fire Department	4th & Girard	400-08 Girard Avenue	19123	686-1349	D	N/A	1,000
53	24 / 7	Fire Department	82nd & Tinicum	8201 Tinicum	19153	492-3393	D	N/A	1,000
54	24 / 7	Fire Department	52nd & Willows	783 S. 52nd Street	19143	685-1987	D	N/A	2,000
56	24 / 7	Fire Department	Foulkrod & Darrah	1652-54 Foulkrod Street	19124	685-1295	D	N/A	1,000
57	24 / 7	Fire Department	Bustleton & Bowler	1701 Bowler Street	19115	685-0387	D	N/A	3,000
58	24 / 7	Fire Department	Bustleton & Hendrix	812 Hendrix Street	19116	685-0388	D	N/A	1,000

	59	24 / 7	Fire Department	Chelten & Baynton	300 E. Chelten Avenue	19144	685-2227	D	N/A	1,000
	60	24 / 7	Fire Department	30th & Grays Ferry	3023-45 Grays Ferry Avenue	19146	685-1790	D	N/A	1,000
	61	24 / 7	Fire Department	Belgrade & Ontario	2520 E. Ontario Street	19134	685-9849	D	N/A	1,000
	62	24 / 7	Fire Department	13th & Shunk	2600 S. 13th Street	19148	685-1783	D	N/A	1,000
	65	24 / 7	Fire Department	24th & Ritner	2301 S. 24th Street	19145	685-1793	D	N/A	600
R	67	MON - FRI 7:00 - 3:30	Commerce / Division Of Aviation	Northeast Airport	3001 Grant Avenue	19114	685-0311	D	N/A	4,000
	68	24 / 7	Fire Department	Academy & Comly	11650 Academy Road	19154	685-9374	D	N/A	600
	69	24 / 7	Fire Department	Ridge & Cinnaminson	6666 Ridge Avenue	19128	685-2555	D	N/A	600
R	70	24 / 7	Police Department	Dungan Road	7790 Dungan Road	19111	685-5101	U	8,000	N/A
	71	24 / 7	Fire Department	Park & Cambria	1325 W. Cambria Street	19132	685-9773	D	N/A	600
	72	24 / 7	Fire Department	Old York Road	5931 Old York Road	19141	685-2881	D	N/A	600
	73	24 / 7	Fire Department	43rd & Market	4299 Market Street	19104	685-7699	D	N/A	600
	74	24 / 7	Fire Department	Belgrade & Huntington	2601 Belgrade Street	19125	685-9847	D	N/A	600
	75	24 / 7	Fire Department	Rising Sun	5332 Rising Sun Avenue	19120	685-9197	D	N/A	600
	80	24 / 7	Office of Fleet Management	3033 S. 63RD	3033 South 63rd Street	19125	685-4250	D	N/A	10,000
R	95	MON – FRI 6:00- 3:00	School District of Philadelphia	Shallcross	Byberry & Woodhaven	19154	281-2617	D	N/A	10,000
R	96	MON – FRI 6:00- 3:00	School District of Philadelphia	Broad & Lehigh	2600 N. Broad Street	19132	215-227-4430	D	N/A	10,000

TOTAL NUMBER OF SITES IS SIXTY TWO
“R”= RESTRICTED TO VEHICLES ASSIGNED TO THE DEPARTMENT ONLY!!!!

Managing Director's Office

The Managing Director, in consultation with the Mayor, has the authority to declare a snow emergency and if necessary, close City offices. This plan should limit, if not eliminate, the need to enforce any closures during snow events.

When a snow emergency is declared the Managing Director's Office is responsible for coordinating the citywide response to the emergency. Streets Department personnel, along with personnel from other departments, participate in the staffing of the Emergency Operations Center, located at 3rd and Spring Garden Streets in the Fire Administration Building, and in other coordinated efforts as necessary.

Police Department

Police Department support is required to support existing parking regulations. Police will ticket vehicles identified as impeding snow removal efforts including, but not limited to, vehicles parked on corner radii and double-parked vehicles. Police officers will stop all private entities placing snow in previously cleared streets. During declared snow emergencies, Police support will ensure snow emergency routes are clear. The Police Department is responsible for performing de-icing activities in their facilities. The Police Department will coordinate with the Philadelphia Parking Authority for towing.

Other City Departments

The tertiary route structure is maintained by the following City Departments under the direction of the Residential Snow Coordinator.

Streets Department
Water Department
Public Property
Parks & Recreation
Managing Director's Office (CLIP)
Licenses & Inspections
Prisons Department
Revenue Department
Free Library

Snow Fighting Equipment Inventory

Streets Department 2017/2018 Fleet Summary

Listed below is the Streets Department's fleet inventory for snow operations. Due to the age of the fleet and the challenges facing the Office of Fleet Management, we (the City) have concerns about the reliability of the equipment. Winter operations place a great strain on aging vehicles, and equipment availability will have a significant impact on the Department's ability to effectively respond to weather events. With projected downtime, the City will be challenged to field a full complement of equipment to cover all routes.

The result of insufficient equipment will be slow response time, particularly on residential streets. To address this issue, in part, the Streets Department has snow contract agreements to provide supplemental equipment for both large and residential streets. The Department also continues to work closely with the Managing Director's Office to identify interdepartmental equipment that can supplement the inventory.

All departments are required to provide a full complement of necessary vehicles for snow operations for clearing the roadway system.

Streets Dept. Snow Vehicles	
Highway Salt	70
Loaders, Highway, Backhoe	25
Loaders, Highway, Articulated	13
Compactors	120
Brine, Highway	1
Brine. Sanitation	2
Brine, CLIP	1
Streets Residential	18
Total:	239
Departmental Snow Vehicles	
Assigned to Residential	66
Total:	66
Other Departments (not assigned to Residential):	51

Route Designations and Treatment

The primary and secondary route systems are divided into 148 specific routes. Salting and/or plowing of these routes will continue until the routes are deemed passable and safe for vehicular traffic.

The tertiary street system is covered in a grid pattern determined by each District Highway Engineer and the Residential Snow Coordinator. These streets are salted/plowed as storm type dictates (see Chart A, page 3). Grids are assigned and the plows attempt to clear all streets in that grid. Streets that are blocked by parked cars or other obstructions will not be treated until the obstruction is removed. Double-parked vehicles or vehicles parked on corner radii will be ticketed and towed by Police to permit snow removal efforts.

All tertiary grids will not be treated during every storm. The City's topography will primarily dictate the specific areas that will be treated during every storm type. Storm severity will dictate the expansion of treatment in the tertiary network. Regional commerce, public health, mass transit issues, sporting & special events and time of year will guide these decisions.

Snow and ice on the tertiary street system will be cleared to provide one passable lane for each direction that the specific streets can accommodate. Residential efforts are designed to allow access to the primary and secondary route system and mass transit.

Use of Salt and Other De-icing Materials

Salt (sodium chloride) or a brine solution of the same chemical, or in extreme situations, sand or other abrasives, will be spread on Philadelphia's roadway network to ensure safety for the traveling public.

Salt brine is a liquid containing a 23 per cent sodium chloride solution. Applied at rates of 30 gallons per lane mile, this treatment should effectively melt the first 2 inches of snow before re-application is necessary. The treatment can also be applied before storms begin. The Department will utilize this program in the Northwest and Northeast sections of the city, areas that typically have higher evaluations. In addition, the department may Brine the sports complex if there is an event. This should provide greater service delivery at a reduced cost, especially in the higher elevation areas of the City. The decision to Brine will be made 72 hours in advance. Brine is primarily used to pre-treat the roadway so snow does not bind to roadway. As conditions permit, brine trucks may be re-filled and used on some routes or parking lots if conditions permit. This is effective when there is less then 2 inches of snow.

Storm Types and Response

There are eight (8) basic storm types that require different responses as outlined below.

POST STORM FORECAST: Above Freezing Temperatures

Storm Type		Deployment of Fleet
1	**Sleet/Freezing Rain**	City salt truck deployment and primary and secondary routes only.
2	**1 to 3 inches of snow**	City salt truck deployment on primary and secondary routes. Partial residential deployment in limited areas of higher elevation. If cold temperatures are forecast, limited plowing may occur. (No contractors).
3	**3 to 5 inches of snow**	City and contractor salt truck deployment on primary and secondary Routes. Partial residential deployment in limited areas of higher elevation. A snow lifting may be deployed in the central business district.
4	**Above 5 inches of snow***	As above, plus the declaration of a "snow emergency." Sanitation compactors will plow the primary and secondary route system. Additional contractor equipment will be deployed. Full residential will be deployed.

POST STORM FORECAST: Borderline and Below Freezing Temperatures

Storm Type		Deployment of Fleet
5	**Sleet/Freezing Rain**	City salt trucks deployed on primary and secondary routes only. Possible partial residential deployment in limited areas of higher elevation.
6	**1 to 3 inches of snow**	City salt truck contractor deployment on primary and secondary routes. Salting Operation for tertiary streets may occur once the primary and secondary network is complete. This operation will be performed by primary and secondary route vehicles that can navigate smaller streets. Partial residential deployment in limited areas of higher elevation. If cold temperatures are forecast, limited plowing may occur.
7	**3 to 5 inches of snow**	As above, plus a snow lifting may be deployed in the central business district.
8	**Above 5 inches of snow***	As above, plus the declaration of a snow emergency. Sanitation compactors will plow the primary and secondary route system. Additional contractor vehicles will help clear snow. Full residential will be deployed.

*Full deployment may be deployed when the National Weather Service issues a winter storm warning. Lifting snow from other sections of the City will only occur when directed by the Chief Highway Engineer.

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Weather Forecasting Services

The City of Philadelphia will, in addition to monitoring local national weather forecasts for our metropolitan region, contracts with an independent private weather service to ensure that forecasts are made specific to our needs. The City recognizes that there are unique geographic differences within our boundaries, and expects detail in our contracted services to assist in deployment decisions.

Storm Operations

Storm Conditions

Philadelphia's geographic position contributes substantially to the forecasting uncertainties that it faces. Due to our location, with the mountains to our west and the Atlantic Ocean to our east, forecasters usually must watch storm systems for as long as possible before determining if they are going to hit Philadelphia or be deflected to the east or west. In addition, there are literally thousands of types of winter storms - each storm combines a number of factors that lends to its uniqueness.

The Streets Department must be prepared to deal with these planning uncertainties, as well as uncertainties that occur during the storm. For example, the Blizzard of March 1993 was originally forecasted as a 3" storm. It mushroomed into a major storm of upwards of 12 inches, including sleet and freezing rain. In early December, 2013, a forecasted 1” storm during an Eagles game turned into a 9 inch winter event. The unexpected changes in forecasts made it more difficult for the Streets Department to mobilize the most effective response to react to a storm of such magnitude. The Blizzard of January 2016 (Winter Storm Jonas) was suppose to start at 10PM and started at 7PM. In March, 2017 (Winter Storm Stella) was forecasted for over 12 inches of snow, about 4 inches of snow fell followed by a couple of inches of sleet and below freezing temperatures.

There are several other variables that affect the Department's timely response to storm events. These variables are briefly outlined below. Each of the variables listed may have a significant impact on the Department's response. Proper planning and the development of appropriate procedures, combined with some level of operational flexibility is a priority to develop the most appropriate, effective response possible, given the existing conditions. Communication through Snow Headquarters is the key to success.

- Storms may fail to materialize at the forecasted hour. Conversely, storms may stall, thereby increasing the duration of the event and the amount of accumulation. These factors increase the expense associated with responding to a storm and the chance of work force fatigue.

- During a storm, the type of precipitation may change. Different types of precipitation require different responses. For example, plowing may be hampered as ice accumulates on the top of the snow, creating a hard crust.

- The time of the year also impacts the Department’s response to storms. In the late fall and early spring months when the temperature is warmer, it may be possible to fight a storm of four to five inch accumulation with salt alone. In colder months, plowing would be necessary.

- If two or more severe storms occur in rapid succession, the Department's response may be affected. Response to the initial event may be expanded in anticipation of the subsequent storm. For example, in 2015, we had 2 storms within 36 hours at accumulations of 12 inches and 5 inches respectively with 8 hours in between.

- Low temperatures increase the amount of salt necessary to melt off precipitation.

- Winds can create havoc during storms. Although light breezes help to dry roadways following storms, stronger winds may hamper snow fighting efforts by drifting snow across cleared roadways.

- Significant elevation differences exist between the southern portion of the City and the areas in the northeast and northwest. In the northeast and northwest, snow frequently accumulates to greater depths.

- The city has developed micro-climates along the rivers creating black ice.

- Other Department’s core services may impact equipment and personnel (ie: Water main breaks or down trees due to ice and wind)

The Department's Snow and Ice Operations Plan presents a flexible framework providing effective response to all types of storms.

It is the goal of the City of Philadelphia that for the majority of the winter weather events that typically affect this city, that we will have, depending on storm type and response protocol, all routes identified in these response protocols passable within 24 to 48 hours of the fall of the last flake. Storms outside of the protocol upper limits may lead to significant adjustments in this time line.

Storm Types 1, 2 & 3

Deployment

Streets Department

Chief Highway Engineer

- Will develop the operations plan for approval by the Streets Commissioner
- Once the plan is approved, The Chief & Assistant Chief Highway Engineers will notify as listed below:
    - Notifies District Highway Engineers, Central Maintenance Unit (CMU), Bridge Maintenance Unit (BMU) of mobilization time and plan
    - Notifies Residential Snow Coordinator of mobilization time
    - Notifies Highway Division Snow Headquarters, located at the Bridge Maintenance Yard – 4040 Whitaker Avenue, personnel to report at specified deployment time
    - Notifies OIT
    - Notifies Office of Fleet Management of mobilization decision
    - Notifies SEPTA
    - Notifies Sanitation
    - Notifies maintenance supervisors
    - Notifies Parks and Recreations
    - Notifies Unified Dispatch
    - Notifies Water Department
    - Notifies the Streets Department, Public Affairs
        - Will coordinate with 311
    - An E.mail notification will be sent out to all involved. The Streets Commissioner will be included so it can be shared with the MDO or Mayor's Office at his discretion. This is a follow-up to phone calls.
    - Establish communication with the EOC if activated.

Highway District Engineers
- Notify Maintenance Supervisors to assemble salting staff
- Notify spotters to report at specified deployment time

Highway District Maintenance Supervisors
- Notify personnel to report at specified deployment time

Residential Snow Coordinator
- Notifies residential snow operations personnel of partial residential deployment

Office of Fleet Management

- Will determine which garages for Fleet maintenance support and fueling sites for duration of event at determined times. This will be coordinated with Snow Headquarters

Parks and Recreation

- Responsible to activate operation for salting Park road system including Benjamin Franklin Parkway, MLK, Kelly, Lincoln Drive.

Operations

Highway Districts

Spotters monitor street conditions. Salt trucks are loaded and positioned at the start of an assigned route. As street surfaces accumulate sufficient moisture for effective salting, spotters notify Maintenance Supervisors to begin salting activity. Spotters will provide route condition reports to their district headquarters on intervals as directed. District headquarters will compile this data and forward to Highway Division Snow Headquarters.

Residential Districts

Spotters monitor street conditions. Trucks are positioned at the start of an assigned route. Treatment of the street surface begins upon notification from the Residential Snow Coordinator. Spotters will provide route condition reports to their district headquarters on three (3) hour intervals. District headquarters will compile this data and forward it to the Residential Snow Coordinator, who in turn summarizes the information and forwards it to Highway Division headquarters.

Highway Division Snow Headquarters

Snow Headquarters will:

- Inform Highway Districts of weather forecasts
- Monitor, through Highway Districts, the status of all salting operations
- Maintain a log of all service calls for snow and ice related activities
- Monitor weather conditions and forecasts
- Analyze the data and forward it to the appropriate parties
- Analyze reports from the field and make changes to future operations where required
- Forward emergency calls from Police and Fire Departments to Highway Districts
- Maintain Snow Route Status Report
- Order commodities as required to maintain an adequate supply at all Districts
- Take calls from the EOC
- View PennDOT, Police and Streets Department cameras.

Office of Fleet Management

- Repair vehicles as necessary
- Report vehicle down time to Snow Headquarters

Parks and Recreation
- Treat Park road system, trails, and recreation facilities

Cessation of Operations

Highway Districts
- District Engineers release spotters to regularly assigned duties.
- District Engineers collect route inspection information

Residential Districts
- Release spotters and drivers to their respective departments
- Forward all reports to Residential Snow Coordinator who, in turn, forwards them to Highway Division Snow Headquarters
- Supervise the cleaning and redeployment of residential snow equipment

Highway Division Snow Headquarters
- Compile final report on personnel, equipment utilized and material usage and forward to Streets Commissioner.
- Estimate cost of event

Office of Fleet Management
- Compile final report on equipment costs and return to normal Fleet repair activities
- Prepare for the next event

Parks and Recreation
- Compile final report on personnel and equipment utilized
- Return to normal Park maintenance activities

Storm Types 6, 7, & 8

Same as response 1, 2 & 3, except the following additions:

Deployment

Streets Department

Chief Highway Engineer

- Notifies District Highway Engineers and Residential Snow Coordinator of decision to salt/plow tertiary system (Note: Storm type 6 only, partial to full residential deployment depending on event specifics).
- Will advise everyone for potential of multiple shifts

Residential Snow Coordinator

- Notifies residential snow operations personnel of partial to full residential deployment

Storm Types 4 & 9

Deployment

Streets Department (same as 1, 2, 3 but also includes:

Chief Highway Engineer:

- Notifies District Highway Engineers of initial mobilization time for salting operations and subsequent mobilization time for plowing operation
- Advises district that Sanitation, contractor equipment and residential roadway treatment will occur
- Notifies Highway Division Snow Headquarters, personnel to report at specified deployment time
- Notifies Snow Contractor Liaison to order contractor support equipment at specified time
- Notifies Residential Snow Coordinator of mobilization time
- Notifies Deputy Commissioner for Sanitation for full deployment of Sanitation resources, both for plowing primary and secondary routes
- Notifies Office of Fleet Management of mobilization decisions
- Advises all involved of anticipated number of shifts
- Notifies SEPTA
- Notifies Sanitation
- Notifies Water

Snow Contractor Liaison:

- Contact private sector vendors and orders equipment for each highway district.
- Advises of deployment time and likelihood of deployment duration
- Advises contractors of lifting set (if any) requirements

Highway District Engineers:

- Notify Maintenance Supervisors to deploy their staff at specified time
- Notify spotters to report at specified time
- Notify inspection staff for contracted equipment to report at specified time
- Are advised that residential street system snow removal has been activated

Residential Snow Coordinator:
- Notifies residential snow operations personnel of residential deployment

Highway District Maintenance Supervisors:
- Notify personnel to report at specified deployment time

Streets Department - Sanitation Division
Deputy Commissioner-Sanitation
- Mobilizes plows for primary/secondary route system at six Sanitation yards at specified time.
- Notify Chief of Operations to designate a Sanitation representative for Highway Division Snow Headquarters
- Notify division management of deployment times and subsequent suspension of curbside collections

Office of Fleet Management
- Will deploy sufficient resources to support fleet maintenance activities for duration of winter weather event
- Will open fuel sites for duration of event
- Will support Sanitation Division of Streets Department during plow and chain mounting for Sanitation compactors and support equipment

Parks and Recreation
- Responsible to activate operations for salting/plowing road system and trail system

Office of the Managing Director
- Will issue declaration of snow emergency
- Will activate the city's Emergency Operations Center located at the Fire Administration Building 3rd and Spring Garden Streets.

Operations

Streets Department

Highway Division

- Spotters monitor street conditions
- District Highway Engineers assign inspection staff to contact salting vehicles
- Salt trucks are loaded & positioned at the start of an assigned route. As street conditions accumulate sufficient moisture for salt to be effective, spotters notify districts to begin salting operation. Salt will be applied prior to plowing operations or until no longer effective

- Plowing operations will begin at 2”-3” accumulation and continue until routes are clear
- Chief Highway Engineer directs Residential Snow Coordinator to begin Tertiary Street plowing/salting when needed
- Highway District Engineers direct Sanitation plowing commencement
- All spotters & inspectors will provide route condition reports on three (3) hour intervals. Each district headquarters will compile this information & forward to Highway Division Snow Headquarters
- Highway District Engineers will insure that all routes are salted upon completion of plowing efforts
- Highway District Engineers will direct snow lifting/melting operations within their respective district

Residential Snow Districts

- Spotters monitor street conditions. Trucks are positioned at the start of an assigned route. Treatment of the street surface begins upon notification from the Residential Snow Coordinator
- Spotters will provide route condition reports to their district headquarters on three (3) hour intervals. District headquarters will compile this data and forward it to the Residential Snow Coordinator, who in turn summarizes the information and forwards it to Highway Division Snow Headquarters

Sanitation Division

- Sanitation Assistant Chiefs of Operation and District Managers direct Sanitation Operations and report progress to Highway District Engineers
- At the Highway District Engineers direction, they will adjust on-street operations for specified route assignments
- Progress reports are to be provided at two (2) hour intervals to Highway District Sanitation Coordinator
- Managers will insure that all vehicles are manned at shift change
- Personnel will not be released without replacement
- Sanitation and Highway Yard Liaison will coordinate completion of the routes so a salt truck can follow behind

Highway Division Snow Headquarters

Snow Headquarters will:

- Inform Highway Districts of weather forecasts
- Monitor, through Highway Districts, the status of all salting operations
- Maintain a log of all service calls for snow and ice related activities
- Monitor weather conditions & forecasts. Analyze the data & forward it to the appropriate parties
- Analyze reports from the field & make changes to future operations where required

- Forward emergency calls from Police and Fire Departments to Highway Districts
- Maintain Snow Route Status Report
- Order commodities as required to maintain an adequate supply at all Districts
- Provide Emergency Operations Center (EOC) reports route conditions, weather updates and identified trouble spots

Office of Watersheds (Division of PWD)

- Office of Watersheds will de-ice the porous streets when a conditional deployment is called. During a full deployment, they will appropriately treat those streets. If they are not treated by the Office of Watersheds, then the residential program will treat the porous streets.

Office of Fleet Management (OFM)

- OFM will provide necessary manpower & garage space as need to support storm type
- OFM will supply vehicle status reports to Highway Division Snow Headquarters, the Managing Director's Office and Emergency Operations Center on an hourly basis

Parks and Recreation

- Treat Park road system and Benjamin Franklin Parkway as required by conditions
- Clear all sidewalks around recreation centers
- All trails will be treated

<u>Cessation of Operations</u>

Streets Department

Highway Division

- Highway District Engineers will release all equipment to their respective departments for regularly assigned duties
- Highway District Engineers will release all personnel to their regularly assigned duties
- District Maintenance Supervisors will insure salt truck operators return unused material to stockpiles and wash truck beds, augers and spinners.
- Highway District Engineers will compile final contractor billing information
- All storm related information on personnel, equipment deployed, contract support & material used will be compiled by each district and forwarded to Snow Headquarters

Residential Districts

- Release spotters and drivers to their respective departments.
- Forward all reports to Residential Snow Coordinator who in turn forwards them to Highway Division Snow Headquarters
- Supervise the cleaning and redeployment of residential snow equipment

Sanitation Division

- Sanitation Division will dismount plows, remove chains and ready fleet for return to normal collection/cleaning activities

Highway Division Snow Headquarters

- Compile final report on all elements deployed for specific storm type
- Forward report to Streets Commissioner and EOC
- Compile cost estimate for event
- Direct highway districts post storm clean up deployment

Office of Fleet Management (OFM)

- OFM to compile final report on equipment repair costs and vehicle status and return to normal fleet repair activities
- Prepare for next event

Parks and Recreation

- Compile final report on personnel and equipment utilized
- Return to normal Park maintenance activities

Office of the Managing Director

- End snow emergency declaration and close EOC
- Effective in 2015, the 686-SNOW phone number has been permanently changed to inform citizens of their responsibilities of parking on a Snow Emergency Route

De-icing Support Personnel Assignments

The following functions will be performed by Streets Department and other City agencies personnel not directly involved with the operation of snow fighting equipment:

Bridge Maintenance Unit

The Bridge Maintenance Unit will perform anti-icing activities on the sidewalks of the City's bridges & pedestrian bridges as well as removing snow from the 15 stairways in Manayunk. Highway maintenance district yard personnel and Sanitation area personnel will be called to assist with this effort as dictated by storm type.

Highway Maintenance District Personnel and Sanitation area personnel

Highway maintenance district personnel and Sanitation area personnel, as dictated by storm type, will be provided hand snow removal equipment and will clear snow from curb ramps and open city inlets. This is to allow melting snow access to the drainage system and provide pedestrian accessibility. Snow may also be cleared from areas surrounding fire hydrants. Efforts will be made to keep select bike lanes clear of snow & ice. All bike lanes will be attempted to receive de icing treatment.

SWEEP Support (Streets & Walkways Education and Enforcement Program)

SWEEP Officers will, beginning in commercial corridors, enforce sidewalk clearance - Ordinance 10-719. Upon completion, enforcement will expand to schools, hospitals, etc., culminating in residential inspection.

All City Departments

- Dry salting Will NOT be practiced.
- Sidewalks & ADA ramps: All City departments will be responsible for removing snow on the sidewalks abutting their facilities. Salt can be requested through snow HQ. In addition, bagged salt & Calcium Chloride is available on a City Wide contract for all Departments to Purchase
- Parking Lots: All Departments are responsible for treating & salting their respective parking lots.
  - The Police Department will coordinate with the Chief Highway Engineer for salt needed to salt all Police parking lots & driveways. The Streets Dept will treat the Round House ramp and the Traffic Police ramp on Erie Ave.
  - No Department will be supplied salt for the purposes of dry salting

- Dilworth Park is the responsibility of Center City District
- Dilworth Plaza is the responsibility of Public Property. Note: It is not recommended to drive heavy equipment on Dilworth Plaza.
- Sanitation will provide salting & plowing vehicles to treat the citizen's drop off areas.

Highway Division Support Personnel

Highway Division support personnel will continue snow removal support functions as part of their daily work activities after Sanitation workers return to regular trash collection. Snow removal equipment will supplement these efforts as it becomes available.

Small Streets

As part of the City's responsibility of making streets passable, the Sanitation Division will be de-icing several miles of streets that are less then 10 feet in width. These are known as Gator Routes. These will be treated when a full deployment is called. The crew chief in charge of this operation will report to the residential manager.

PWD Support (Philadelphia Water Department)

During major events, PWD crews will be dispatched to clear snow at inlets to prevent intersection flooding (if appropriate)

Bus Stops

OTIS has contracted with Intersection to de-ice all bus stops. This contract includes access to the bus stops and ADA ramp. In addition they will be clearing the snow at the Direct Bus Stops along Roosevelt Blvd.

Police Department Support

The Philadelphia Police Department will enforce existing ordinance/regulations prohibiting the discharge of snow back onto city streets. Private plow contractors caught in the act of plowing snow from private property onto city streets risk fine and/or forfeiture of equipment.

Bicycle Facilities

The City of Philadelphia is becoming one of the most bicycle friendly City in the United States. As doing so, a de-icing plan shall include bike facilities:

- The City (OTIS) has permitted bicycle corrals to be installed within the parking lanes. The private sponsor of the bike corral is responsible for clearing snow and de-icing. Note, throwing snow into the travel lane is not permitted. The City does not take on any responsibility for damage done by de-icing operations.
- No bike corrals are permitted on snow emergency routes during winter months
- The INDIGO bike share program is privately owned and coordinated with OTIS. INDIGO is responsible for snow removal and de-icing
- As part of the Streets Department's Deicing and snow removal program, emphasis will be placed on bike lanes where it is feasible.
  - Salting the bike lanes can occur with the salting of the travel lanes.
  - If the bike lane is next to the curb, efforts will be made to push the snow as close to the curb as possible. As the snow begins to melt, additional plowing and salting may be performed to expedite the snow melting
  - The City will be treating protected bike lanes. Each protected bike lane will be treated in a different manner:
    - The bike lanes in the 5th St Tunnel is being treated by DRWC. Since most of it is in the tunnel, salt should be applicable.
    - Frankford Ave, south of Ashburner. The Streets Department will be removing the delineators prior to the first plowable event and then returned in April. This will allow Streets Department crews to push the snow to the curb.
    - Ryan Ave from Rowland to Lexington has a protected bike lane with over 100 delineators. This was installed in the fall of 2016. The Highway Division has determined a method to treat the bike lane with plows.
    - South St, west of 27th. As of this update to the snow manual, the protected bike lane has been installed but not maintained by CHOP. Once installed, the Highway Division will treat.
    - Chestnut St from 44th to 33rd has a protected bike lane with over 150 delineators. In addition, some of the intersections delineators in the crosswalk that provide protection to pedestrians. This was installed in the summer of 2017. The Highway Division will be experimenting with ways to appropriately to de-ice the bike lane.
    - Parkside Ave from Girard/40th to 52nd St. As of the time of this publication, the protected bike lane has not been installed, once it is, the Highway Division will experiment with different methods of treating. This includes the islands installed at 42nd St.

Public Relations and Education

PPA and Major Media Notification

PPA will use the local major media and community newspapers to ensure that notification of the Department's plan is timely as well as effective.

Key communications tools include:

- Issuing of press releases/advisories
- Posting information on Streets Department's website including list of FAQs, snow tips and status of departmental services as appropriate. Suggested snow tips will include:
  - "Park car as far away from the corner as possible. Cars parked too close to the corner limit the turning radius of snow equipment."
  - "Obstructions, such as, illegally parked cars affect our ability to plow effectively."
  - For effective snow and ice management partnership, City and citizens need to work together.
- Posting information on community websites/list serves
- Posting information on the City's Government Access Cable Channel 64
- Utilizing OIT to distribute announcements email

Notification System

The Department uses a voice mail messaging system to reach out to residents to inform them of important updates during snow events. The system is used when needed for this purpose.

311/Streets Department Communication Protocols for Snow Events

During storm events, all snow related inquiries will be accepted by 311, however, formal service requests will not be taken until 311 is notified by the Streets Department Public Relations that the event is officially declared over. During the event, 311 will advise the public of the level of deployment and let citizens know if their street is to be serviced depending on the level of service. After the event is ended, 311 will resume taking complaints from the public and the requests will be forwarded to the Streets Department for response within a reasonable time.

Customer Affairs

Residents are also able to call the Streets Department's Customer Affairs Unit at 215-686-5560 for information. When appropriate, "updated" advisories regarding the status of services will be pre-recorded on the Customer Affairs' voice mail system. The 686-SNOW tow number will be answered by the Police Communications

Responding to Citizens' Complaints

- Delegation – Service requests are, as always, delegated from the centralized system to operational units for appropriate action.
- Tabulation – Information can be gathered from the Customer Affairs Unit's computerized system to provide a post-storm picture of complaints.
- Planning – This information can be further utilized to plan appropriately and change plans for future snow events.

School Closure Policy

When inclement weather is present or anticipated that may impact schools opening or closing early, Streets, SDP, MDO, and MDO/OEM will conference to determine appropriate action relating to storm conditions.

Post Season Survey/Spring Maintenance

Beginning March 1 of each year and continuing through April 30th, weather conditions permitting, sweeps will be made of Philadelphia road network, identifying defects for the upcoming spring repair season. Streets Department personnel, as well as those involved with residential inspection, may be asked to perform this task.

Operational Guidelines – Fighting Snow in Philadelphia

Material Resources

Salt inventory is dictated by several factors: storage capacity (including salt domes at secure, satellite locations throughout the city), availability of product, and environmental concerns. A salt dome is located at the six Highway District Yards and Domino Lane, Area 4. The City has the capacity to store over 50,000 tons of salt. Note, Anti-skid may be added to the salt if the inventory starts to run low or if the temperatures are cold where the salt may not be as effective. The Sanitation will sweep the street as conditions permit.

The Department orders salt as the inventory is depleted to maintain maximum capacity throughout the winter. Initial salt orders are placed against purchase orders cut from a blanket purchase order under the Commonwealth of Pennsylvania's or contract.

Subsequent product is obtained from the City of Philadelphia's citywide rock salt contract. This contract provides for a primary and secondary vendor, and has language that includes the product specification, testing procedures, delivery locations, quantities and requirements, and weight certifications, and liquidated damages.

Requisitioning

The District Supervisor keeps an up-to-date inventory of the materials used for snow and ice removal during the winter months. S/he notifies the Administrative Officer (AO) and Assistant Chief Highway Engineer as orders need to be placed. An overall salt inventory for all six Districts & Domino Lane is maintained by the Assistant Chief Highway Engineer.

At the end of the winter season, the Chief Highway Engineer, AO, the Director of Planning & Analysis, and the Budget Officer review the remaining salt inventory to determine the necessary amount of salt needed to meet the following year's requirements. Accordingly, the State is notified of our estimated quantities, as is the Procurement Department for use in developing contracts for the following year.

Salting Policy

The Highway Division endeavors to maximize every application of de icing salt in order to maintain the safest roads possible in the most economical way while protecting the environment. This also puts the City of Philadelphia in compliance with the MS-4 permit, this is maintained by PWD. The policy includes:

Personnel Training: The Streets Department is committed to providing continuing personnel training to ensure that staff is well equipped to perform their jobs effectively.

Equipment: The Streets Department and Office of Fleet Management should update and replace equipment in an economically responsible manner.

Calibration of Spreaders: Regardless of whether automatic or manual controls are used, they should be calibrated before the snow season starts. Poorly maintained and un-calibrated controls are responsible for excessive salt use.

Use of Automatic Controls: The use of automatic controls is recommended for spreaders to make sure the correct amount of salt is being spread at all times.

Adequate Covered Storage: Storage facilities are vital to any winter operation. They must have sufficient capacity and good cover preferably under roof. Stock piles that are stored unprotected should be covered to prevent loss of materials and to protect the environment

Proper maintenance procedures should be followed around storage areas. Outside stockpiles should be properly shaped and should be on impermeable pads. There must also be proper drainage to keep the salt dry and protect the surrounding area. A method for disposal or retention of the leached salt should be in place.

The 7 salt storage locations are domes or sheds. This will protect the salt from the weather.

The Street's Department is committed to work with the MDO's & Water Dept Clean Water & GSI initiatives

Safeguarding the Environment: Salt and de-icing materials should be used in a manner that safeguards the environment. If misused, de-icing can pollute. If improperly used or stored it can get into wells or ground water. Excessive salt use can be damaging to certain plants and trees when runoff leaves sodium chloride in the soil. This practice makes the City of Philadelphia in compliance with the MS-4 permit.

Application: The application of salt alone depends on the type of precipitation, temperature, and snowfall intensity. When there is adequate frozen precipitation on the pavement (non plowable depth), and the temperature is above 25 degrees Fahrenheit, straight salt is optimized. Below 25 degrees Fahrenheit, a mixture of salt and abrasives will be used. The initial treatment of the roadway before plowing operations begin is to reduce ice or snow bonding to the pavement. Salt application rates range from 200 to 800 pounds per two-lane mile, depending on the storm conditions. Salt can be applied in a windrow or full width, which is sometimes necessary. Brine, formed by salt and water, will run to other parts of the road and be spread by traffic. Plowing operations should be timed to allow maximum melting. Salt reaction time is usually 20 to 30 minutes. (Reaction time increases as temperature decreases.)

Operation of equipment:

Within the City of Philadelphia, there are many bridges with weight restrictions. The drivers are not to drive crew cabs or tri-axles loaded with salt over bridges with low weight restrictions. These bridges include but not limited to:

- Falls Bridge
- Martin Luther King Drive
- 15th St, North of Callowhill
- Calumet, east of Wissahickon

In addition, drivers who are responsible for driving vehicles with "dumps" need to be aware of the height restrictions so to avoid low clearance bridges, wires and tree limbs.

Equipment Resources

Certain specialized equipment is required to support the snow and ice removal plan; specifically, snow plows, salt spreaders, and snow loaders. Much of this equipment is available within the Department. Additional equipment is obtained through contract and is provided by other operating departments.

Spreaders: Spreaders including tailgate and V-box spreaders are used to apply salt or sand, which are the primary de-icing chemicals used for fighting winter storms. Application rates are set for various conditions following Salt Institute guidelines.

Plows: Plows are mounted on Highway Division trucks and Sanitation Division compactors of the Streets Department, as well as equipment in supporting departments for residential plowing once accumulation predictions are for 4” or more snow (or as conditions permit)

Contract Equipment: City equipment is supplemented by the use of private sector contracted equipment for significant weather events. This equipment is used to assist clearing snow and ice from the primary/secondary network, as well as hauling snow from the CBD to a predetermined snow field.

Footbridge/Sidewalk Clearance Protocol: Bridge Maintenance employees of the Streets Department are dispatched after each event ends to clear snow and de-ice from pre-determined footbridges and from the sidewalks of bridges. Other personnel may be asked to clear of sidewalks as conditions permit.

Communication: All vehicles will be equipped with either radios or cell phones for communication during the events.

Winter Maintenance Facilities: The six Highway Division maintenance facilities serve, along with Snow Headquarters, located in the Bridge Maintenance Yard, as the bases of all de-icing operations. During significant events, they are supplemented by Sanitation area and residential facilities. Salt is stored at the six Highway Division yards and Domino Lane.

Operation and Safety: Equipment will be operated in a safe, effective manner by trained, properly licensed, operators. Winter is the season when equipment fails to start, personnel take shortcuts, traction is poor, visibility is poor, and other motorists may not see the operators of other vehicles. All drivers and crews should make required checks prior to and during the use of equipment to ensure safe operations are maintained. Pre and post trip inspections are mandatory.

Personnel Resources

All Streets Department personnel are subject to reporting to duty during snow and ice storms. Failure to notify the supervisor of the inability to work during a storm is grounds for disciplinary action. Please see the Essential Staff Policy in Section 1, page 6.

The Highway Division is responsible for overall coordination of snow and ice control preparations. Supervisors are responsible for providing the direction required for effective snow and ice control.

Clothing: The lack of proper clothing is a direct cause of most frostbite occurrences, falls, and in many cases is a factor in equipment accidents. All crews are urged to dress for the possibility that they may be stranded without heat for several hours. It is contemplated that within two hours assistance will be provided to any crew experiencing difficulty.

Communications: On street communications are maintained by inspectors and spotters, who are in constant communication with the Highway and Sanitation Districts and Snow Headquarters.

Personnel Notification Lists (and equipment and other assignments) will be provided to required personnel. Phone trees are to be initiated as necessary at the beginning of a snow alert.

Reporting Procedures

Status Reports: District Highway Engineers will be responsible for maintaining contact with all supervisors and operators in their districts and reporting on the progress of the field personnel to the Snow Headquarters. District Highway Engineers or their designee will make their first report one hour after notification of the snow alert and will continue to make reports as needed throughout the duration of the snow removal operations.

Accident Reports: The following are the responsibilities of the driver if an accident should occur during snow removal operations:

- Check for injury to persons, never admit liability , call 911 immediately for medical emergencies and state that there is a medical emergency;
- Obtain identification of the other vehicle and driver;
- Notify Police immediately either through radio dispatcher or by telephone. Do not leave the scene of an accident except in cases where physical harm is threatened. If physical harm is threatened, relocate then notify the police;
- Notify supervisor by radio or telephone immediately. All accident should be reported to Snow Headquarters

- Forms 77-501 (Employee Accident/Incident Information) and 77-502 (Citizen Accident Information) should be carried in every vehicle and thoroughly completed at the scene of any accident then forwarded to either a supervisor or directly onto Form 82-S-87 (Traffic Accident Report);

- Employee should not sign statements, suggest any settlement or volunteer information about the accident except as noted above. All other requests for statements or signatures should be forwarded to the City of Philadelphia's Risk Management Department;

- The Safety Office shall be notified. Also, Email sent to the Safety Office.

Non-Municipal Employees contracted for snow removal operations should follow all of the directives listed above except completion of Form 82-S-7 which should be completed by the City on duty supervisor. The contractor is responsible for their own equipment.

Training

Requirements and Timelines: Training will be held for all personnel involved in snow removal as needs determine. Snow plow training for Highway Division and Sanitation Division personnel is part of on-going CDL training. Residential training is an intensive effort that will take place in November of each year for required personnel.

Field Inspection Procedure

Spotters/inspectors- will report on actual roadway condition. Reports will include surface condition, material application, plow progress, and problem locations. Conditions which have prevented the removal of snow and ice, such as illegally parked cars, abandoned cars, vehicles stuck in snow, etc. will be noted for follow-up removal efforts. Spotters/inspectors will file field reports with their respective coordinators after each event.

Primary/Secondary - Spotters/inspectors are to report on the condition of the network, with a focus on identifying areas that are particularly troublesome for immediate follow-up.

Residential - Spotters/inspectors, as well as the residential navigators, are to report on residential conditions, noting streets that will require follow-up work due to problems encountered during the initial effort.

Frequency of Report & Detail - Reports are to be made as needed to the district managers and forwarded to Snow Headquarters. Detail to include whether road is passable, snow covered, salted, plowed or bare pavement. Conditions are coded and noted on inspector's reports.

Expectations - It is the City's expectation that the road network be at least passable, no longer than 12 hours after the last flake has fallen. Additionally, it is the City's goal to have all routes identified in this manual's response protocols clear within 24 hours of the fall of the last flake.

Policy on Snow Plowed into Street

As noted in the Philadelphia Code, Chapter 9, Section 601 (4) (f), Chapter 9, Section 404 and Chapter 10, Section 720, snow is not permitted to be plowed or shoveled onto City streets. Enforcement and penalties are described in the respective chapters.

Police Department Responsibility - Police Department personnel are to stop private contractors from plowing snow off of parking lots and driveways into city streets.

Streets Department Responsibility - SWEEP Officers will be dispatched to warn residents about throwing snow in the streets, as well as enforcing the 6-hour timeline to have your sidewalk shoveled to a minimum of a 36-inch path.

Communication

Internal - Communication of on-street activity during winter weather events will occur as needed. Spotters and inspectors will report to their respective coordinators route conditions and any identified trouble spots on their assigned routes. Operators will report any mechanical problems to both their headquarters and the Office of Fleet Management. All district coordinators will forward the updates to Highway Division Snow Headquarters, where the information will be compiled.

External - Highway Division Snow Headquarters will disseminate all information concerning winter weather events to external sources. Route progress reports, street conditions, equipment and personnel deployed, and materials used will be included in these reports. For major events, this information will be forwarded to the Streets Commissioner. He will then forward this information. Snow Headquarters will communicate to the Emergency Operations Cen

Section 2
Snow Emergency Routes

2. - Snow Emergency Routes

2.1 Snow Declaration

The Mayor, through the Managing Director, has the authority to issue a Snow Emergency Declaration for significant events. This declaration implements parking regulations on dedicated snow emergency routes.

2.2 Citizen Responsibility

Citizens are required to remove their vehicles from snow emergency routes.

2.3 Inspector Responsibility

Inspectors are required to report locations where cars have not been moved and to ensure that designated routes are plowed completely curb to curb.

2.4 Police / Parking Authority Support and Timelines

Police Tow Squad and Parking Authority tow vehicles will remove vehicles from snow emergency routes. Towing will begin at the designated snow emergency starting time and continue as necessary until the declaration is lifted.

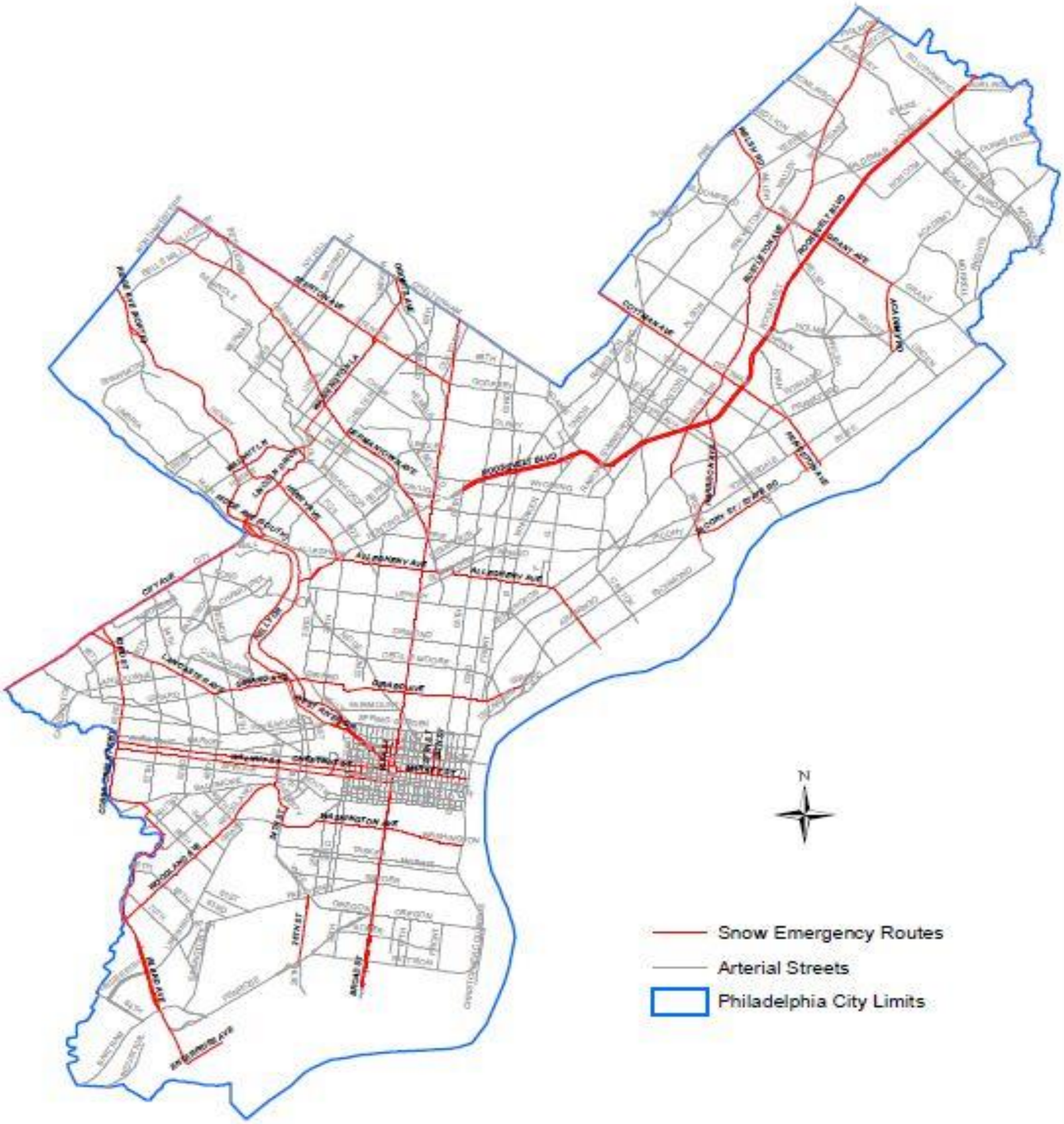
2.5 Record Keeping

Police Department and the Parking Authority personnel will keep records of the location of the relocated vehicles.

2.6 Snow Emergency Routes

Reference Map and Route Table

CITY OF PHILADELPHIA
Snow Emergency Routes



City of Philadelphia
Snow Emergency Routes

ON	FROM	FROM_HUNDRED	TO	TO_HUNDRED
06TH ST	I-676 OFF RAMP	300 N	MARKET ST	UNIT BLOCK
07TH ST	MARKET ST	UNIT BLOCK	I-676 ON RAMP	300 N
15TH ST	I-676 OFF RAMP	300 N	MARKET ST	UNIT BLOCK
16TH ST	MARKET ST	UNIT BLOCK	I-676 ON RAMP	300 N
20TH ST	CHESTNUT ST	UNIT BLOCK	MARKET ST	UNIT BLOCK
26TH ST	I-676 ON/OFF RAMPS	2500 S	PENROSE AVE	3800 S
34TH ST	UNIVERSITY AVE	1100 S	GRAYS FERRY AVE	1100 S
38TH ST	WALNUT ST	200 S	UNIVERSITY AVE	200 S
63RD ST	CITY AVE	2100 N	WALNUT ST	100 S
ACADEMY RD	FRANKFORD AVE	9100	GRANT AVE	9400
ALLEGHENY AVE	HUNTING PARK AVE	2900 W	I-95 ON/OFF RAMPS	2800 E
BEN FRANKLIN PKWY	ART MUSEUM CIRCLE	2300	16TH ST	1600
BRIDGE ST	HARBISON AVE	2100	I-95 ON RAMP	2300
BROAD ST	CHELTENHAM AVE	7200 N	I-95 ON/OFF RAMPS	3800 S
BUSTLETON AVE	FRANKFORD AVE	5200	ROOSEVELT BLVD	6300
BUSTLETON AVE	ROOSEVELT BLVD	UNIT BLOCK	COUNTY LINE	UNIT BLOCK
CHESTNUT ST	COBBS CREEK PKWY	6200	20TH ST	2000
CITY AVE	CITY BOUNDARY	7700	I-76 ON RAMPS	3800
COBBS CREEK PKWY	WALNUT ST	200	WOODLAND AVE	2100
COTTMAN AVE	I-95 OFF RAMP	5000	FILLMORE ST	UNIT BLOCK
ENTERPRISE AVE	ISLAND AVE	8400	I-95 ON/OFF RAMPS	8200
GIRARD AVE	LANCASTER AVE	4700W	I-95 ON/OFF RAMPS	800 E
GERMANTOWN AVE	BROAD ST	UNIT BLOCK	NORTHWESTERN	UNIT BLOCK
GRANT AVE	WELSH RD	1300 E	ACADEMY RD	3000 E
GRAYS FERRY AVE	34TH ST	3300	WASHINGTON AVE	2600
HARBISON AVE	BRIDGE ST	5200	ROOSEVELT BLVD	6500
HENRY AVE	CATHEDRAL RD	8500	HUNTING PARK AVE	3000
HUNTING PARK AVE	HENRY AVE	3000 W	KELLY DR	3300
ISLAND AVE	WOODLAND AVE	2200	ENTERPRISE AVE	4000
KELLY DR	LINCOLN DR	4600	ART MUSEUM CIRCLE	2300
LANCASTER AVE	CITY AVE	6300	GIRARD AVE	4800
LINCOLN DRIVE	RIDGE AVE	3600	WISSAHICKON AVE	5900
MARKET ST	SCHUYLKILL AVE	2300	I-95 ON RAMP	100
OGONTZ AVE	WASHINGTON LN	7400	CHELTENHAM AVE	8000
POPLAR ST	WEST COLLEGE AVE	2500	GIRARD AVE	2400
PRINCETON AVE	TORRESDALE AVE	4700	I-95 ON/OFF RAMPS	5000
RIDGE AVE (NORTH)	NORTHWESTERN AVE	9100	CATHEDRAL RD	8600
RIDGE AVE (SOUTH)	WALNUT LN	5600	CITY AVE ON RAMP	4500
ROOSEVELT BLVD	09TH ST	800 W	CITY BOUNDARY	16000 E
SCHUYLKILL AVE	MARKET ST	UNIT BLOCK	WALNUT ST	100
SEDGLEY AVE	ALLEGHENY AVE	1000 W	ALLEGHENY AVE	900 W
STENTON AVE	NORTHWESTERN AVE	9600	BROAD ST	1400
TACONY ST/STATE RD	BRIDGE ST	5200	TACONY-PALMYRA BRIDGE	6300
TORRESDALE AVE	COTTMAN AVE	7200	PRINCETON AVE	7100
UNIVERSITY AVE	38TH/39TH ST	300/400	34TH ST	600
WALNUT LN	WAYNE AVE	400 W	RIDGE AVE	500
WALNUT ST	BROAD ST	1400	COBBS CREEK PKWY	6200

WASHINGTON AVE	GRAYS FERRY AVE	2600	CHRISTOPHER COLUMBUS BLVD	UNIT BLOCK
WASHINGTON LN	WAYNE AVE	200 W	OGONTZ AVE	2000 E
WAYNE AVE	WALNUT LN	6100	WASHINGTON LN	6200
WELSH RD	CITY BOUNDARY	UNIT BLOCK	GRANT AVE	1100
WEST COLLEGE AVE	POPLAR ST	900	GIRARD AVE	900
WEST RIVER DRIVE	ART MUSEUM CIRCLE	2300	FALLS BRIDGE	2700
WISSAHICKON AVE	LINCOLN DR	6000	WALNUT LN	6000
WOODLAND AVE	COBBS CREEK PKWY	7200	UNIVERSITY AVE	3800

Section 3
Snow/Plow Routes

3. - Snow / Plow Routes

Highway Snow Operations (Map Location)

Go to the Streets Department's intranet site
http://streetsweb.city.phila.local/

Select "Streets GIS"
http://streetsweb.city.phila.local/streets_gis.html

Select "Divisional Maps"
ftp://streetsweb.city.phila.local/Maps/

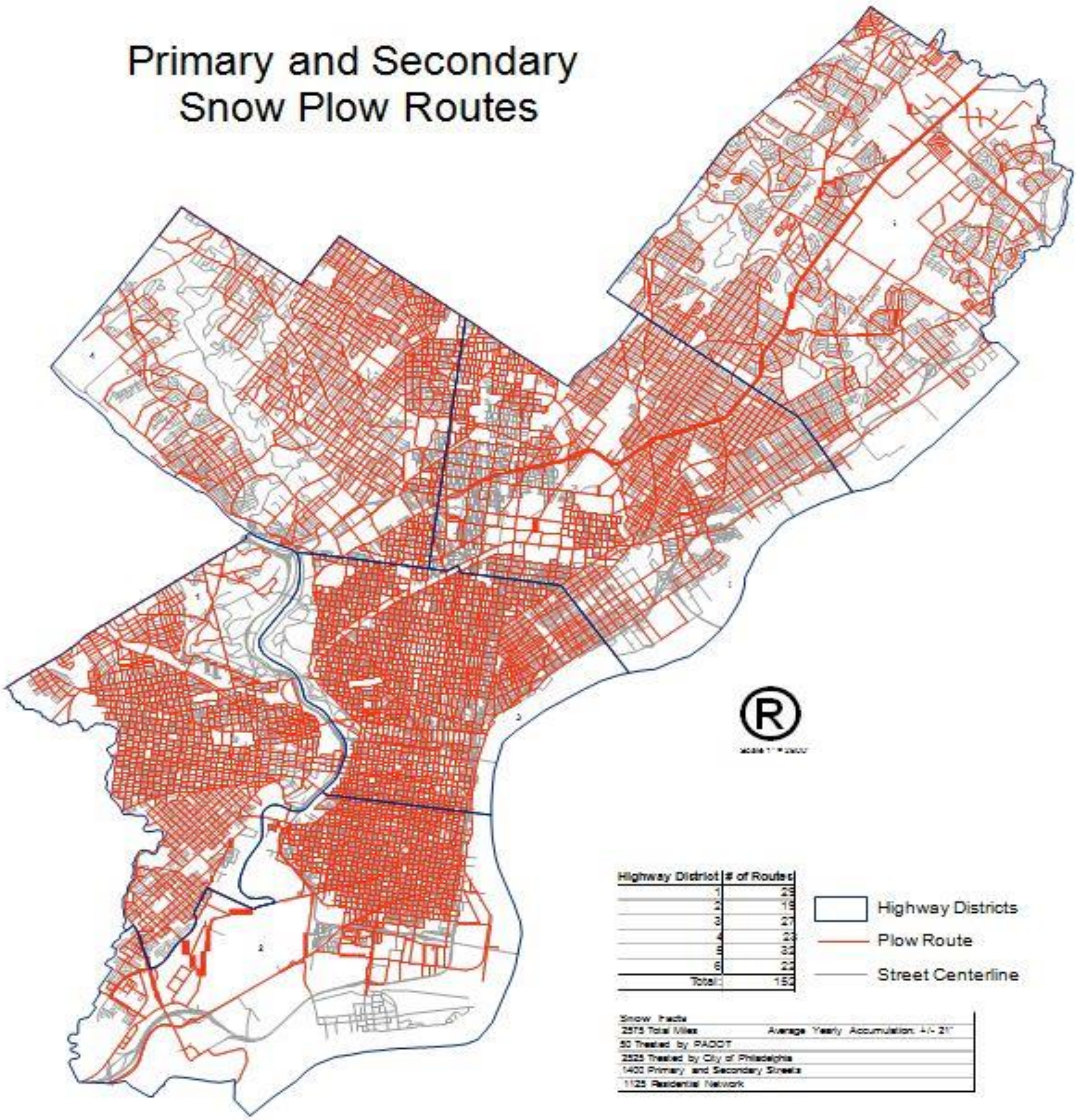
Select "Highways"
ftp://streetsweb.city.phila.local/Maps/Highways/

Select "Snow"
ftp://streetsweb.city.phila.local/Maps/Highways/Snow/

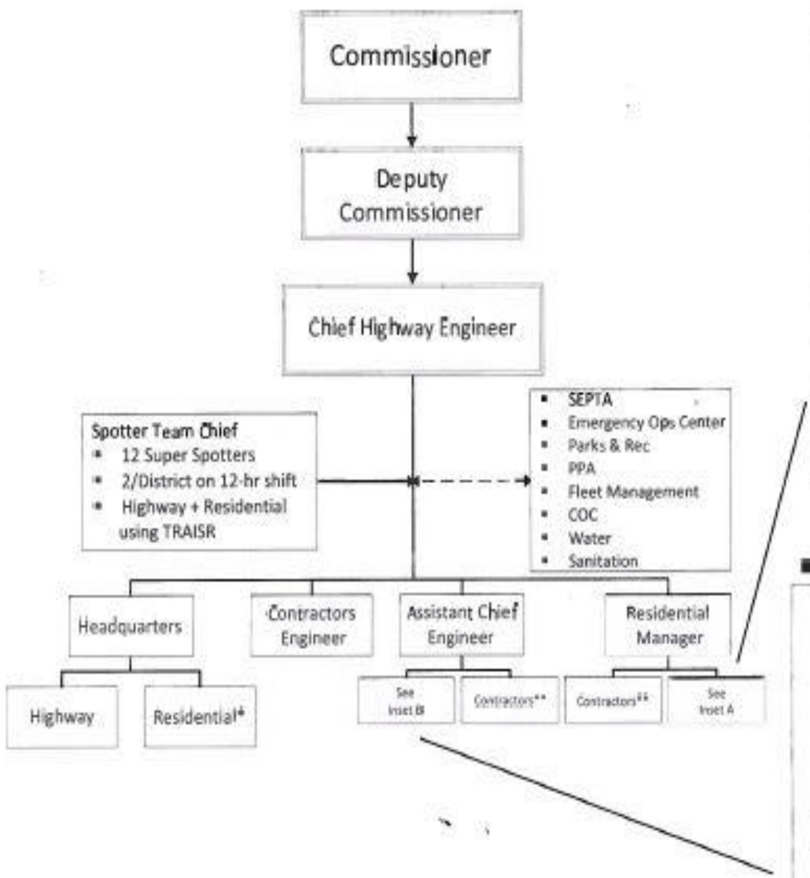
Select "Snow Maps"
ftp://streetsweb.city.phila.local/Maps/Highways/Snow/Snow%20Maps/

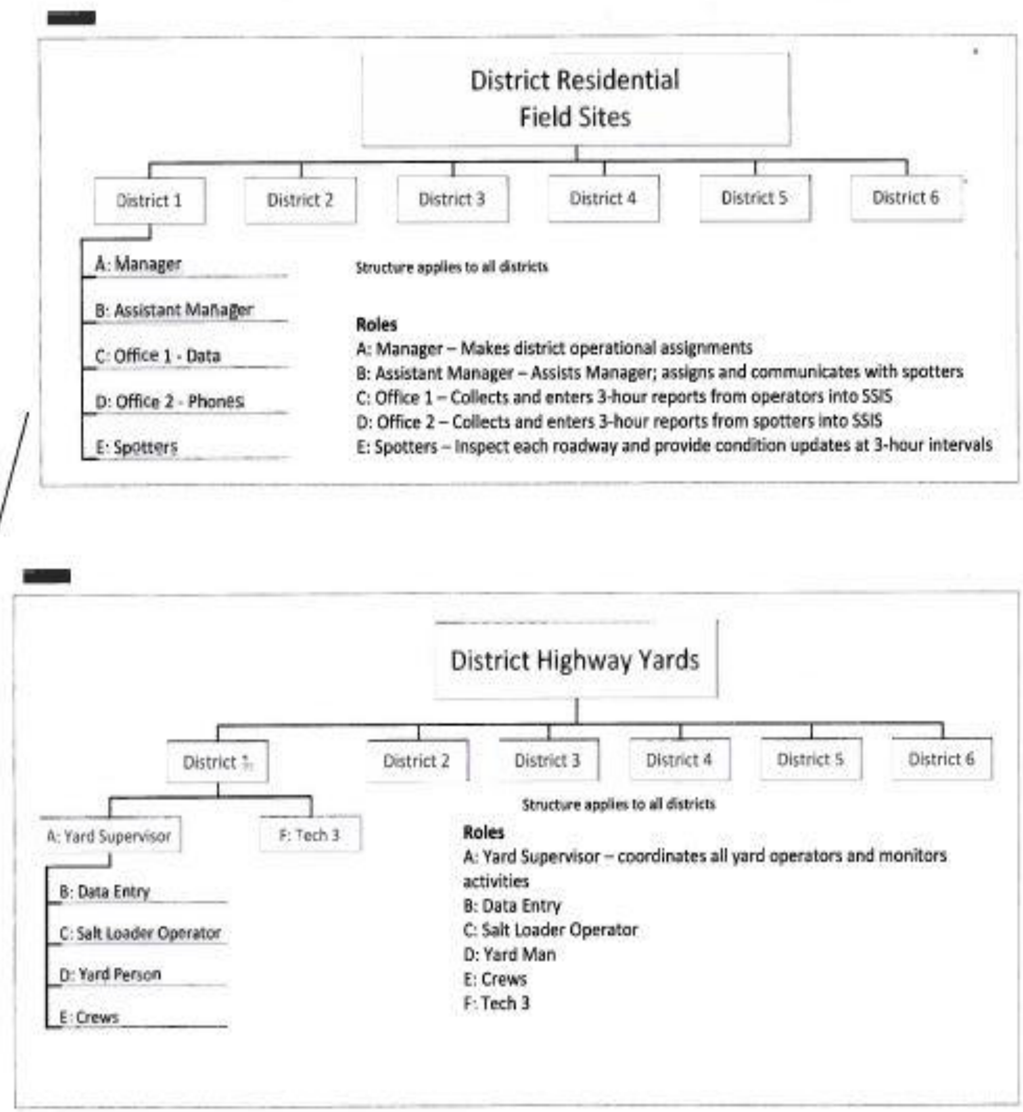
Select:
"Directory Overviews"
"Directory Plow Trip Packs"

Primary and Secondary Snow Plow Routes



Section 4
Key Information





Notes

* HQ Residential – Analyze data in SSIS and report anomalies to Residential Manager; follow up as requested

** Contractors are coordinated by Contractors Engineer to report to District sites

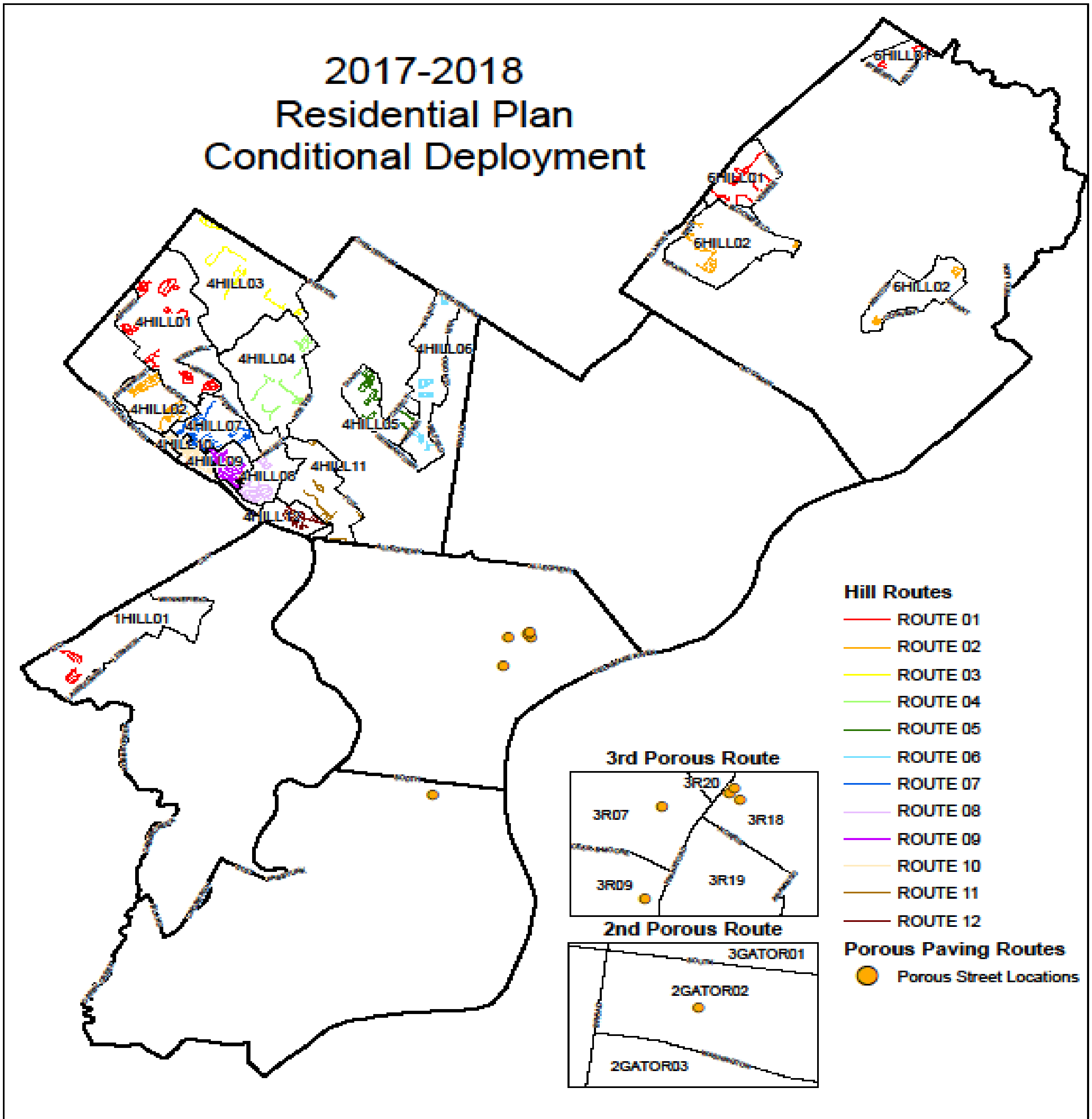
Final approval is at chief level

COP: Winter Weather Operations Organizational Chart

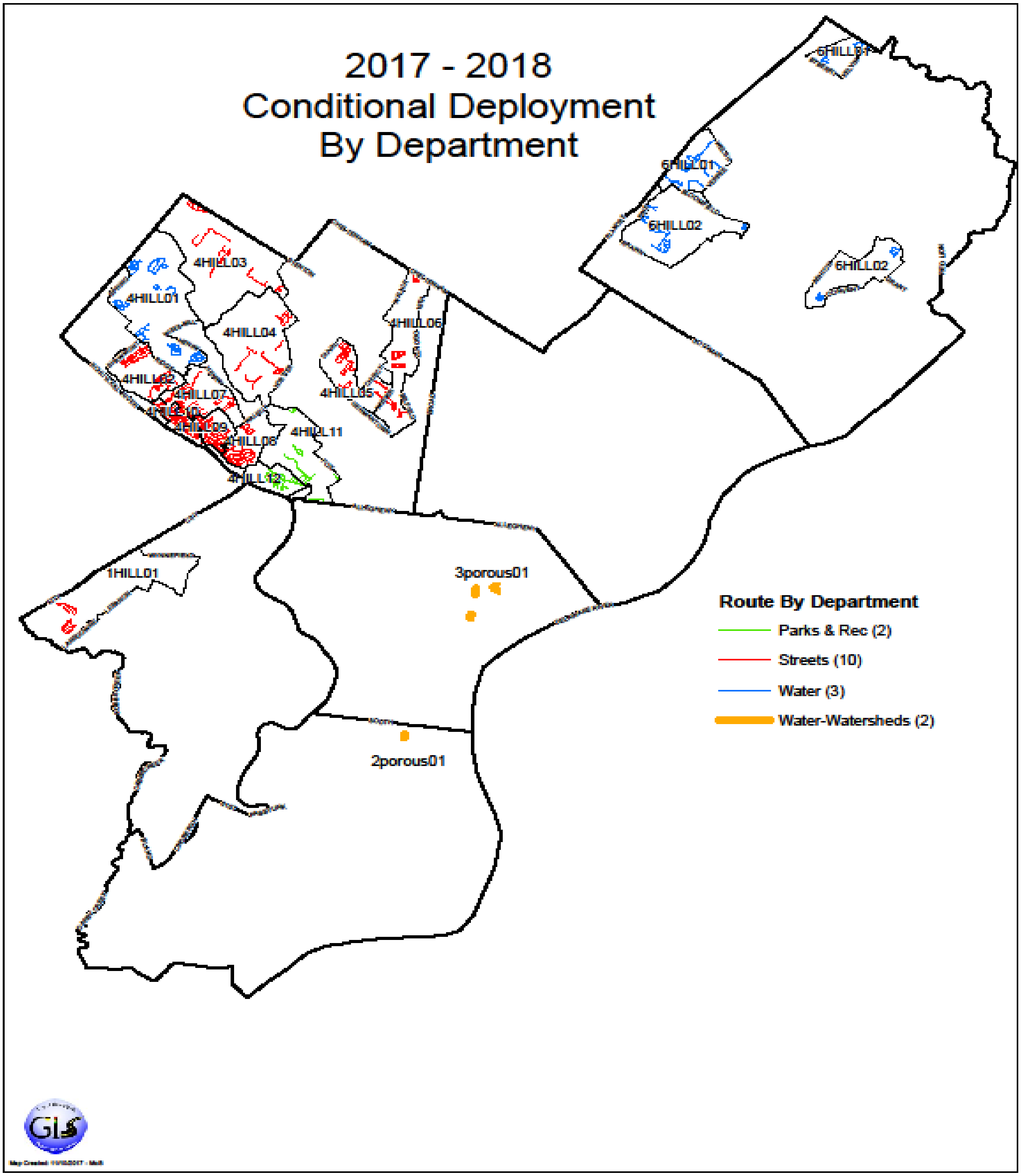
11/14/2014

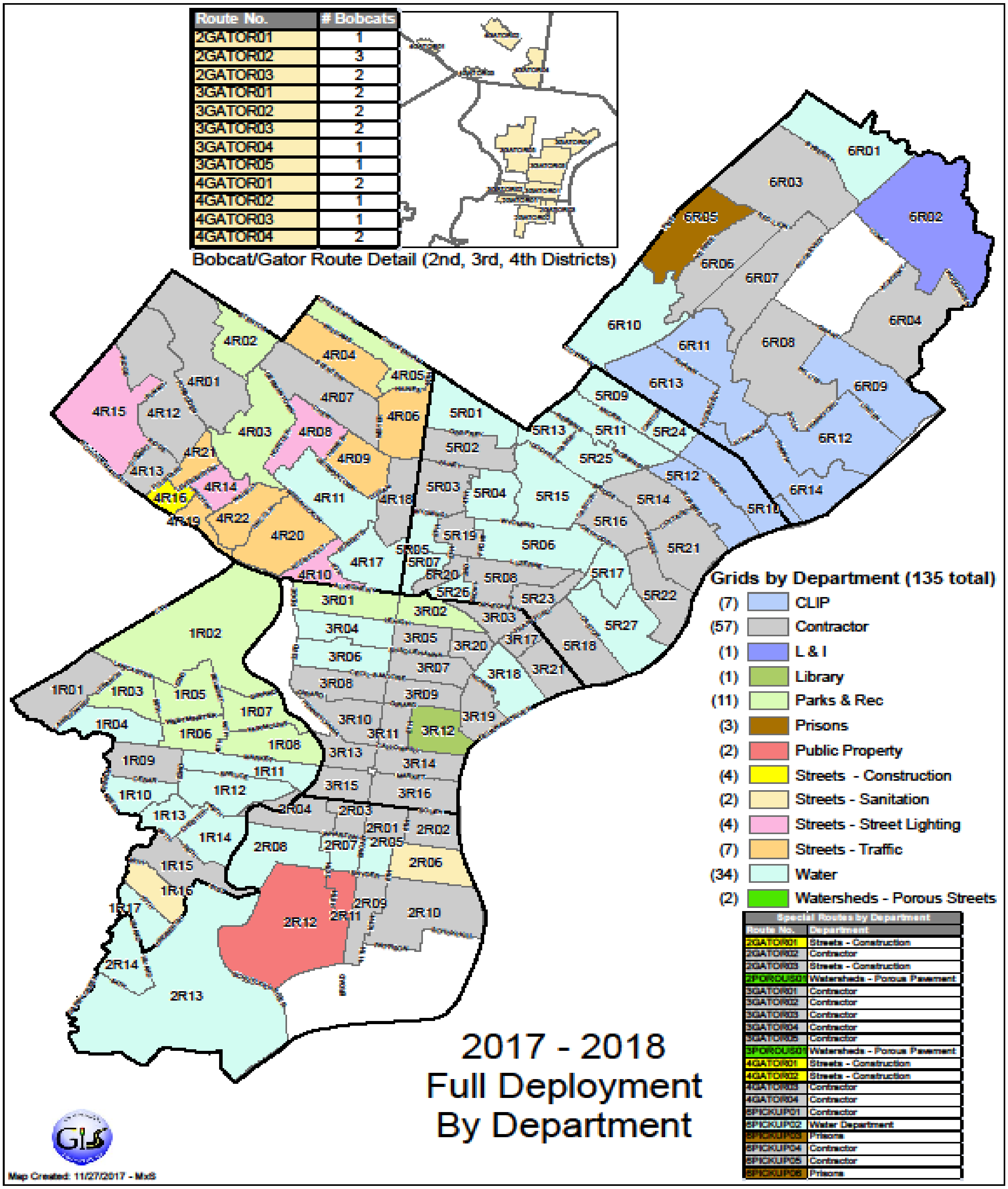
Section 5
Residential Street System

- Deployment Maps
    - Conditional Hill
    - Full
- Office Location & Phone List
- Support Departments-Manager Contacts
- Office Support Staff
- Residential Spotters



Operaton	District	Deployment	Miles Serviced	
Hill	1st	1 Route	2.42	72
	4th	12 Routes	59.53	
	6th	2 Routes	10.11	
Porous Streets	2nd	1 Route	0.04	0.31
	3rd	1 Route	0.27	


2017 - 2018
Conditional Deployment
By Department
6HILL01
6HILL01
6HILL02
6HILL02
4HILL03
4HILL01
4HILL04
4HILL06
4HILL02
4HILL07
4HILL05
4HILL09
4HILL08
4HILL11
4HILL12
1HILL01
3porous01
2porous01
Route By Department
Parks & Rec (2)
Streets (10)
Water (3)
Water-Watersheds (2)



Route No.	# Bobcats
2GATOR01	1
2GATOR02	3
2GATOR03	2
3GATOR01	2
3GATOR02	2
3GATOR03	2
3GATOR04	1
3GATOR05	1
4GATOR01	2
4GATOR02	1
4GATOR03	1
4GATOR04	2

Grids by Department (135 total)

(7)	CLIP
(57)	Contractor
(1)	L & I
(1)	Library
(11)	Parks & Rec
(3)	Prisons
(2)	Public Property
(4)	Streets - Construction
(2)	Streets - Sanitation
(4)	Streets - Street Lighting
(7)	Streets - Traffic
(34)	Water
(2)	Watersheds - Porous Streets

Special Routes by Department

Route No.	Department
2GATOR01	Streets - Construction
2GATOR02	Contractor
2GATOR03	Streets - Construction
2POROUS01	Watersheds - Porous Pavement
3GATOR01	Contractor
3GATOR02	Contractor
3GATOR03	Contractor
3GATOR04	Contractor
3GATOR05	Contractor
3POROUS01	Watersheds - Porous Pavement
4GATOR01	Streets - Construction
4GATOR02	Streets - Construction
4GATOR03	Contractor
4GATOR04	Contractor
5PICKUP01	Contractor
5PICKUP02	Water Department
5PICKUP03	Prisons
5PICKUP04	Contractor
5PICKUP05	Contractor
5PICKUP06	Prisons

Section 6
Snow Lifting Accounting Procedures

6. - Snow Lifting Accounting Procedures

Snow Lifting Records

1. Forms Required

a. Streets Department Spreadsheet 77-298

2. Snow Equipment Rental Form (77-298)

a. The District Engineer will be responsible for recording the following information for each piece of equipment assigned to their location.
   1. Highway District
   2. Contractor
   3. Who notified you
   4. Day of the week
   5. Time called
   6. Type of equipment ordered
   7. Operation to be performed by the equipment
   8. Where the equipment is to be assigned

b. The contractor will assign the equipment and the operator as directed by the Streets Department, and record the license number of the equipment, and the name and address of the operator on the 77-298 form. The form will be given to the contractor operator to be used as his assignment and time record.

c. The District Engineer will give the 77-298 form to his inspector assigned to the operation. The inspector will be told to report at the designated time and location for the start of operations. The inspector will sign-in the equipment assigned to him on the 77-298 form, recording the following information:
   1. Equipment license number
   2. Contractor's employee name
   3. Contractor's employee address
   4. Starting time
   5. Phone number

The contractor's operator will indicate on the 77-298 form the <u>Time Started.</u>

d. The inspector will call his District Engineer at hourly intervals and inform him of the progress being made. When the assignment is completed the inspector and the contractor's operator will each note <u>Time Stopped</u> on their form.

e. The City of Philadelphia will pay only for the operating time for the contractor's equipment. Stand-by time or lost time will be entered under "Penalty Time" and an explanation of the cause under "Penalty Remarks". When additional assignments are given to the inspector, he will complete "Location From To" on form 77-298. He will give this information to the contractor's operator, who will note this added assignment on his copy of form 77-298.

f. Whenever the contractor replaces a piece of equipment, or replaces an operator, the contractor will initiate a new form 77-298. The inspector at the worksite will then prepare a new form 77-298 to cover the replacement. Procedures will then proceed as previously outlined.

g. When a form 77-298 is completed, the city inspector will sign his copy and the contractor's operator copy. The inspector's copy of the form will be returned at the end of his tour of duty to his District Engineer.

h. When a form 77-298 is completed, the contractor's operator will sign his copy and the city inspector's copy. The operator's copy of the form will be returned to his employer.

i. The reverse side of form 77-298 can be used for remarks or explanations of unusual situations. On forms 77-298 containing the time record for dump trucks the city inspector will note on the reverse side the following information:

1. The time the dump truck leaves the work location to unload
2. The time the dump truck returns to the work location from unloading.

j. When the District Engineer receives the city inspector's forms, his personnel will enter on each line the "Total Working Hours". This is the number of hours at the site (start-finish) less the "penalty time" lost. Appropriate travel time will be added for each piece of equipment.

k. The District Engineer will check the city inspector's form and will then forward them to the Snow Contractor Liaison of Department of Streets. The contractor will use his copies of the form 77-298 to prepare his invoice, in triplicate, will be drawn on the Accounting Division, Office of the Director of Finance, Room 1330 Municipal Services Building, and sent directly to Administrative Office, Highway Division, Department of Streets for pre-auditing. The invoice will contain the following information and will be submitted for each 24 hour period:

1. Contractor's name and address
2. Snow Event
3. Number of pieces, kind and class of equipment in operation
4. Location of operations, i.e.: streets on which equipment operated
5. Dates and hours of work at specified rate per hour for
    a. Equipment with operator
        Regular time
        Premium Time

b. Foreman
   Regular time
   Premium Time
c. Laborers
   Regular time
   Premium Time
d. Travel time for equipment only (rate times the standard level travel time allowed)

l. The Snow Contractor Liaison, Highway Division, Department of Streets will summarize the form 77-298 and prepare a receiving report (form 71-20) in the usual manner for each 24 hour period. The receiving report and supporting form 77-298 will be forwarded to the Accounting Division.

m. Time calculations for equipment and personnel will be based on full 15-minute periods. For example, a piece of equipment operating for 4 hours and 27 minutes will be paid for 4 ½ hours.

3. Contractor Labor-Snow Emergency Form (77-298)

a. Procedures applicable to “Snow Equipment Rental”, form 77-298 are also applicable to “Contract Labor – Snow Emergency”, form 77-298 except as indicated below.

b. The contractor’s foreman will maintain the contractor’s time record for the foreman and the labor crew.

4. The Chief Highway Engineer will terminate Snow lifting operations.

5. This procedure will also be included with the rental of loaders for the salt domes if needed.

Section 7
Snow Removal Cost
Accounting Procedure

7. Snow Removal Cost Accounting Procedures

Snow and Salting Cost Accounting Procedures

A. Purpose

The Purpose of this procedure is to (1) provide a means for determining the cost of plowing and salting city streets and legislative routes within the city street system, and (2) provide a method for allocating these costs to both legislative routes and city streets. Most of this data is kept in the SSIS. Hard copies are not necessary to be kept.

B. Scope

The use of the forms described in this procedure shall apply to ALL agencies involved during snow and salting operations. Since the methods of attaching snow and ice storms vary, the accounting for costs will be compiled separately. The Department of Parks & Recreation shall report to the Department of Streets the cost of plowing and salting the Kelly Drive (Legislative Route #67292).

C. Definitions

1. Light snow requiring only de-icing techniques shall be considered <u>Salting Operations</u>

2. Snow operations shall include storms of such magnitude that plowing and de-icing operations are necessary.

3. The Snow Season will extend from October to April of the following year.

D. Cost Accounting Policies

1. The cost of snow emergency headquarters and agencies outside the Department of Streets (other than Department of Parks & Recreation) shall be allocated to snow. Snow headquarters is normally opened when storm conditions require plowing operations. Even though there is preliminary salting, the entire cost will be allocated to Snow Operations. However, if only salting is required, the cost of snow headquarters and that of other agencies will be allocated to Salting Operations.

2. The ratio of State and City costs shall be calculated by comparing the sum of the City and State plow miles in Snow Operations. For salting, the ratio shall be computed by applying the percentage of City and State salt route miles to the tons of salt required for each route. Plow miles and salt route miles shall be the product of the linear mileage and the number of cuts or passes made by the vehicle.

3. For Streets Department, the labor cost will be the actual hourly labor cost for each employee. The vehicle cost will be the average hourly operational cost of a vehicle by type as determined by PennDOT/FEMA. Fleet Managements will supply these costs.

4. Standby time prior to plowing or salting will be charged at the district City - State ratio of the actual storm.

    a. In the event that standby personnel are not used, the cost will be shared in the ratio of existing City-State miles or roadway.

    b. For snow, this ratio shall be City 58.6%, State 41.4%; for salting operations City 66.5%, State 33.5%. These ratios are subject to change when snow and salt routes are revised.

5. The cost of snow removal on legislative routes is not chargeable to PennDOT since $2.5 million is paid to the City on an annual basis for this service.

E. Forms

The following forms will be used in conjunction with this procedure. Instructions for the use of these forms are described in the body of the procedures.

77-307 Rev. 4/71, 77-307A - Report on Snow Plowing / Salting
77-360 = Salting Report

Time and Costing Snow and Salting Operations, formerly recorded on forms 77-308 Rev. 8/98 and 77-308A, are now recorded in the Snow Storm Information System (SSIS), a MS Access database designed by the IT unit of the Streets Department.

F. Snow Operations

All personnel reporting for snow duty will sign in on the approved time sheet for their department or agency. Prior to leaving the yard the inspector will receive Form # 77-307 Rev. 4/71 which will delineate the route.

Each District prior to the snow season will type on Form 77-307 Rev. 4/71 the following information:

1. Legislative route number if the street segment is part of the State highway system.
2. The street that is to be plowed or salted.
3. The “from – to” limits of plowing or salting.
4. The mileage of the street segment.
5. The route number or letter.

The inspector (plowing) or the truck driver (salting) will complete the following items:

6. The date and day of the week.
7. The operation, plowing or salting, day or night
8. Driver’s name
9. Truck number
10. The number of cuts or passes required
11. Time reported for duty
12. Time started plowing/salting
13. Time finished plowing/salting

If the inspector/driver works on more than one route, items (12) and (13) are to be completed for the time spent on the route – NOT THE TOTAL TIME. Item (11) is time reported for duty and will not change even though the route may change.

14. Any delays in route
15. Cause of delay
16. The inspector/driver will sign his name to the report

The inspector supervisor in district will calculate item (17) Total Miles plowed for each segment, total all miles plowed and determine the City and State shares, item (18).

19. Will be used during salting operations

The Highway district office will then determine the ratio of City and State plow miles for each route, and by summing the routes, the district ratio.

The time of ALL personnel combating a storm will be accounted for in the SSIS (previously tracked on form 77-308 rev. 8/72).
The District or Area Office completes this information as follows:

1. Organization – 5th Highway, Area 2, Water Department, etc.
2. Condition
3. Date personnel called in and released
4. Time personnel called in and released
5. Employee name
6. Employee number
7. Function – the particular function the person was performing (e.g.: plow driver, inspector plow, auto repair, install chains, etc.)
8. Vehicle number – if applicable
9. Hours – the district office will enter the actual number of hours worked in the appropriate column (regular, time and a half, double time)

10. Vehicle cost – the hourly operating cost multiplied by the operating hours. The Accounting Section will supply these costs.

The Sanitation Area office will complete items #1 through #10.

During severe storms when contractor personnel are called to augment City personnel, it is the responsibility of the Highway District Engineers to insure that the contractors submit the following necessary information required when invoicing the City:

1. Number of pieces, kind and class of equipment in operation
2. Number of foremen, operators, laborers, regular hours worked, premium hours worked, hourly rates
3. Location of operations (e.g.: streets on which equipment operated)
4. Dates and hours of work at specified hourly rates

At the time invoices are received by Highway District Offices it will be the responsibility of each Highway District Engineer to call and discuss with the Snow Contractor Liaison cost applicable to the State as per existing agreements between the Commonwealth of Pennsylvania and the City of Philadelphia with respect to snow plowing and salting operations.

G. Salting Operations

Since the rate of salt expended on a street varies by such factors as the type of spreader and size and speed of vehicle, the use of miles salted by itself is not an indication of the labor required to complete a route. Therefore, for Salting Operations, the City - State ratio will be used and defined in Section “D”.

Personnel called-in to combat an ice storm will sign in on the authorized sign-in sheet for the Highway yard. The streets repair supervisor will issue the salt truck operator Form # 77-307 rev. 4/71, which delineates the route. The equipment operator will complete the form as described under Snow Operations, and will note in column (10) the number of passes necessary for each street segment. Upon completion of the route the operator will sign the form and return it to the streets repair supervisor.

The streets repair supervisor will perform the following tasks:

1. Complete SSIS information as described under Snow Plowing for each person in his district.

H. Responsibilities

1. Accounting Section Streets Department

a. The Accounting Section will determine the average fringe rates to be applied to labor, retrieve PennDOT vehicle rates, and distribute the information to all divisions of the Streets Department.

b. SSIS will accumulate the cost of each snow and ice storm. The Accounting Section will prepare any cost reports required by PennDOT on a schedule determined by PennDOT.

2. Sanitation Division Streets Department

a. Each Sanitation District will be responsible for accurately entering all necessary data in SSIS and marking the storm data complete. All data must be in the system within 24 hours of the close of each storm.

b. Time sheets and supporting data will be kept in the Area office. These will be filed chronologically by date of storm for every snow season. Records will be kept for four (4) years after the snow season.

c. Sanitation Headquarters will summarize the payroll cost of each storm and submit these costs to the Budget Officer within two (2) days after the storm.

3. Highway District Offices

a. For Snow Operations the Highway district office will calculate the plow miles for each route on Form # 77-307 rev. 4/71 and determine the City / State ratio for each route and the district as a whole.

b. For Snow Operations the District Office and Yards will be responsible for accurately entering all necessary data in SSIS and marking the storm data complete. All data must be in the system within 24 hours of the close of each storm.

c. For Salting Operations the street repair supervisor will forward form 77-360 and form 77-307 to the office of the Assistant Chief Engineer Maintenance.

d. After Salting Operations the office of the Assistant Chief Engineer will be responsible for making sure all data is entered into SSIS and marking the storm data complete. All data must be in the system within 24 hours of the close of each storm, and inform the Chief Highway Engineer and the Accounting Officer of the information available.

e. The Assistant Chief Engineer will submit the report out of the SSIS system

4. Other Agencies

a. When other agencies are involved in snow or salting operations, they will submit the required SSIS information to the Chief Highway Engineer immediately after the storm. The labor cost for these agencies will be the actual wage rates for the employees assigned to snow duty. SSIS will add fringe benefits and overhead.

Conclusion

The system described herein provides a standard system for allocating the cost of snow and salting operations. Deviations from the system will be authorized only when the Chief Highway Engineer, the Accounting Officer and Budget Officer agree to the change.

Appendix N – Sanitary Infiltration Events

Report Date	Report Time	Problem Location	Spill Notes	Affected Outfall:	Abatement Date	Abatement Time	Abatement
6/7/2018	1:30 PM	5950 RIDGE AVE	Sewage discharge into storm sewer from choked sanitary sewer.	S051-08	6/7/2018	3:00 PM	Broke choke with flusher. Will send to CCTV for investigation.
5/14/2018	12:40 PM	BYEBERRY RD & WORTHINGTON RD.	Choked sewer & sewage running along the street from FAI.	Q117-05	5/14/2018	6:40 PM	Flushed open & removed debris from choked sanitary sewer.
5/2/2018	5:00 PM	4224 W THOMPSON ST	Found choked sewer causing water in cellar sewage at 4224 & 4226 W. Thompson.	N/A	5/2/2018	7:50 PM	Flushed & cleaned sewer.
5/2/2018	12:00 PM	338 LEVERINGTON AVE	Choked sewer at Leverington & Fleming.	S059-04	5/2/2018	3:00 PM	Used flusher to break choke & clean sewer.
3/29/2018	11:30 AM	449 KRAMS AVE	Found sewer on 400 Krams Ave. Choked sewer on 4500 Mitchell - Sewage into basements 4523,4525,4529,4531,4524,4526 Mitchell & 449 Krams Ave.	N/A	3/29/2018	4:20 PM	Relieved choke with flusher – flushed, cleaned, excavated & repaired sewer.
3/22/2018	11:50 AM	HOLME AVE & LONGFORD	Sewer choked at manhole p-100-14-s0015.	P091-13	3/22/2018	2:30 PM	Flushed open choked sewer. Still has grease & rags in manhole set up bypass pumping so we can clean out manhole.
3/12/2018	1:30 AM	PUMP STATION 648 FORCE MAIN DIRECTLY OUTSIDE OF VALVE CHAMBER	When pump station runs, sewage is coming out of hole in ground onto paved surface around pump station.	N/A	3/15/2018	10:30 AM	Sewer maintenance used vactors to suck up discharge while pump station was being run by pump station unit. Vactor trucks. Responded by 2:30 pm 3/12/18 and were on site until pipe was repaired on 3/15/2018. Pig booms were placed in the area around

							the leak to contain the leak before the leak was repaired. No sewage entered any water body or storm sewer. JPC repaired damaged pipe after it was excavated.
2/23/2018	12:00 PM	4600 PECHIN ST	Sanitary sewer choked at cave and discharging into storm sewer.	S059-04	2/23/2018	1:40 PM	Broke choke in sanitary sewer with vactor (flusher).
2/22/2018	4:00 PM	8122 LEONARD ST	Choked sewer & grease in sanitary sewer.	P091-06	2/22/2018	7:50 PM	Broke choke in sanitary sewer with vactor (flusher).
2/12/2018	3:20 PM	100 DAWSON ST	Found sewage discharge into storm sewer at Sharp & Dawson.	S051-01	2/12/2018	7:10 PM	Broke choke in sanitary sewer with flusher (vactor).
2/6/2018	2:50 PM	5504 RIDGE AVE	Found sewage discharging into storm sewer.	S051-08	2/6/2018	5:20 PM	Broke choke with vactor (flusher) & placed degreaser in sewer.
1/1/2018	2:30 PM	RITTENHOUSETOWN LANE	Found sewage discharging from WHL-B0750 and pooling in a grass area. Mr. Tammaro stated this happened a few days earlier and was familiar with the area.	N/A	1/1/2018	6:00 PM	Flusher cleared choke and area was unable to be addressed due to freezing temperatures and darkness.
12/29/2017	9:45 AM	Rittenhouse Village	Sewage Discharge from manhole.	N/A	12/29/2017	12:30 PM	Flusher crew from sewer maintenance. Relieved choke sewer.
11/6/2017	3:30 PM	10781 HELMER DRIVE	Sewage was discharging from sanitary sewer to storm sewer. DEP was notified through phone call to EMG. Phone number by Chris Lasalle.	Q106-17	11/6/2017	8:00 PM	Flusher cleaned 10" choked sewer with degreaser. Will start track down of discharge.
10/23/2017	9:30 AM	8606 VERREE RD	Found choked manhole at 8606 Verree.	P108-12	10/23/2017	1:00 PM	Flushed open choked sewer & removed debris with flusher truck.

9/23/2017	6:00 AM	4116 RIDGE AVE	Sewage discharging from choked sanitary sewer to storm sewer.	S046-06	9/23/2017	9:30 AM	Flusher relieved grease choke possibly caused by restaurant in Riva will refer to IWU to check grease traps.
9/15/2017	12:00 PM	3000 HOLME AVE	Found manhole choke with grease.	P100-14	9/15/2017	3:30 AM	Flushed open choked sewer.
9/6/2017	11:30 AM	2039 S 66TH ST	Found water in cellar at 25, 27, 29, and 39, called for customer service rep for cleanup.	N/A	9/6/2017	2:40 PM	J. Mack forwarded email to B. Jewell for possible disconnection of 6" pipes. There is a 3x2 in the center of street.
8/25/2017	4:00 PM	300 HERMITAGE ST	Sewage discharge into storm sewer to outfall S-059-03.	S059-04	8/25/2017	5:30 PM	Flusher relieved choke sewer due to grease. Will CCTV. Need to track down how discharge entered storm sewer.
7/4/2017	5:30 PM	6900 N. BROAD ST.	Found contractor JPC’s excavation filled with sewage going into storm sewer.	T088-01	7/4/2017	10:00 PM	JPC set up bypass pump.

Appendix O – Pollution Migration / Infiltration

Date	Location	Pollutant	Drainage Type	Follow-up Actions
7/4/2017	North 7th St. and Coventry Ave	Sewage	Separate	Municipal Radio advised the IWBC inspector that Montgomery County officials needed assistance at North 7th St. and Coventry Ave. The inspector arrived on site at 5:10pm and met with Pennsylvania Fish and Boat Commission and Cheltenham Township Hazmat personnel. All of the assembled individuals identified the sanitary sewage discharge occurring at T-88-01 located near north 7th St. and Cheltenham Ave. and noted the probability of a fish kill having occurred. Inspector suspected the previous night's heavy may have clogged a diversion valve and contacted Philadelphia Water's Flow Control standby for response to the site. A check of nearby MS4 sewer revealed a heavy flow of sewage. The inspector trailed the flow by using key manholes which led to the JPC Sewer Reconstruction excavation. The sewage filled the excavation and flowed into the nearby MS4 sewer as no bypass pumping occurred. As efforts continued to contact JPC for response to the area for activation of the bypass pump, the IWBC inspector proceeded to check selected locations of Mill Run Creek. Inspector did not observe any obvious effects of the sewage spill on the creek during this time. PADEP received a situation advisory call, and a Public Works representative received a courtesy call identifying the sewage spill source, from the inspector. Inspector returned to the site on the following day, Wednesday, July 5, 2017. During that afternoon the inspector, accompanied by PADEP, surveyed the Mill Creek stream. During this activity, the two identified six dead fish in the steam bed. PWD's Waterways Restoration Crew performed cleanup of the stream. This MS4 sewer overflow into Mill Run Creek had a major effect on the operations of PWD.
7/7/2017	222 Green Lane	Concrete Washwater	Separate	The IWBC inspector responded to 222 Green Lane in the city's Roxborough section at 3:00pm per a PWD employee's request. This employee observed construction individuals releasing concrete laden water into a nearby unprotected MS4 sewer. Employee had instructed on water diversion measures and advised the workers against allowing the concrete laden water to enter the MS4 inlet but believed the act would continue after departure. This previously ongoing illegal activity of the contractor's workers and cement delivery drivers had the potential to block the two MS4 inlets at Green Lane and Silverwood St. or discharge into the canal along the Schuylkill River. The IWBC inspector met with the workers and advised them not to pour anything into the street. Inspector then observed the next concrete truck delivery. Whereas the concrete delivery driver rinsed into a wheelbarrow, the workers rinsed their tools into the street. This concrete laden water flowed to the unprotected MS4 sewer in the intersection of Green Lane and Silverwood St. Inspector later noted this water had no effect upon the canal. Inspector copied the names of the responsible individuals from the posted building and requested Engineering Support's forwarding of Notices of Violation to each. This event at Green Lane and Silverwood St. had minor effect upon the operations of PWD.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
7/10/2017	3400 S. Christopher Columbus Blvd	Diesel Fuel	Combined	Two trucking company tractors and four trailers burned during a suspected arson fire inside the parking lot at 3400 S. Christopher Columbus Blvd. on Sunday, July 9th at 10:28pm. Per Fire Communication's request the IWBC inspector responded to that location at 9:45am, Monday, July 10th and met a representative from a hazardous materials company. Of the 100 gallons of diesel fuel contained in the tractors fuel tanks before the fire, only 10 gallons remained. Inspector surveyed the area and noticed the water from the fire trailing toward two MS4 storm inlets in the lot. The two MS4 inlets led to an outfall that emptied into a tidal marsh which flowed to a stream that entered the Delaware River. The inspector, while surveying from the outfall to the Delaware River during low tide with the PADEP representative, did not notice any negative environmental effects at the MS4 inlets, the outfall or the stream. Both individuals observed fish swimming in the stream. However, inspector did notice a fuel oil odor at the outfall and noticed pockets of sheen downstream. A consultant company arrived on site to coordinate the cleanup and draft the required government documents. A contractor responded to the site and used an estimated 500 gallons of creek water to flush the MS4 inlets and place booms at the outfall and along the stream to capture any released fuel oil residue.
8/8/2017	300 block of Butler Ave	Debris	Combined	The Municipal Dispatcher contacted IWBC for an event involving construction debris and a storm sewer. Inspector arrived at 12:45pm on the 300 block of Butler Ave. The affected storm sewer, a combined inlet, had a mud and concrete mixture covering its exterior and contained additional material in its interior. Inspector contacted complainant who advised the excavation began the previous Saturday. Complainant observed several occasions of equipment washing and the loading of excavation material above the inlet. Despite the absence of a prominently posted construction permit at the job site the inspector learned a contracting company performed the work. Inspector requested cleaning of the debris from the inlet by a Water Department crew and requested Engineering Support's forwarding of a warning letter to the contracting company. The inspector assessed this event as having a minor effect upon the operations of the PWD.
8/14/2017	Outfall Q-106-21	Sewage	Non-contributing	A resident's concern about the discoloration of a tributary to Byberry Creek led to a IWBC inspector's response to 3306 S. Keswick Plz at 1:35pm. Inspector could not contact complainant upon arrival but gained access to the creek via the complainant's back yard. Inspector observed a slight discoloration of the creek and noticed the sewage odor. Upon following the stream to outfall q106-21 at Morrell Ave. and Calera St., the inspector discovered an abundance of sewage but no dead fish. Inspector initiated a check of the MS4 manholes on Morrel Ave. to locate chokes and contacted Flow Control supervisor. The two individuals discovered a choke on Red Lion Rd. located east of Calera St. Inspector notified the PADEP of the choke at 3:55pm. Inspector also notified PWD Sewer Maintenance of the choke location and PWD

Date	Location	Pollutant	Drainage Type	Follow-up Actions
				Sewer Maintenance dispatched a crew and a flusher truck. The crew cleared the choke by 5:45pm. On the following day, Tuesday, August 15, 2017, the Flow Control supervisor and the IWBC inspector returned to the Byberry Creek stream bed. The crew had completed cleanup of the stream and its confluence with the Byberry Creek with no signs of dead fish. This situation significantly affected PWD's operation.
8/18/2017	Markoe St. and Woodland Ave	Discharged Groundwater	Combined	The IWBC inspector responded to the intersection of Markoe St. and Woodland Ave. at 11:25am. This visit came because of a report of discharged groundwater to a storm inlet from a nearby flooded construction site. Upon arrival the inspector discovered a garden hose actively discharging into the combined sewer inlet and no supervisor or workers present on site at that time. The attempt to directly contact a representative of the contractor by phone failed so the inspector provided a voice message ordering a cessation of the discharge. Inspector contacted IWBC Engineering Support and requested the forwarding of a Notice of Violation for unauthorized discharge to the contractor. Inspector assessed this event as having a minor effect on the operations of PWD.
8/28/2017	4345 Lancaster Ave.	Grease	Combined	A restaurant at 4345 Lancaster Ave. received a 2:50pm visit from a IWBC inspector. A PWD employee reported the dumping a grease into a nearby inlet by an employee from that establishment. The inspector surveyed the inlet and noticed the accumulation of grease inside and staining outside of sanitary sewer inlet 72036. The amount of the substance indicated multiple episodes of dumping previously occurred. The investigator discussed the situation with the owner, who admitted knowing about the incorrect handling of the grease into the inlet, but unaware which employee performed the act. Investigator advised the owner of the illegality of the act and the possibility of a warning letter or Notice of Violation depending on the amount of grease cleaned from inside the sewer system by PWD technicians. The owner and the inspector toured the establishment and this activity revealed: the business did not have a grease trap and no grease disposal records existed; fat trimmings went into the trash; grease from the cooked meat went into the grill. Employees used a blast fan located on the grill stack to remove the grease from the grill. A contractor visits at three-month intervals to clean the grill stack. Grease from the cooking area is cleaned with bleach, hot water and a cleaning agent called "Blast Away" into the coals of the grill. The grease, cleaning agents and coals are then removed from the grill and placed into the trash. Before departure from the restaurant the inspector advised the owner on proper grease handling methods along with printed materials. Inspector then proceeded to the manhole on Ogden St. and Lancaster Ave. and observed accumulated sediment believed to be a typical substance inside manholes. The release of water into the Ogden St. line confirmed the absence of a blockage above the restaurant. PWD experienced minor effect on its operation because of this event.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
9/1/2017	1100 block of Rosalie St	Decontaminate Water	Combined	The Philadelphia Police and Fire Departments conducted drug raid operations in the 1100 block of Rosalie St. The 10 gallons of water used to decontaminate two of the first responders and the nine detainees raised concerns of possible heroin and fentanyl release into the environment. The 29th St. Emergency Desk contacted the IWBC with this concern and the investigator responded to the location at 2:15pm. The Hazardous Materials Department chief advised on the concerns involving the two decontamination points in use: first behind the homes in the alley behind Rosalie St. and the second on Rosalie St. Although the unit in the alley received the higher use, water from the decontamination point on Rosalie St. released onto the street to the combined inlet nearby. Inspector surveyed the area around the decontamination unit on Rosalie St. and the combined sewer inlet and realized the minimal loss of water from the unit and the low amount that entered the inlet. Inspector contacted the IWBC manager and notified sewer maintenance of the event. Inspector determined the exposure of heroin and fentanyl to the responders and prisoners was low. Dilution of the low-level substances along with the decontamination process resulted in reduced levels of exposure to the participants. The inspector assessed this activity as having had no effect upon the operations of PWD.
9/9/2017	1229 N. Front St	Illegal Discharge	Combined	IWBC Engineering Support received a report of illegal discharging of muddy water into a combined inlet from an employee of GSI Design. Engineering then directed the complaint to the inspector who responded to 1229 N. Front St. at 9:25am. The site had no contractor personnel present. Inspector observed mud staining the gutter on Front St. leading to Inlet #71401 from the construction site. No equipment remained out on the site and inspector departed with plans to return on Monday, September 11th. Further research revealed the contractor did not obtain a ground water permit from IWBC. At 9:40am Monday, September 11th, IWBC received a report of pumping activity at the site. The inspector ordered the contractor to cease the activity. IWBC inspector returned to the site at 11:46am. The pumping of muddy water to inlet 71401 had ceased. One of the contractor personnel informed of the order from the Stormwater Inspection to also obtain a ground water permit for the pumping of water and add filtration before discharging. This event had minor effect upon the operation of PWD as the IWBC inspector referred to Engineering Support for issuance of a Notice of Violation for discharge without permit.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
9/10/2017	455 Old Ridge Rd	Sewage	Outside of municipal boundary	After receipt of a citizen's report of sewage discharge to a MS4 storm inlet, an IWBC inspector responded to apartments at 455 Old Ridge Rd. in Bensalem, Pa. The inspector discovered a sewer backup into the apartments as the source of the water to the inlet which drained to Poquessing Creek. The release of water ceased before the inspector's arrival on site. Because the spill occurred above the intakes of the Baxter Water Treatment Plant, the inspector contacted and warned the treatment plant operator. Inspector spoke the plumbing contractor who advised of the effort to clear the sewer blockage in apartment building #5. While jet cleaning the sewer at the excavation site the unit's hose broke and thereby forced muddy water to flow 1,500 feet to the MS4 inlet on Old Ridge Rd. which flowed to Poquessing Creek. The contractor and inspector could not determine the amount released. A check of Poquessing Creek revealed no adverse effects occurred. Inspector again contacted the treatment plant operator at Baxter and advised muddy water, not sewage, constituted the release.
10/4/2017	Philadelphia International Airport	Jet A	Separate	The release of an estimated 250 gallons of Jet A fuel occurred at Philadelphia International Airport during the refueling of an American Airlines commuter aircraft. Hazmat expressed concern that the fuel may have traveled to a nearby creek. The Industrial Waste & Backflow Compliance (IWBC) inspector responded to the site around 4:00pm. Technicians pumped an estimated 650 gallons of water and oil from a drain box which had four grates. A contractor pumped fuel from a downstream manhole. The IWBC inspector requested the repositioning and replacement as needed of the booms already in place. Some of the booms had sheen residue from earlier fuel releases. A Hazmat official did not observe any fuel residue on the airport's creek. This confirmed that none of the fuel had left the site of the original spill.
10/20/2017	Silverwood and Fountain Sts	Concrete Washing	Separate	Residents near the intersection of Silverwood and Fountain Sts. observed contractors from a construction company washing their cement covered tools at a street inlet and reported the activity. The IWBC inspector responded to the site and observed wet cement material around the exterior opening and inside along the interior walls of the inlet. The company's workers denied washing their tools at the inlet. They would not give their names of the name of the on-site manager/supervisor. Contractors working on a Philadelphia Gas Works project one block away confirmed they had observed the company's workers washing cement material from their tools and the sidewalk earlier in the week. The undetermined amount of cement/concrete material washed into the inlet had the potential for causing problems downstream in the MS4 system or affecting the Manayunk Canal waterway. The incident warranted cleanup and cost recovery from the construction company.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
10/24/2017	Baxter Water Treatment Plant	Ammonia Tank	Separate	The Baxter Water Treatment Plant superintendent reported a spill of Ammonium Hydroxide in the tank vault. Philadelphia Fire Department Hazardous Materials units reported to the 9001 State Road location. The IWBC inspector reported to the event at 5:00pm. The system alarm alerted plant personnel of the leak. Upon inspection of the system officials determined the tank vault contained all the 3,700 gallons leaked of the 6,000 gallons which the ammonia tank had contained. The plant superintendent contacted a contractor to begin the process of emptying the tanks.
10/24/2017	2201 Spring Garden St	Oil Drums	Combined	A citizen in the area of 22nd and Spring Garden Sts. reported a leaking 55-gallon drum at a gas station (2201 Spring Garden St.). The IWBC inspector responded to the location at 2:50pm and observed oil stains which showed the potential to reach the corner of 23rd and Spring Garden Sts. Inspector could not confirm that the oil entered the inlet. Inspector also discovered 20 uncovered drums stored outside without containment. These partially filled containers had no labels and contained various types of automotive fluids. The gas station manager received notification the drums required covering or removal from the site and the oil absorbent material removed to prevent further spillage. Philadelphia Fire Department officials visited the site October 25th after receipt of a delayed report. They did not observe any further problems or oil leakage. The IWBC inspector returned to the location on October 31st. A contractor had removed the 20 drums on October 26th and only two containers, in use, remained. No further leaks or problems noted.
11/6/2017	9th St. and Roosevelt Blvd	Diesel Fuel	Combined	A tractor-trailer struck an island and a sign pole at 9th St. and Roosevelt Blvd. The collision resulted in the release of an estimated 30 to 40 gallons of diesel fuel. The IWBC investigator arrived on scene at 6:45pm and met a representative from the Philadelphia Fire Department's Hazmat Team. The fuel entered a combined system storm drain located in the inner north bound lane at 8th St. and Roosevelt Blvd. Fuel stained leaves filled the inlet. The investigator did not observe any additional fuel around the inlet. A contractor received the call to come in for the cleanup.
11/1/2017	Outfall P-106-01	Paint	Non-contributing	IWBC inspectors received a report of gray discharge from Outfall P-106-01 and responded to that location near Northeast Airport at 1:00pm. Sampling for fecal and fluoride performed. The odor of sewage not detected in the air. The inspectors suspected the substance as old paint and they tested for VOC and PCBs. The inspectors and responding officials from PADEP suspected the sink used by the painters at the airport tied into the storm line. Their performance of a dye test at the sink confirmed their suspicion. The sink was immediately taken out of service. The following day they discovered the sink on the opposite side of the wall also tied into the storm line and they removed it from service. The plumbers began dye testing at other locations to confirm no other sinks or drains tied into the storm line.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
11/14/2017	702 Pecan St	Mud	Separate	A complaint from a City Councilman's office resulted the dispatch of an inspector to 702 Pecan St. Complainant advised of the dumping of mud onto a lawn at 702 Pecan St. and the potential effects on the sewers and nearby creek. Upon arrival, the inspector saw the mud atop the lawn. An inspection of Outfall P108-10 showed no ill effects from the placement of the mud. The mud on the street did not exist in a quantity to have significant future effect upon the nearby MS4 inlet and the outfall. Inspector also received notice that officials from PADEP had also visited the location prior to his visit.
11/15/2017	8th and Walnut Sts	Sprinkler System Discharge	Combined	An IWBC investigator observed the discharge of water from a building in the intersection of 8th and Walnut Sts. Upon further inquiry personnel from the fire protection company advised the investigator of their performance of a fire suppression system test. When informed by the investigator of their need for a permit to discharge water to the combined city inlet, the company personnel expressed their confidence they did not. They further informed of their performances of suppression tests daily. Investigator directed a request to the IWBC Engineering Support section for the issuance of a Notice of Violation for illegal discharge to storm sewer to the fire protection company.
11/21/2017	Outfall PO91-01	Suds Flow	Separate	A PWD employee reported the accumulation of suds at Outfall PO91-01. The IWBC inspector reported to the location at 9:00am. No odor, detergent or otherwise, detected and the plunge pool appeared clear. Inspector collected a sample for fecal coliform and fluoride analysis. The laboratory reported readings of 554 MPN/100 ml for fecal coliform and 0.658 mg/L for fluoride.
12/7/2017	Outfall T-079-01	Chlorine	Non-contributing	The IWBC investigator observed increased flow and received high chlorine readings at Outfall T-079-01 around 10:10am. The MS4 inlet, located at Crescentville and Adams Aves., did not have any fluids or residue related to the high chlorine reading. The investigator surveyed nearby manholes and did not see significant flow into those locations. On Friday, December 8th, Investigator sent advisory e-mails to the Leak Detection supervisor, the Emergency Services and Support supervisor and a notification of the discharge to the PADEP. Investigator inspected the outfall which by this time had reduced flow. No dead aquatic life observed and no chlorine odor detected. Samples taken produced readings of 0.4 mg/l @ the outfall and .04 mg/l downstream of the foot bridge 360' downstream.
12/15/2017	Outfall W-067-01	Milky Substance	Non-contributing	Inspector responded at 10:30am to a PWD employee's notice of a milky substance at Outfall W-067-01 at Gorgas Lane and Lawnton St. Fecal and fluoride samples taken to the laboratory on Saturday, December 16th registered 2419.6/fecal and 0.15 parts per million/fluoride. Efforts to track the origin of the substance proved unsuccessful. No aquatic life affected by the substance. The plunge pool and downstream to the Wissahickon were clear.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
12/24/2017	7th St. and Cheltenham Ave	Fuel	Separate	A discharge of what later proved to be #2 Fuel oil occurred at 7th St. and Cheltenham Ave. The spill affected the stream leading into Mill Run. Upon arrival, the inspectors surveyed the areas and ensured the effective placement and repositioning of booms. The inspectors accomplished an EWS notification and placed a request for the creek's cleanup. A contractor's cleanup of the creek began on Tuesday, December 26, 2017 and concluded on Tuesday, January 2, 2018. The mud on the street did not exist in a quantity to have significant future effect upon the nearby MS4 inlet and the outfall. Inspector also received notice that officials from the PADEP had also visited the location prior to his visit.
12/26/2017	3200 N. Delaware Ave	Ferric Chloride	Other	The parking lot at the Philadelphia Parking Authority, located at 3200 N. Delaware Ave., contained a truck having 3,200 gallons of 38% ferric chloride. The truck leaked an estimated 50 gallons into the Delaware River via Outfall D17. A contractor received the call from MC Transport officials to pump the remaining ferric chloride from the tanker truck. HEPCO also scrubbed and cleaned the parking lot asphalt. The IWBC investigators did not observe any dead fish or discoloration of the Delaware River during this activity.
12/26/2017	9201 Krewstown Rd	Illegal Dumping	Separate	Over a one-week period from Monday, December 18, 2017 an IWBC inspector noticed the discharge of water a carwash at 9201 Krewstown Rd. The inspector later stopped at the location to observe the discharge set up and conduit which went into an open manhole on one of the compartments of the separator pit. The car wash owner informed of problems with the lateral and the interceptor backing up. Inspector informed owner the method of wastewater disposal was illegal as it flowed to a nearby creek. Owner stated they would obtain the services of a plumber to correct the lateral and interceptor problem.
1/3/2018	6800 block of N. 9th St.	Kerosene	Other	A resident of the 6800 block of N. 9th St. telephoned a complaint of neighbors dumping kerosene into a nearby MS4 storm water inlet T-088-01. This inlet discharged to Mill Run at 7th St. and Cheltenham Ave. The IWBC investigator estimated the release of least five gallons of kerosene into the inlet. PID reading from the inlet registered 34 parts per million and the odor remained constant. The PADEP received notification of the situation. Sewer Maintenance and a contractor received summons to initiate cleanup of the flow control gates and the inlet respectively.
1/18/2018	3783 Roberts Ave	Contaminated Water	Separate	An estimated 4' of water stood in the driveway of a painting company located at 3783 Roberts Ave. as a result of an internal building water line break. The owner opted to pump the water from the driveway onto Roberts Ave. The affected inlet of this operation on Roberts east of Stokley was an MS4 and flowed to the Schuylkill River into Outfall S-046-06 @ the Twin Bridges. Inspector advised the owner of the illegality of this action and to contact the 311 line for assistance in the future.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
1/23/2018	Philadelphia Parking Authority Economy Parking Lot Section J	hydraulic fluid	Combined	The IWBC inspector reported to this incident at 12:40pm. The spilling of seven gallons of hydraulic fluid occurred on the Philadelphia Parking Authority Economy Parking Lot Section J near the maintenance building. Responders estimated about 5 gals spilled onto the ground and 2 gals went into the storm drain which led to Mingo Creek. A contractor performed the cleanup.
1/29/2018	9200 Blue Grass Rd	Sewage	Separate	A resident sent pictures of a "green substance" they had seen on Saturday, January 27, 2018 at Wooden Bridge Run. The IWBC inspector went to the source of the substance, Outflow P-105-01 and checked manholes in the shopping center for chokes. None found. Samples collected by the inspector at Outfalls P-105-01 and P-105-0-0010 proved to be sewage. The inspector believed a choke caused the release of sewage. A sewer maintenance crew came to the site and opened a critical storm water manhole in the shopping center's driveway. Technicians later discovered the problem resulted from a clogged lateral from Applebee's Restaurant. Applebee's plumber completed this repair on Wednesday, February 7, 2018.
2/7/2018	1937 Snyder Ave	Grease Dumping	Combined	An IWBC investigator responded at 12:30pm to a report of grease dumping into the northeast corner inlet at 1937 Snyder Ave. Investigator identified a greasy/fatty substance coating the exterior of the inlet. The interview which followed with employees resulted in denial of inlet dumping. Investigator requested Engineering Support's forwarding of a grease pamphlet to the company.
2/15/2018	1584 N. 52nd St	Solvent	Combined	The IWBC investigator, while working with the Scrap Yard Task Force, observed a sink apparently used for cleaning metal parts and dumping the cleaning solution. The sink, in use at an auto repairs shop at 1560 – 1584 N. 52nd St., had residue and a solvent odor. The Investigator took pictures and advised the owner's daughter of the potential to cite for violation.
2/26/2018	5100 Bleigh St.	Fire Water Runoff	Separate	Philadelphia Fire Department officials requested sampling support on the fire water runoff at The Forge, Inc., 5100 Bleigh St. Inspector responded to the location at 3:30pm and completed taking of a sample. Inspector also noted the submerging of D-074-01, the Bleigh and Delaware River outfall from the MS4 and notified the emergency desk at the PADEP.
3/1/2018	Outfall W-060-01	Excess flow	Non-contributing	IWBC inspector noticed a higher flow rate than normal at Outfall W-060-01 during a routine observation. Although plunge pool had greenish-blue tinge, no dead or live aquatic life appeared in the stream. Inspector traced the fresh water and high flow rate to a manhole at Martin and Park Terrace, W-060-0305. The inspector believed this amounted to a water main break and referred the situation to Water Emergency.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
3/12/2018	11600 Norcom Rd	Diesel Fuel	Separate	A car moving at a high rate of speed struck a D&A tractor-trailer around 3:00am. An estimated 50 to 100 gallons of diesel fuel spilled from the tractor-trailer onto the street and made its way to an inlet at 11600 Norcom Rd. near Bridgeman's Hall. The inlet drains to Outfall Q-114-05 but the fuel remained confined to the inlet. The IWBC investigator responded to the scene at 9:15am and inspected the outfall. No effects of the fuel or sheen appeared at the outfall. Philadelphia Fire Department Hazmat summoned Clean Venture to perform the cleanup. A contractor cleaned both the street and the inlet.
3/30/2018	900 W. Glenwood Ave.	Short Dump	Combined	Someone dumped 30 drums of oil-based textiles paints, dyes and chemicals dyes at 1900 W. Glenwood Ave. on the Margie St. Bridge. The IWBC investigator reported to the scene at 2:30pm. This event required responses from units of PWD, Philadelphia Fire Department Hazmat officials, PADEP and notification of the U. S. Coast Guard. Clean Venture performed the cleanup services which required monitoring several nearby sewer lines and removal of the empty chemical drums. Officials noted no sheen or color having escaped from outfall D39 at Susquehanna Ave. and Beach St. at Penn Treaty.
4/3/2018	201 N Broad St.	Grease	Combined	IWBC inspectors, while conducting a grease inspection at Jake's Pizza, observed one of its employees pour a detergent and grease mixture into a nearby stormwater drain. The inspectors advised the owner that act violated city health codes. Because that action occurred during their visit the inspectors directed a recommendation to Engineering Support for the issuance of a Notice of Violation with intent to fine.
4/3/2018	5601 N. 10th St.	Sulfuric Acid	Combined	An individual hired by the owner of 5601 N. 10th St. to clean a garage area. The individual took a one-gallon bottle of an unidentified chemical and poured it into the building's drain. The sample taken from the drain trap later proved the substance as highly acidic, corrosive, industrial strength sulfuric acid. The License & Inspections representative at the location considered the issuance of a violation for the disposal of hazardous chemicals at a residence.
4/16/2018	1405 Bridgewater Rd.	Oil	Outside of municipal boundary	A company located at 1405 Bridgewater Rd. in Bensalem, Bucks County, had nine 55-gallon oil bearing drums stored behind their property. Heavy rains caused the unsecured drums to become mobile and release an estimated 300 to 400 gallons of oil. The substance released to the ground and traveled to a nearby wetland and then to a tributary of Neshaminy Creek. Responders to this event included: PADEP; Bensalem Township Fire Rescue Battalion. Lewis Environmental performed the cleaning activity. This spill had no effect on the Baxter Water Treatment Plant as officials determined the tide gates remained closed during the time of the spill.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
4/26/2018	4418 “O” St.	Trash	Separate	The IWBC inspector responded to 4418 “O” St. at 4:15pm regarding a report of repeated trash dumping in a nearby inlet which connected to a MS4 system. Inspector discovered food containers, cans and other assorted items. The complainant informed of having video footage of the unidentified culprit in action and agreed to send to the inspector via e-mail. Inspector contacted an inlet cleaning crew which completed its activity afterward.
5/3/2018	300 block of Butler Ave.	Storm Inlet Discharge	Combined	An IWBC inspector responded to the 300 block of Butler Ave. at 10:32am for the report of water discharge into a storm inlet. Although no pumping occurred at time of visit, evidence existed of prior release of concrete residue and water into the inlet. Inspector spoke to the construction manager and advised on the illegal release of water into inlets and the requirement for a permit. The property owner contacted the inspector, and in turn Engineering Support, who provided guidance for obtaining a permit.
5/4/2018	720 St. Andrews St.	Sediment	Separate	The report of white sediment release from outfall W-076-07 brought a 10:00am response from an IWBC inspector. Although some sediment settled on rocks near the outfall, the substance showed no effects to the stream and no fish kill. Inspector took a sample and while accompanied by another PWD representative went on a tour of a nearby construction site. The two visited the activity at 720 St. Andrews St. and discovered evidence of prior runoff to a nearby inlet. The inspector obtained a sample from the inlet and the residue did not match the appearance of the white sediment found at outfall W-076 -07. The construction manager met the two investigators and advised his site held no responsibility for releases in the area. He suggested the site at Cherokee and Hartwell Streets. as the probable cause for any sediment in the storm water system. The construction manager later contacted the inspector and recommended a check of the inlet located at St. Andrews and Cherokee Streets. The results of the inspector’s check of that inlet proved negative as a PWD crew recently repaired the site with only light concrete residue remaining thereon.
5/8/2018	Oregon Ave. and Columbus Blvd.	Wash Water	Combined	Two IWBC inspectors responded to Oregon Ave. and Columbus Blvd. at 10:50am. Their visit came as a response to the report of the release of detergent and other chemical-based substances into a nearby inlet from truck wash and power wash company. The operator of the truck wash received notice that the release of water, detergent and other chemicals into an inlet, especially near the Delaware River, is illegal. The operator disregarded the inspector’s warning and proceeded to wash another truck. The operator then presented a permit issued from Licenses & Inspections which had expired August 6, 2012 and had no operating location stated. The inspectors contacted Engineering and Support and recommended the issuance of a Notice of Violation to the truck wash and power wash company.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
5/10/2018	Concourse Lake	Herbicides	Non-contributing	The application of two gallons of the herbicides at Concourse Lake by the owner of a weeding company resulted in a fish kill. IWBC inspectors responded to the location at 1:30pm as two company employees removed dead fish. Both claimed having no knowledge of the prior activity and the chemical agents used which caused the situation. The inspectors contacted a PADEP representative who advised of their prior visit to the location. The PADEP representative expressed belief that the dying of the treated vegetation caused a reduction of oxygen in the lake which resulted in the suffocation of the aquatic life in the lake. The inspectors concluded this activity for this event at 3:00pm.
6/8/2018	5900 Block of Ridge Ave.	Grease	Separate	Sewer Maintenance Supervisor called IWBC to report that Sewer Maintenance had relieved a grease choke on the 5900 Block of Ridge Ave near the school at Gerhardt St. The choke had been cleared earlier in the day. Sewage was backing up into properties with basements. The backup in the sewer was reported to be from the 5900 to the 6000 Block. The top of the system was 6053 Ridge. Due to traffic concerns, the area was inspected next morning after rush hour to check the water quality at the Main St and Shurs Ln. manhole prior to S51-08. The sample was clear with some solids. The results for fecal were 100MPN/100mL. The OF was also checked and no discoloration or odor was noted. It did not appear to have affected the OF. A list of potential grease generating businesses will be forwarded to for further action.
6/9/2018	1600 Schuylkill Ave.	Oil Spill	Combined	An inspector responded to an oil spill on the Schuylkill River from CSX railroad. He met with an employee of CSX. He explained that a hydraulic coupling burst and about 75 gallons of oil leaked from railroad bridge down to the river below. The leak was repaired prior to inspector’s arrival. Emergency response team was contracted by CSX to handle emergency response. The emergency response team did not perform any remedial activities or containment. The oil dispersed and immediately traveled downstream as the leak occurred. The oil was a vegetable-based oil and was mostly biodegradable. The inspector walked out on the bridge to inspect the repaired coupling. No signs of leaking were observed. Also, no impacts were observed on the river. It was requested that the emergency response team provide their spill report to PWD.

Date	Location	Pollutant	Drainage Type	Follow-up Actions
6/12/2018	1214 Bristol Pike	Gasoline	Outside of municipal boundary	IWBC was notified by the OEM of an explosion in Bensalem at 1214 Bristol Pike. A gas station was located there. There was concern of contaminated runoff from either the gas or firefighting foam. Inspector attempted to check with the main command center but could not gain access due to a meeting. Township Engineer for Bensalem explained the details of the storm sewer in the area. One portion led to the Poquessing Creek west of the site and the other storm sewers led to swales along I-95 which ultimately discharged to the Delaware River. No gas odors were detected at the Poquessing Creek. The Storm sewers did not have traps which would allow vapors to travel. Extensive monitoring was conducted by the various HAZMAT teams. The inspector observed the water flowing to either the ground or the storm sewers were from the charged fire hoses. No foam was deployed. The water service for the gas station was ruptured during the explosion. The service was shut off once the situation had stabilized. The gasoline tanks were off loaded into a tank. The area along I-95 was checked by the inspector and no odors were detected. On 6/13/18, it was reported that the explosion was related to a propane tank in an underground vault.
6/20/2018	11th Street between Snyder and Mercy St.	Oil	Combined	An inspector reported to this incident on 6/21/2018. Upon arrival inspector was not able to locate any signs of gushing oil or remnants of any oil discharge or spill. There was no staining or sheen or odors from any of the nearby inlets. Inspector checked the surrounding blocks, including around an auto body shop (which the anonymous complainant stated may be the source) but there was nothing. The complainant, came forward and said it was too late. She stated that the event had occurred the previous day (6/20/18), and she had called to report the issue at approximately 06:00-06-30. [IWBC did not get the NRC email until approx. 6/20/2018 @ 16:33]. Apparently, the material about which she complained had come out of the alley inches deep and had a “shine” on the surface, and a bad odor like oil. It was possible that the overnight rain event had washed away any evidence of odors, but there was no staining at all to indicate oily discharge.

Appendix P – Defective Lateral Quarterly Report FY18

STORM WATER MANAGEMENT PROGRAM
NPDES PERMIT NO. PA0054712

DEFECTIVE LATERAL CONNECTION STATUS REPORT
(Covering Period from July 1, 2017 to September 30, 2017)

Submitted to

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER QUALITY MANAGEMENT

By

CITY OF PHILADELPHIA
PHILADELPHIA, PA

November 14, 2017

DLC Program Update
3rd Quarter 2017

I. INTRODUCTION

This Defective Lateral Connection Status Report is submitted to the Pennsylvania Department of Environmental Protection (PADEP) as part of the reporting requirements of the City of Philadelphia NPDES Storm Water Management Permit No. PA 0054712. The report covers the three-month period beginning July 1, 2017 and ending September 30, 2017.

The body of this report will describe the recent activities of the City during the past quarter within the 1998 COA Priority Outfall areas and at other significant outfalls on the Stormwater Outfall Priority Score list. Additionally, goals for the next quarter will be listed.

Table 1 provides a summary of the program with respect to Complete tests, Cross-connections identified, and Abatements performed. Table 2 provides a listing of all laboratory analyses of samples taken at stormwater outfalls or within the stormwater system during the previous quarter. Table 3 provides a listing of properties with cross-connections outstanding greater than 120 days. Finally, Table 4 provides a listing of reported wastewater spills to the stormwater system or receiving streams.

II. PAST QUARTER REVIEW

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

DLC program activities have performed 2,831 Complete tests in this sewershed, identifying 132 Cross-connections, all of which have been Abated.

Eight (8) sites intercepting flow are listed below.

1.	CFD-01	Plymouth St. west of Pittsville St.
2.	CFD-02	Pittsville St. south of Plymouth St.
3.	CFD-03	Elston St. east of Bouvier St.
4.	CFD-04	Ashley St. west of Bouvier St.
5.	CFD-05	Cheltenham Ave. east of 19th St.
6.	CFD-06	Verbena St. south of Cheltenham Ave.
7.	CFD-07	Cheltenham Ave. east of 7th St.
8.	CFD-08	7th St. south of Cheltenham Ave.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	12	0	0
CFD-02	11	0	0
CFD-03	11	0	0
CFD-04	7	1	0
CFD-05	8	0	0
CFD-06	10	0	0
CFD-07	27	2	1
CFD-08	27	2	0

The most recent fecal sample value was >2419.6 MPN per 100 ml. at the outfall on July 12, 2017.

2. Monastery Ave. Outfall (W-060-01)

DLC program activities have performed 611 Complete tests in this sewershed, identifying 16 Cross-connections, all of which have been Abated.

Two (2) sites intercepting flow are listed below.

1. MFD-01 Jannette St. west of Monastery Ave.
2. MFD-02 Green La. north of Lawnton St.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
MFD-01	8	1	0
MFD-02	8	0	0

The most recent fecal sample value was 1553.1 MPN per 100 ml. at the outfall on July 17, 2017.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

DLC program activities have performed 2,748 Complete tests in these sewershed areas, identifying 94 Cross-connections, all but one of which have been Abated. The majority of the efforts have been in the W-068-05 sewershed area which is by far the largest in terms of drainage area and properties served.

The most recent fecal sample value was >2419.6 MPN per 100 ml. at the W-068-05 outfall on July 17, 2017.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

DLC program activities have performed 2,478 Complete tests in these sewershed areas, identifying 61 Cross-connections, all of which have been Abated. The majority of the efforts have been in the S-059-04 sewershed area.

The most recent fecal sample value was >2419.6 MPN per 100 ml. at the S-058-01 outfall, >2419.6 MPN per 100 ml. at the S-059-01 outfall, >2419.6 MPN per 100 ml. at the S-059-02 outfall, 1986.3 MPN per 100 ml. at the S-059-03 outfall, 1732.9 MPN per 100 ml. at the S-059-04 outfall, 1413.6 MPN per 100 ml. at the S-059-05 outfall and the S-059-09 outfall was found almost dry, all on July 11, 2017.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

DLC program activities have performed 5,832 Complete tests in this sewershed, identifying 87 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. PFD-01 Sandyford Run (Brous and Lexington Aves.)

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
PFD-01	26	0	0

The most recent fecal sample value was 108.1 MPN per 100 ml. at the outfall on July 21, 2017.

2. Franklin and Hasbrook Outfall (T-089-04)

DLC program activities have performed 1,017 Complete tests in this sewershed, identifying 46 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. CFD-01 Franklin and Hasbrook Aves.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	33	3	2

The outfall was found dry on July 12, 2017.

Note: for the quarterly report ending 3/31/17, there were actually 2 discharges (rather than the reported 1).

3. A current summary of additional outfalls from the Stormwater Outfall Priority Score list that the City has performed complete testing or abatements this quarter is as follows.

Outfall #	Complete Tests	Cross-Connections	Abatements
P-083-03	1	0	0
P-091-06	0	0	1
P-091-07	124	3	0
P-092-02	3	0	0
P-100-03	1	0	0
P-100-04	126	0	0
P-100-08	(6)	0	0
P-100-14	1	0	0
P-100-17	31	2	(1)
P-100-20	47	1	0
P-104-08	1	0	0
P-105-13	3	0	2
P-108-21	1	0	0
P-112-02	1	0	1
P-113-08	1	0	0
Q-101-03	1	0	1
Q-102-01	1	0	0
Q-106-06	3	1	0
Q-106-13	1	0	0
Q-107-06	3	0	0
Q-109-07	125	0	0
Q-110-09	1	0	0
Q-110-14	0	0	1
Q-115-09	1	0	0
Q-117-05	1	0	0
Q-120-08	1	0	1
S-046-06	4	0	0
S-051-08	1	1	0
S-052-05	3	0	0
T-080-02	11	0	1
T-089-03	105	4	1
W-077-02	1	0	0

III. NEXT QUARTER GOALS

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

2. Monastery Ave. Outfall (W-060-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

Goals for the Quarter

- Continue sampling at outfall W-068-05 with dry-weather flow.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

Goals for the Quarter

- Continue sampling at the outfalls with dry-weather flow.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

2. Franklin and Hasbrook Outfall (T-089-04)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

3. Continue to perform abatements of identified cross-connections within the following outfalls.

- P-091-07
- P-100-14
- P-100-17
- P-100-20
- P-105-13

- Q-106-06
- Q-114-10
- S-051-08
- S-052-05
- S-066-01
- T-080-02
- T-089-03
- W-067-01

4. Continue to perform property testing within the following outfalls.

- P-091-07
- P-113-03
- Q-109-07
- S-052-05
- T-089-03
- W-077-02

Table 1
DLC Program Summary
July 1, 2017 to September 30, 2017

Complete Tests:

- 60,415 Complete tests have been performed under the DLC program
- **601 Complete tests were performed this past quarter**
- 1 Complete test was performed in outfall P-083-03
- 1 Complete test was performed in outfall P-090-02
- 124 Complete tests were performed in outfall P-091-07
- 3 Complete tests were performed in outfall P-092-02
- 1 Complete test was performed in outfall P-100-03
- 126 Complete tests were performed in outfall P-100-04
- (6) Complete tests were performed in outfall P-100-08
- 1 Complete test was performed in outfall P-100-14
- 31 Complete tests were performed in outfall P-100-17
- 47 Complete tests were performed in outfall P-100-20
- 1 Complete test was performed in outfall P-104-08
- 3 Complete tests were performed in outfall P-105-13
- 1 Complete test was performed in outfall P-108-21
- 1 Complete test was performed in outfall P-112-02
- 1 Complete test was performed in outfall P-113-08
- 1 Complete test was performed in outfall Q-101-03
- 1 Complete test was performed in outfall Q-102-01
- 3 Complete tests were performed in outfall Q-106-06
- 1 Complete test was performed in outfall Q-106-13
- 3 Complete tests were performed in outfall Q-107-06
- 125 Complete tests were performed in outfall Q-109-07
- 1 Complete test was performed in outfall Q-110-09
- 1 Complete test was performed in outfall Q-115-09
- 1 Complete test was performed in outfall Q-117-05
- 1 Complete test was performed in outfall Q-120-08
- 4 Complete tests were performed in outfall S-046-06
- 1 Complete test was performed in outfall S-051-08
- 3 Complete tests were performed in outfall S-052-05
- 11 Complete tests were performed in outfall T-080-02
- 105 Complete tests were performed in outfall T-089-03
- 1 Complete test was performed in outfall W-060-10
- 1 Complete test was performed in outfall W-068-05
- 1 Complete test was performed in outfall W-077-02

Cross-Connections Found:

- 1,452 Cross-connections have been identified under the DLC program
- **12 Cross-connections were identified this past quarter**
- 3 Cross-connections were identified in outfall P-091-07
- 2 Cross-connections were identified in outfall P-100-17
- 1 Cross-connection was identified in outfall P-100-20
- 1 Cross-connection was identified in outfall Q-106-06
- 1 Cross-connection was identified in outfall S-051-08
- 4 Cross-connections were identified in outfall T-089-03

Abatements:

- 1,429 Abatements have been performed under the DLC program
- **9 Abatements were performed this past quarter**
- 1 Abatement was performed in outfall P-091-06
- (1) Abatement was performed in outfall P-100-17
- 2 Abatements were performed in outfall P-105-13
- 1 Abatement was performed in outfall P-112-02
- 1 Abatement was performed in outfall Q-101-03
- 1 Abatement was performed in outfall Q-110-14
- 1 Abatement was performed in outfall Q-120-08
- 1 Abatement was performed in outfall T-080-02
- 1 Abatement was performed in outfall T-089-03
- 1 Abatement was performed in outfall W-060-10

Outfall/Manhole Screening and Sampling:

- 10 outfall inspections were made as part of the Priority Outfall Inspection Program this past quarter
- 9 outfall samples were taken due to observed dry-weather flow during the above inspections

- 21 outfall inspections were made as part of the Permit Inspection Program this past quarter
- 11 outfall samples were taken due to observed dry-weather flow during the above inspections

Table 2
Lab Analysis of Water at Outfalls and/or in the Storm Sewers
July 1, 2017 to September 30, 2017

Outfall	Date	Time	Location	Sewer Size (in)	Flow (gph)	Fluoride (mg/l)	Fecal Count (MPN per 100 ml)	Comments
A. Priority Outfalls								
T-088-01	7/12/2017	10:30	Outfall: 7th & Cheltenham	84	10800	0.17	>2419.6	
W-060-01	7/17/2017	11:05	Outfall: Monastery Lane	5'-0" x 4'-4"	NR	0.11	1553.1	
W-068-05	7/17/2017	11:40	Outfall: Lincoln & Morris	90	2160	0.19	>2419.6	
S-058-01	7/11/2017	10:55	Outfall: Domino Lane	54	NR	0.18	>2419.6	river influence, plunge pool observations: cloudy, mild musty odor
S-059-01	7/11/2017	11:15	Outfall: Parker	60	1800	0.25	>2419.6	
S-059-02	7/11/2017	11:25	Outfall: Fountain	42	360	0.13	>2419.6	slight musty odor, fish observed
S-059-03	7/11/2017	11:45	Outfall: Wright	42	3600	0.15	1986.3	clear, no odor
S-059-04	7/11/2017	11:55	Outfall: Leverington	51	NR	0.15	1732.9	river influence, fine cloud of sediment visible
S-059-05	7/11/2017	11:59	Outfall: Leverington (east)	4'-0" x 2'-8"	NR	0.16	1413.6	river influence
S-059-09	7/11/2017	12:15	Outfall: Green Lane	36	95	NS	NS	unable to sample - inaccessible
B. Permit Inspection Program								
P-090-02	7/21/2017	10:50	Outfall: Brous & Lexington (Sandyford)	156	600	0.59	108.1	sample collected approximately 10' downstream of outfall, sediment visible
T-089-04	7/12/2017	10:15	Outfall: W of Franklin Ave & County Line	3'-0" x 5'-6"	NF	NS	NS	no flow from city side (flow only from township side), ambient sewage odor
S-051-08	8/28/2017	11:45	Manhole: Main & Shurs	9'-0" x 7'-0"	300	0.37	>2419.6	manhole S-051-08-0010, fluffy, brown suspended solids
S-052-05	8/10/2017	11:30	Manhole: Sumac & Rochelle	42	NR	0.18	343.6	manhole S-052-05-0015, clear, no sheen or odor
P-090-01	7/21/2017	11:00	Outfall: Brous & Lexington (at Roosevelt Blvd)	42	60	<0.10	95.9	
P-108-23	7/8/2017	6:20	Outfall: Redd Rambler & Oakfield	36	NF	NS	NS	
P-108-24	7/10/2017	11:45	Outfall: Verree & Pine Hill	60	30	<0.10	>2419.6	clear, slight surface sheen / scum
Q-109-06	9/13/2017	10:30	Outfall: Red Lion & Roosevelt Blvd	66	<1	0.10	>2419.6	clear, no sheen or odor
Q-109-07	9/13/2017	10:50	Outfall: Roosevelt Blvd & Red Lion	36	NF	NS	NS	
Q-110-02	9/28/2017	12:05	Outfall: Decataur & Darnell	42	NF	NS	NS	
Q-110-03	9/28/2017	12:00	Outfall: Decataur & Darnell	42	NF	NS	NS	
Q-110-04	9/29/2017	10:40	Outfall: Decataur & Darnell	42	25	0.69	54.8	clear, no sheen or odor
Q-110-05	9/28/2017	11:30	Outfall: Drummond & Red Lion	66	<1	0.13	1413.6	clear, no sheen or odor
Q-110-06	9/28/2017	10:25	Outfall: Academy & Amity	54	NF	NS	NS	
Q-110-07	9/28/2017	10:45	Outfall: Academy & Chalfont	30	<1	<0.10	64.4	clear, no sheen or odor
Q-110-08	9/29/2017	11:35	Outfall: Academy & Comly	42	NF	NS	NS	
Q-110-09	9/29/2017	11:30	Outfall: Academy & Comly	36	1	0.61	>2419.6	cloudy, slight sheen, heavy sewage odor
Q-110-10	9/29/2017	11:45	Outfall: Comly & Tara	36	NF	NS	NS	
Q-110-11	9/29/2017	12:10	Outfall: Comly & Tara	60	NF	NS	NS	
W-095-03	7/11/2017	11:10	Outfall: Stenton & Bells Mill	36	NF	NS	NS	pipe wet
W-095-04	7/11/2017	10:50	Outfall: Stenton & Bells Mill	30	300	<0.10	>2419.6	

Table 3
Residential Cross Connections Not Abated Within 120 Days

A. Properties Abated & Confirmed Prior to Reporting:

Address			Outfall Code	Complete Date	Admin. Action	Abatement Confirmation Date	Comments
08222	Narvon	St	P-091-12	12-03-2016		05-12-2017	
10128	Proctor	Rd	P-113-03	12-14-2016		04-25-2017	
03512 W	Crown	Ave	Q-106-09	12-14-2016		04-20-2017	
13031	Lindsay	St	Q-120-08	12-23-2016		05-24-2017	
10120	Proctor	Rd	P-113-03	12-29-2016		05-08-2017	
10133	Proctor	Rd	P-113-03	01-14-2017		06-09-2017	
08204	Bustleton	Ave	P-091-06	02-17-2017		07-17-2017	
05801	Morris	St	W-060-10	03-17-2017		08-08-2017	
13411	Kelvin	Ave	Q-120-08	04-01-2017		08-10-2017	

B. Properties Active As Of Reporting:

Address			Outfall Code	Complete Date	Admin. Action	Comments
03128	Holly	Rd	Q-114-10	05-27-2017		

Table 4

Spills to Storm Sewers and/or Receiving Waters

July 1, 2017 to September 30, 2017

Date	Outfall	Address	Source Code	Material Involved	Completion Date	Remarks
07/04/17	T-088-01	Broad Street between 69th and 70th Avenues Mill Run	3008 3009	Sewage	07/04/17	Sewer Maintenance unit flushed 12" diameter sanitary sewer causing approximate 50 gpm discharge. Sewage backed up into open excavation of PWD contractor (JPC / Work #40361) and flowed into an open storm sewer. Contractor setup bypass pump. PWD cleaned affected area.
08/09/17	T-088-01	N. 7th Street and W. Cheltenham Avenue Mill Rum	3009	Sewage	08/09/17	Industrial Waste unit investigated a reported discharge. No active overflow identified. No problems reported from nearby PWD construction site (JPC / Work #40361).
08/14/17	Q-106-21	Red Lion and Calera Roads Byberry Creek	3009	Sewage	08/14/17	Sewer Maintenance unit flushed 12" diameter sanitary sewer causing discharge. Storm sewer flushed with dechlorinated water. Affected area cleaned.
08/25/17	S-059-04	Hermitage and Pechin Streets Manayunk Canal	3009	Sewage	08/25/17	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate <1 gpm discharge.
09/06/17		S. 66th Street and Greenway Avenue	3008	Sewage	09/06/17	Sewer Maintenance unit flushed 6" diameter combined sewer causing approximate <1 gpm discharge resulting in W/C at multiple properties. Street flushed with water by Vactor / Flusher truck.
09/15/17	P-100-14	Holme Avenue and Longford Street Wooden Bridge Run	3009	Sewage	09/15/17	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate 1 gpm discharge. Affected area cleaned.
09/15/17	S-046-07	4000 Neill Drive unnamed tributary of Schuylkill River	3009	Sewage	09/15/17	Industrial Waste unit investigated a reported discharge. Although sewage odors were present, no active overflow was identified.
09/23/17	S-046-06	Ridge Avenue and N. Ferry Road Schuylkill River	3009	Sewage	09/23/17	Sewer Maintenance unit flushed 12" diameter sanitary sewer causing approximate 1 gpm discharge.

Source Codes:

3008 - Spill to Ground Only

3009 - Spill to Storm Sewer

3010 - Spill to Sanitary Sewer

3011 - Spill to Receiving Stream

STORM WATER MANAGEMENT PROGRAM
NPDES PERMIT NO. PA0054712

DEFECTIVE LATERAL CONNECTION STATUS REPORT
(Covering Period from October 1, 2017 to December 31, 2017)

Submitted to

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER QUALITY MANAGEMENT

By

CITY OF PHILADELPHIA
PHILADELPHIA, PA

February 14, 2018

DLC Program Update
4th Quarter 2017

I. INTRODUCTION

This Defective Lateral Connection Status Report is submitted to the Pennsylvania Department of Environmental Protection (PADEP) as part of the reporting requirements of the City of Philadelphia NPDES Storm Water Management Permit No. PA 0054712. The report covers the three-month period beginning October 1, 2017 and ending December 31, 2017.

The body of this report will describe the recent activities of the City during the past quarter within the 1998 COA Priority Outfall areas and at other significant outfalls on the Stormwater Outfall Priority Score list. Additionally, goals for the next quarter will be listed.

Table 1 provides a summary of the program with respect to Complete tests, Cross-connections identified, and Abatements performed. Table 2 provides a listing of all laboratory analyses of samples taken at stormwater outfalls or within the stormwater system during the previous quarter. Table 3 provides a listing of properties with cross-connections outstanding greater than 120 days. Finally, Table 4 provides a listing of reported wastewater spills to the stormwater system or receiving streams.

II. PAST QUARTER REVIEW

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

DLC program activities have performed 2,831 Complete tests in this sewershed, identifying 134 Cross-connections, all but two of which have been Abated.

Eight (8) sites intercepting flow are listed below.

1. CFD-01 Plymouth St. west of Pittsville St.
2. CFD-02 Pittsville St. south of Plymouth St.
3. CFD-03 Elston St. east of Bouvier St.
4. CFD-04 Ashley St. west of Bouvier St.
5. CFD-05 Cheltenham Ave. east of 19th St.
6. CFD-06 Verbena St. south of Cheltenham Ave.
7. CFD-07 Cheltenham Ave. east of 7th St.
8. CFD-08 7th St. south of Cheltenham Ave.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	11	1	0
CFD-02	11	2	0
CFD-03	8	1	0
CFD-04	9	0	0
CFD-05	9	1	0
CFD-06	8	0	0
CFD-07	18	0	0
CFD-08	18	0	0

The most recent fecal sample value was >2419.6 MPN per 100 ml. at the outfall on October 5, 2017.

2. Monastery Ave. Outfall (W-060-01)

DLC program activities have performed 611 Complete tests in this sewershed, identifying 16 Cross-connections, all of which have been Abated.

Two (2) sites intercepting flow are listed below.

1. MFD-01 Jannette St. west of Monastery Ave.
2. MFD-02 Green La. north of Lawnton St.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
MFD-01	9	0	0
MFD-02	8	0	0

The most recent fecal sample value was 78.9 MPN per 100 ml. at the outfall on October 3, 2017.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

DLC program activities have performed 2,748 Complete tests in these sewershed areas, identifying 94 Cross-connections, all but one of which have been Abated. The majority of the efforts have been in the W-068-05 sewershed area which is by far the largest in terms of drainage area and properties served.

The most recent fecal sample value was >2419.6 MPN per 100 ml. at the W-068-05 outfall on October 3, 2017.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

DLC program activities have performed 2,479 Complete tests in these sewershed areas, identifying 62 Cross-connections, all but one of which have been Abated. The majority of the efforts have been in the S-059-04 sewershed area.

The most recent fecal sample value was 1553.1 MPN per 100 ml. at the S-058-01 outfall, >2419.6 MPN per 100 ml. at the S-059-01 outfall (on October 4, 2017), >2419.6 MPN per 100 ml. at the S-059-02 outfall, 344.8 MPN per 100 ml. at the S-059-03 outfall, >2419.6 MPN per 100 ml. at the S-059-04 outfall, 547.5 MPN per 100 ml. at the S-059-05 outfall and the S-059-09 outfall was found almost dry, all but one on October 2, 2017.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

DLC program activities have performed 5,832 Complete tests in this sewershed, identifying 87 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. PFD-01 Sandyford Run (Brous and Lexington Aves.)

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
PFD-01	19	1	0

The outfall was found dry on October 5, 2017.

2. Franklin and Hasbrook Outfall (T-089-04)

DLC program activities have performed 1,017 Complete tests in this sewershed, identifying 46 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. CFD-01 Franklin and Hasbrook Aves.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	19	2	0

The outfall was found dry on October 5, 2017.

3. A current summary of additional outfalls from the Stormwater Outfall Priority Score list that the City has performed complete testing or abatements this quarter is as follows.

Outfall #	Complete Tests	Cross-Connections	Abatements
P-091-07	2	0	3
P-099-03	2	0	0
P-100-04	2	0	0
P-100-11	51	2	0
P-100-14	0	0	1
P-100-17	2	0	0
P-100-23	(7)	0	0
P-100-24	7	0	0
P-105-13	1	0	1
P-113-03	1	1	0
Q-106-04	2	0	0
Q-106-06	1	0	0
Q-109-07	330	6	1
Q-114-10	0	0	1
S-052-04	88	16	0
S-052-05	2	0	1
S-066-01	0	0	2
T-080-02	1	1	1
T-089-03	5	1	5
W-077-02	4	1	0
W-086-01	1	0	0

III. NEXT QUARTER GOALS

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

2. Monastery Ave. Outfall (W-060-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

Goals for the Quarter

- Continue sampling at outfall W-068-05 with dry-weather flow.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

Goals for the Quarter

- Continue sampling at the outfalls with dry-weather flow.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

2. Franklin and Hasbrook Outfall (T-089-04)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

3. Continue to perform abatements of identified cross-connections within the following outfalls.

- P-100-11
- P-100-17
- P-100-20
- P-113-03
- Q-106-06
- Q-109-07
- S-051-08
- S-052-04
- S-059-04
- T-080-02
- T-088-01
- T-089-03
- W-067-01
- W-077-02

4. Continue to perform property testing within the following outfalls.

- P-100-11
- Q-109-07
- S-051-08
- S-052-04

- W-086-02

Table 1
DLC Program Summary
October 1, 2017 to December 31, 2017

Complete Tests:

- 60,911 Complete tests have been performed under the DLC program
- **496 Complete tests were performed this past quarter**
- 2 Complete tests were performed in outfall P-091-07
- 2 Complete tests were performed in outfall P-099-03
- 2 Complete tests were performed in outfall P-100-04
- 51 Complete tests were performed in outfall P-100-11
- 2 Complete tests were performed in outfall P-100-17
- (7) Complete tests were performed in outfall P-100-23
- 7 Complete tests were performed in outfall P-100-24
- 1 Complete test was performed in outfall P-105-13
- 1 Complete test was performed in outfall P-113-03
- 2 Complete tests were performed in outfall Q-106-04
- 1 Complete test was performed in outfall Q-106-06
- 330 Complete tests were performed in outfall Q-109-07
- 88 Complete tests were performed in outfall S-052-04
- 2 Complete tests were performed in outfall S-052-05
- 1 Complete test was performed in outfall S-059-04
- 1 Complete test was performed in outfall T-080-02
- 5 Complete tests were performed in outfall T-089-03
- 4 Complete tests were performed in outfall W-077-02
- 1 Complete test was performed in outfall W-086-01

Cross-Connections Found:

- 1,483 Cross-connections have been identified under the DLC program
- **31 Cross-connections were identified this past quarter**
- 2 Cross-connections were identified in outfall P-100-11
- 1 Cross-connection was identified in outfall P-113-03
- 6 Cross-connections were identified in outfall Q-109-07
- 16 Cross-connections were identified in outfall S-052-04
- 1 Cross-connection was identified in outfall S-059-04
- 1 Cross-connection was identified in outfall T-080-02
- 2 Cross-connections were identified in outfall T-088-01
- 1 Cross-connection was identified in outfall T-089-03
- 1 Cross-connection was identified in outfall W-077-02

Abatements:

- 1,445 Abatements have been performed under the DLC program
- **16 Abatements were performed this past quarter**
- 3 Abatements were performed in outfall P-091-07
- 1 Abatement was performed in outfall P-100-14
- 1 Abatement was performed in outfall P-105-13
- 1 Abatement was performed in outfall Q-109-07
- 1 Abatement was performed in outfall Q-114-10
- 1 Abatement was performed in outfall S-052-05
- 2 Abatements were performed in outfall S-066-01
- 1 Abatement was performed in outfall T-080-02
- 5 Abatements were performed in outfall T-089-03

Outfall/Manhole Screening and Sampling:

- 11 outfall inspections were made as part of the **Priority Outfall Inspection Program** this past quarter
- 10 outfall samples were taken due to observed dry-weather flow during the above inspections

- 52 outfall inspections were made as part of the **Permit Inspection Program** this past quarter
- 21 outfall samples were taken due to observed dry-weather flow during the above inspections

Table 2
Lab Analysis of Water at Outfalls and/or in the Storm Sewers
October 1, 2017 to December 31, 2017

Outfall	Date	Time	Location	Sewer Size (in)	Flow (gph)	Fluoride (mg/l)	Fecal Count (MPN per 100 ml)	Comments
A. Priority Outfalls								
T-088-01	10/5/2017	11:40	Outfall: 7th & Cheltenham	84	5400	0.20	>2419.6	heavy sewage odor
W-060-01	10/3/2017	11:45	Outfall: Monastery Lane	5'-0" x 4'-4"	NR	0.12	78.9	flow from cracks in outfall, unable to estimate flow
W-068-05	10/3/2017	11:20	Outfall: Lincoln & Morris	90	NR	0.28	>2419.6	clear flow, unable to estimate flow
S-058-01	10/2/2017		Outfall: Domino Lane	54	NR	0.24	1553.1	river influence, unable to estimate flow
S-059-01	10/2/2017	11:05	Outfall: Parker	60	720	0.41	1413.6	
S-059-01	10/4/2017	11:11	Outfall: Parker	60	1200	0.42	>2419.6	
S-059-02	10/2/2017	11:15	Outfall: Fountain	42	75	0.14	>2419.6	
S-059-03	10/2/2017	11:30	Outfall: Wright	42	480	0.12	344.8	
S-059-04	10/2/2017	12:00	Outfall: Leverington	51	NR	0.30	>2419.6	river influence, unable to estimate flow
S-059-05	10/2/2017	12:05	Outfall: Leverington (east)	4'-0" x 2'-8"	NR	0.18	547.5	river influence
S-059-09	10/2/2017	12:10	Outfall: Green Lane	36	<1	NS	NS	unable to sample - inaccessible
B. Permit Inspection Program								
P-090-02	10/5/2017	12:25	Outfall: Brous & Lexington (Sandyford)	156	NF	NS	NS	
T-089-04	10/5/2017	12:00	Outfall: W of Franklin Ave & County Line	3'-0" x 5'-6"	NF	NS	NS	no flow from city side (flow only from township side)
S-051-08	10/3/2017	12:20	Manhole: Main & Shurs	9'-0" x 7'-0"	NR	0.32	>2419.6	manhole S-051-08-0010, fluffy, minor suspended solids, no odor
S-052-05	10/3/2017	12:10	Manhole: Sumac & Rochelle	42	NR	0.36	>2419.6	manhole S-052-05-0015, clear
P-090-01	10/5/2017	12:20	Outfall: Brous & Lexington (at Roosevelt Blvd)	42	60	<0.10	547.5	clear, no sheen or odor
P-091-01	11/21/2017	10:10	Outfall: Sandyford & Brous	36	300	0.66	554	clear, faint musty odor
P-103-01	12/20/2017	11:15	Outfall: Pine & Shady Lane	42	220	<0.10	29.8	clear, no sheen or odor
P-103-02	12/20/2017	11:15	Outfall: Pine & Shady Lane	18	NF	NS	NS	
P-103-03	12/20/2017	10:45	Outfall: Hoffnagle & Rockwell	42	120	<0.10	<1	clear, no sheen or odor, fish observed
P-104-01	12/8/2017	12:19	Outfall: SW Pine & Longmeadow	21	NF	NS	NS	
P-104-02	12/8/2017	12:20	Outfall: Pine & Longmeadow	42	NF	NS	NS	
P-104-03	12/20/2017	12:20	Outfall: Verree & Meeting House	42	NF	NS	NS	
P-104-04	12/20/2017	12:20	Outfall: Verree & Meeting House	24	NF	NS	NS	
P-104-05	12/8/2017	11:05	Outfall: Norvelt & Hoven	30	NF	NS	NS	
P-104-06	12/20/2017	12:39	Outfall: Meeting House & Verree	48	720	<0.10	>2419.6	
P-104-07	12/20/2017	12:00	Outfall: Tustin & Rising Sun	66	3600	<0.10	>2419.6	strong odor
P-104-08	12/21/2017	12:05	Outfall: Krewston & Rising Sun	36	NF	NS	NS	
P-104-09	12/21/2017	12:30	Outfall: Algon & Placid	48	2	<0.10	>2419.6	
P-104-11	12/20/2017	11:41	Outfall: Ridgerun & Park Hollow	18	30	0.13	435.2	
P-108-01	12/8/2017	11:35	Outfall: W Bloomfield & Jennifer	36	NF	NS	NS	
P-108-02	12/8/2017	12:10	Outfall: Jennifer	21	NF	NS	NS	
P-108-03	12/8/2017	12:00	Outfall: Millwood & Alicia	48	NF	NS	NS	
P-108-04	12/19/2017	11:57	Outfall: Kings Oak & South	30	NF	NS	NS	
P-108-05	12/18/2017	12:50	Outfall: Grey Court	27	5	<0.10	298.7	
P-108-06	12/18/2017	12:10	Outfall: Alburger & Darlington	27	NF	NS	NS	
P-108-07	12/18/2017	12:15	Outfall: Alburger & Darlington	36	1	0.12	>2419.6	
P-108-08	12/18/2017	13:05	Outfall: Kings Oak & East	42	NF	NS	NS	
P-108-09	12/18/2017	12:25	Outfall: Darlington & Grace	36	1	0.10	328.2	
P-108-10	11/7/2017	11:15	Outfall: Pecan & Stratford	18	NF	NS	NS	
P-108-11	12/18/2017	11:50	Outfall: Darlington & Stratford	60	NF	NS	NS	
P-108-12	12/8/2017	11:15	Outfall: E Bloomfield & Verree	36	NF	NS	NS	
P-108-13	12/8/2017	11:20	Outfall: Bloomfield & Verree	36	60	0.60	>2419.6	musty odor
P-108-14	12/19/2017	11:26	Outfall: Verree & Marchman	66	60	<0.10	>2419.6	sample collected approximately 30' downstream
P-108-15	12/19/2017	11:18	Outfall: Verree & Marchman	36	NF	NS	NS	
P-108-16	12/18/2017	10:50	Outfall: Welsh & Alburger	54	NF	NS	NS	creek influence
P-108-17	12/18/2017	10:55	Outfall: Welsh & Alburger	42	NF	NS	NS	creek influence
P-108-18	12/18/2017	11:00	Outfall: Welsh & Walley	36	NR	0.13	60.9	sample collected in-stream
P-108-19	12/18/2017	11:15	Outfall: Walley & Twist	36	NF	NS	NS	
P-108-20	12/18/2017	11:20	Outfall: Northeast & Fulmer	60	NF	NS	NS	
P-108-21	12/18/2017	11:25	Outfall: Northeast & Fulmer	60	NF	NS	NS	
P-108-22	12/18/2017	11:40	Outfall: Redd Rambler & Drive	18	NF	NS	NS	
P-108-25	12/8/2017	11:40	Outfall: E Bloomfield & Jennifer	18	NF	NS	NS	

Table 2
Lab Analysis of Water at Outfalls and/or in the Storm Sewers
October 1, 2017 to December 31, 2017

Outfall	Date	Time	Location	Sewer Size (in)	Flow (gph)	Fluoride (mg/l)	Fecal Count (MPN per 100 ml)	Comments
P-109-05	10/22/2017	10:47	Outfall: Norwalk & Walley	42	NF	NS	NS	no odor
Q-101-03	12/12/2017	9:30	Outfall: Academy & Holme	5'6" x 8' 8"	600	0.42	1732.9	clear, no sheen or odor
Q-101-20	12/12/2017	10:05	Outfall: Outlook & Lansford	54	300	0.57	137.4	clear, no sheen or odor
Q-110-17	10/6/2017	10:45	Outfall: Waldemire & Chalfont	60	NR	0.20	1119.9	creek influence, fish observed
Q-110-18	10/6/2017	11:05	Outfall: Waldemire & Millbrook	36	NF	NS	NS	creek influence
Q-110-19	10/6/2017	11:20	Outfall: Helmer & Keswick	21	NF	NS	NS	
Q-110-20	10/6/2017	11:25	Outfall: Helmer & Keswick	54	NF	NS	NS	
W-060-08	10/20/2017	12:00	Outfall: Walnut & Kingsley	36	NF	NS	NS	
W-067-01	10/20/2017	12:25	Outfall: Gorgas & Lawnton	6'0 " x 6'0"	2700	0.12	4611.0	
W-095-01	11/15/2017	11:40	Outfall: NE Hillcrest & Germantown	48	60	0.29	>2419.6	clear, no sheen or odor

Table 3
Residential Cross Connections Not Abated Within 120 Days

A. Properties Abated & Confirmed Prior to Reporting:

Address			Outfall Code	Complete Date	Admin. Action	Abatement Confirmation Date	Comments
05801	Morris	St	W-060-10	03-17-2017		08-08-2017	
13411	Kelvin	Ave	Q-120-08	04-01-2017		08-10-2017	
03066	Fairfield	St	P-100-14	05-19-2017		10-18-2017	
00200	Sumac	St	S-052-05	05-24-2017		10-03-2017	
03128	Holly	Rd	Q-114-10	05-27-2017		11-10-2017	
09872	Wistaria	St	P-105-13	06-05-2017		11-02-2017	
07849	Nixon	St	S-066-01	06-23-2017		11-08-2017	
07851	Nixon	St	S-066-01	06-23-2017		11-08-2017	
06002	Hasbrook	Ave	T-080-02	06-24-2017		11-20-2017	
06923	Shelbourne	St	T-089-03	06-27-2017		12-15-2017	
07039	Shelbourne	St	T-089-03	07-14-2017		11-30-2017	
00422	Tyson	Ave	T-089-03	07-22-2017		12-05-2017	
00342	Tyson	Ave	T-089-03	07-31-2017		12-08-2017	

B. Properties Active As Of Reporting:

Address				Outfall Code	Complete Date	Admin. Action	Comments
03426	W	Coulter	St	S-052-04	11-29-2016		
09129		Ryerson	Rd	P-100-20	08-05-2017		
02757		Willits	Rd	P-100-17	08-12-2017		

Table 4

Spills to Storm Sewers and/or Receiving Waters

October 1, 2017 to December 31, 2017

Date	Outfall	Address	Source Code	Material Involved	Completion Date	Remarks
10/02/17	W-060-10	Saylor Grove Wetland Wissahickon Avenue / W. Rittenhouse Street / Lincoln Drive Monoshone Creek	3009	Sewage	10/02/17	Industrial Waste unit investigated a reported discharge. Although mild sewage odors were present, no active overflow was identified. Area will be referred to the Sewer Maintenance Defective Connections group for further investigation.
10/23/17	P-108-12	8606 Verree Road Paul's Rum	3009	Sewage	10/23/17	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate 1 gpm discharge. Storm sewer flushed with dechlorinated water. Affected area cleaned.
11/06/17	Q-106-17	10781 Helmer Drive Byberry Creek	3009	Sewage	11/06/17	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate 1 gpm discharge.
11/20/17	P-091-01	Sandyford and Brous Avenues Sandy Run	3009	Sewage	11/20/17	Industrial Waste unit investigated a reported discharge. No active overflow was identified.
12/14/17	W-067-01	Gorgas Lane and Henry Avenue unnamed tributary of Wissahickon Creek	3009	Sewage	12/14/17	Sewer Maintenance and Industrial Waste units investigated a reported discharge. No active overflow was identified.
12/29/17		Historic Rittenhouse Town Lincoln and Forbidden Drives Monoshone Creek	3008	Sewage	12/29/17	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate <1 gpm discharge. Affected area cleaned.

Source Codes:

3008 - Spill to Ground Only

3009 - Spill to Storm Sewer

3010 - Spill to Sanitary Sewer

3011 - Spill to Receiving Stream

STORM WATER MANAGEMENT PROGRAM
NPDES PERMIT NO. PA0054712

DEFECTIVE LATERAL CONNECTION STATUS REPORT
(Covering Period from January 1, 2018 to March 31, 2018)

Submitted to

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER QUALITY MANAGEMENT

By

CITY OF PHILADELPHIA
PHILADELPHIA, PA

May 15, 2018

DLC Program Update
1st Quarter 2018

I. INTRODUCTION

This Defective Lateral Connection Status Report is submitted to the Pennsylvania Department of Environmental Protection (PADEP) as part of the reporting requirements of the City of Philadelphia NPDES Storm Water Management Permit No. PA 0054712. The report covers the three-month period beginning January 1, 2018 and ending March 31, 2018.

The body of this report will describe the recent activities of the City during the past quarter within the 1998 COA Priority Outfall areas and at other significant outfalls on the Stormwater Outfall Priority Score list. Additionally, goals for the next quarter will be listed.

Table 1 provides a summary of the program with respect to Complete tests, Cross-connections identified, and Abatements performed. Table 2 provides a listing of all laboratory analyses of samples taken at stormwater outfalls or within the stormwater system during the previous quarter. Table 3 provides a listing of properties with cross-connections outstanding greater than 120 days. Finally, Table 4 provides a listing of reported wastewater spills to the stormwater system or receiving streams.

II. PAST QUARTER REVIEW

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

DLC program activities have performed 2,831 Complete tests in this sewershed, identifying 134 Cross-connections, all but two of which have been Abated.

Eight (8) sites intercepting flow are listed below.

1.	CFD-01	Plymouth St. west of Pittsville St.
2.	CFD-02	Pittsville St. south of Plymouth St.
3.	CFD-03	Elston St. east of Bouvier St.
4.	CFD-04	Ashley St. west of Bouvier St.
5.	CFD-05	Cheltenham Ave. east of 19th St.
6.	CFD-06	Verbena St. south of Cheltenham Ave.
7.	CFD-07	Cheltenham Ave. east of 7th St.
8.	CFD-08	7th St. south of Cheltenham Ave.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	13	0	0
CFD-02	13	0	0
CFD-03	11	0	0
CFD-04	10	0	0
CFD-05	6	0	0
CFD-06	8	0	0
CFD-07	21	1	1
CFD-08	22	0	0

The most recent fecal sample value was 5475 MPN per 100 ml. at the outfall on March 6, 2018.

2. Monastery Ave. Outfall (W-060-01)

DLC program activities have performed 611 Complete tests in this sewershed, identifying 16 Cross-connections, all of which have been Abated.

Two (2) sites intercepting flow are listed below.

1. MFD-01 Jannette St. west of Monastery Ave.
2. MFD-02 Green La. north of Lawnton St.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
MFD-01	3	0	0
MFD-02	3	0	0

The most recent fecal sample value was 318 MPN per 100 ml. at the outfall on March 1, 2018.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

DLC program activities have performed 2,748 Complete tests in these sewershed areas, identifying 94 Cross-connections, all of which have been Abated. The majority of the efforts have been in the W-068-05 sewershed area which is by far the largest in terms of drainage area and properties served.

The most recent fecal sample value was 9804 MPN per 100 ml. at the W-068-05 outfall on February 28, 2018.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

DLC program activities have performed 2,479 Complete tests in these sewershed areas, identifying 62 Cross-connections, all of which have been Abated. The majority of the efforts have been in the S-059-04 sewershed area.

The most recent fecal sample value was 648.8 MPN per 100 ml. at the S-058-01 outfall, 15531 MPN per 100 ml. at the S-059-01 outfall, >2419.6 MPN per 100 ml. at the S-059-02 outfall, 32.7 MPN per 100 ml. at the S-059-03 outfall, 5794 MPN per 100 ml. at the S-059-04 outfall, 1732.9 MPN per 100 ml. at the S-059-05 outfall and the S-059-09 outfall was found almost dry, all on January 16, 2018.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

DLC program activities have performed 5,832 Complete tests in this sewershed, identifying 87 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. PFD-01 Sandyford Run (Brous and Lexington Aves.)

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
PFD-01	25	0	0

The most recent fecal sample value was 110 MPN per 100 ml. at the outfall on March 1, 2018.

2. Franklin and Hasbrook Outfall (T-089-04)

DLC program activities have performed 1,017 Complete tests in this sewershed, identifying 46 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. CFD-01 Franklin and Hasbrook Aves.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	28	0	2

The outfall was found dry on March 6, 2018.

3. A current summary of additional outfalls from the Stormwater Outfall Priority Score list that the City has performed complete testing or abatements this quarter is as follows.

Outfall #	Complete Tests	Cross-Connections	Abatements
P-091-07	2	0	0
P-100-04	2	0	0
P-100-11	18	1	0
P-100-17	0	0	2
P-100-20	0	0	1
P-113-03	0	0	1
Q-106-06	0	0	1
Q-109-07	80	3	3
Q-117-02	1	0	0
S-051-03	(1)	0	0
S-051-08	(1)	0	(1)
S-052-04	395	65	2
S-052-05	1	1	0
W-086-02	0	1	0

III. NEXT QUARTER GOALS

A. Priority Outfalls

1. 7^{th} & Cheltenham Outfall (T-088-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

2. Monastery Ave. Outfall (W-060-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

Goals for the Quarter

- Continue sampling at outfall W-068-05 with dry-weather flow.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

Goals for the Quarter

- Continue sampling at the outfalls with dry-weather flow.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

2. Franklin and Hasbrook Outfall (T-089-04)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

3. Continue to perform abatements of identified cross-connections within the following outfalls.

- P-100-11
- P-100-17
- Q-109-07
- S-051-08
- S-052-04
- S-052-05
- T-080-02
- T-088-01
- T-089-03
- W-067-01
- W-077-02
- W-086-02

4. Continue to perform property testing within the following outfalls.

- P-090-02
- P-100-11
- P-108-12
- S-051-03
- S-052-04
- S-052-05
- W-060-10

Table 1
DLC Program Summary
January 1, 2018 to March 31, 2018

Complete Tests:

- 61,408 Complete tests have been performed under the DLC program
- **497 Complete tests were performed this past quarter**
- 2 Complete tests were performed in outfall P-091-07
- 2 Complete tests were performed in outfall P-100-04
- 18 Complete tests were performed in outfall P-100-11
- 80 Complete tests were performed in outfall Q-109-07
- 1 Complete test was performed in outfall Q-117-02
- (1) Complete test was performed in outfall S-051-03
- (1) Complete test was performed in outfall S-051-08
- 395 Complete tests were performed in outfall S-052-04
- 1 Complete test was performed in outfall S-052-05

Cross-Connections Found:

- 1,554 Cross-connections have been identified under the DLC program
- **71 Cross-connections were identified this past quarter**
- 1 Cross-connection was identified in outfall P-100-11
- 3 Cross-connections were identified in outfall Q-109-07
- 65 Cross-connections were identified in outfall S-052-04
- 1 Cross-connection was identified in outfall S-052-05
- 1 Cross-connection was identified in outfall W-086-02

Abatements:

- 1,455 Abatements have been performed under the DLC program
- **10 Abatements were performed this past quarter**
- 2 Abatements were performed in outfall P-100-17
- 1 Abatement was performed in outfall P-100-20
- 1 Abatement was performed in outfall P-113-03
- 1 Abatement was performed in outfall Q-106-06
- 3 Abatements were performed in outfall Q-109-07
- (1) Abatement was performed in outfall S-051-08
- 2 Abatements were performed in outfall S-052-04
- 1 Abatement was performed in outfall S-059-04

Outfall/Manhole Screening and Sampling:

- 10 outfall inspections were made as part of the **Priority Outfall Inspection Program** this past quarter
- 9 outfall samples were taken due to observed dry-weather flow during the above inspections

- 17 outfall inspections were made as part of the **Permit Inspection Program** this past quarter
- 8 outfall samples were taken due to observed dry-weather flow during the above inspections

Table 2
Lab Analysis of Water at Outfalls and/or in the Storm Sewers
January 1, 2018 to March 31, 2018

Outfall	Date	Time	Location	Sewer Size (in)	Flow (gph)	Fluoride (mg/l)	Fecal Count (MPN per 100 ml)	Comments
A. Priority Outfalls								
T-088-01	3/6/2018	11:45	Outfall: 7th & Cheltenham	84	NR	0.10	5475	mildly cloudy, no sheen or odor, slight suspended solids
W-060-01	3/1/2018	11:45	Outfall: Monastery Lane	5'-0" x 4'-4"	1200	0.44	318	heavy flow
W-068-05	2/28/2018	11:41	Outfall: Lincoln & Morris	90	420	0.27	9804	slight solids
S-058-01	1/16/2018	11:20	Outfall: Domino Lane	54	5400	0.21	648.8	cloudy, no sheen or odor
S-059-01	1/16/2018	11:55	Outfall: Parker	60	3600	0.24	15531	cloudy, no sheen, slight sewage odor
S-059-02	1/16/2018	12:05	Outfall: Fountain	42	79	0.13	>2419.6	no sheen, slight sewage odor
S-059-03	1/16/2018	12:15	Outfall: Wright	42	3600	0.18	32.7	clear, no sheen or odor
S-059-04	1/16/2018	12:25	Outfall: Leverington	51	NR	0.16	5794	river influence, moderate sewage odor and suspended solids
S-059-05	1/16/2018	12:30	Outfall: Leverington (east)	4'-0" x 2'-8"	NR	0.17	1732.9	river influence, no sheen, slight sewage odor
S-059-09	1/16/2018	12:35	Outfall: Green Lane	36	NR	NS	NS	flow too low to sample, no odor
B. Permit Inspection Program								
P-090-02	3/1/2018	11:00	Outfall: Brous & Lexington (Sandyford)	156	NR	0.50	110	sample collected approximately 30' downstream, clear, no sheen
T-089-04	3/6/2018	11:25	Outfall: W of Franklin Ave & County Line	3'-0" x 5'-6"	NF	NS	NS	no flow from city side (flow only from township side)
S-051-08	2/28/2018	11:10	Manhole: Main & Shurs	9'-0" x 7'-0"	NR	0.32	98.7	manhole S-051-08-0010
S-052-05	2/28/2018	10:50	Manhole: Sumac & Rochelle	42	7	0.19	770.1	manhole S-052-05-0015
P-105-01	1/31/2018	9:57	Outfall: Roosevelt Blvd. & Goodnaw	102	NR	0.56	>241960	sample collected approximately 120' downstream
Q-101-04	1/2/2018	11:45	Outfall: Pearson & Crispin	42	NR	NS	NS	
Q-106-03	3/26/2018	10:15	Outfall: Berea & Glenn	54	NF	NS	NS	
Q-106-04	3/26/2018	10:06	Outfall: Berea & Glenn	42	NF	NS	NS	
Q-106-05	3/26/2018	10:30	Outfall: Chesterfield & Berea	42	60	0.10	95.9	clear flow
Q-106-06	3/26/2018	10:35	Outfall: Chesterfield & Berea	27	NF	NS	NS	
Q-106-07	3/26/2018	10:55	Outfall: Chesterfield & Berea	21	NF	NS	NS	
Q-106-08	3/26/2018	11:00	Outfall: S. Keswick Rd. & S. Keswick Pl.	27	2	<0.10	>2419.6	
Q-106-09	3/26/2018	11:05	Outfall: Churchill & Wessex	24	NF	NS	NS	
Q-106-10	3/26/2018	11:10	Outfall: Morrell & Ashfield	21	NF	NS	NS	
Q-106-11	3/26/2018	11:15	Outfall: Morrell & Ashfield	21	NF	NS	NS	
Q-106-12	3/26/2018	11:21	Outfall: Morell & Ashfield	30	1	<0.10	>2419.6	clear flow, sweet odor
W-076-13	2/15/2018	11:40	Outfall: Wise's Mill & Henry	48	20	<0.10	410.6	

Table 3
Residential Cross Connections Not Abated Within 120 Days

A. Properties Abated & Confirmed Prior to Reporting:

Address			Outfall Code	Complete Date	Admin. Action	Abatement Confirmation Date	Comments
03128	Holly	Rd	Q-114-10	05-27-2017		11-10-2017	
09872	Wistaria	St	P-105-13	06-05-2017		11-02-2017	
07849	Nixon	St	S-066-01	06-23-2017		11-08-2017	
07851	Nixon	St	S-066-01	06-23-2017		11-08-2017	
06002	Hasbrook	Ave	T-080-02	06-24-2017		11-20-2017	
06923	Shelbourne	St	T-089-03	06-27-2017		12-15-2017	
03551	Wessex	La	Q-106-06	07-08-2017		01-03-2018	
07039	Shelbourne	St	T-089-03	07-14-2017		11-30-2017	
00422	Tyson	Ave	T-089-03	07-22-2017		12-05-2017	
00342	Tyson	Ave	T-089-03	07-31-2017		12-08-2017	
09129	Ryerson	Rd	P-100-20	08-05-2017		01-26-2018	
02751	Willits	Rd	P-100-17	09-02-2017		02-27-2018	
02741	Willits	Rd	P-100-17	09-20-2017		03-09-2018	
00105	Seville	St	S-051-08	09-25-2017		04-09-2018	
00466	Green	La	S-059-04	10-07-2017		02-22-2018	
01016	Gorman	St	P-113-03	10-28-2017		03-15-2018	
01845	Sanford	St	Q-109-07	10-31-2017		03-29-2018	
03320	Ainslie	St	S-052-04	11-25-2017		03-27-2018	

B. Properties Active As Of Reporting:

Address			Outfall Code	Complete Date	Admin. Action	Comments
02757	Willits	Rd	P-100-17	08-12-2017		
06925	Shelbourne	St	T-089-03	10-28-2017		
01856	Greymont	St	Q-109-07	10-28-2017		
03347	Ainslie	St	S-052-04	11-14-2017		
03302	Ainslie	St	S-052-04	11-14-2017		

Table 3
Residential Cross Connections Not Abated Within 120 Days

Address				Outfall Code	Complete Date	Admin. Action	Comments
03405	W	Coulter	St	S-052-04	11-15-2017		
03438	W	Coulter	St	S-052-04	11-15-2017		
03344		Ainslie	St	S-052-04	11-17-2017		
03425	W	Coulter	St	S-052-04	11-18-2017		
07028	N	Broad	St	T-088-01	11-22-2017		
03415	W	Coulter	St	S-052-04	11-28-2017		
03426	W	Coulter	St	S-052-04	11-29-2017		
10122		Clark	St	Q-109-07	11-30-2017		
03314		Ainslie	St	S-052-04	11-30-2017		

Table 4
Spills to Storm Sewers and/or Receiving Waters
January 1, 2018 to March 31, 2018

Date	Outfall	Address	Source Code	Material Involved	Completion Date	Remarks
01/01/18		Historic Rittenhouse Town Lincoln and Forbidden Drives Monoshone Creek	3008	Sewage	01/01/18	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate <1 gpm discharge.
02/06/18	S-051-08	5504 Ridge Avenue Schuylkill River	3009	Sewage	02/06/18	Sewer Maintenance unit flushed 8" diameter sanitary sewer causing approximate <1 gpm discharge.
02/12/18	S-051-01	Dawson and Sharp Streets Schuylkill River	3009	Sewage	02/12/18	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate 1 gpm discharge.
02/22/18	P-091-06	E. Roosevelt Boulevard and Stanwood Street Pennypack Creek	3009	Sewage	02/22/18	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate <1 gpm discharge.
02/23/18	S-059-04	Pechin and Hermitage Streets Manayunk Canal	3009	Sewage	02/23/18	Sewer Maintenance unit flushed 8" diameter sanitary sewer causing approximate <1 gpm discharge. Repairs made to damaged sanitary and storm sewers.
03/01/18	W-060-01	Jannette Street and Monastery Avenue Wissahickon Creek	3009	Fresh Water	03/01/18	Industrial Waste unit investigated a discharge caused by an apparent water main leak. Referred to Distribution unit for further investigation.
03/12/18		PNBC Pump Station #648 Philadelphia Naval Business Center S. 26th Street	3008	Sewage	03/15/18	Sewer Maintenance unit investigated a discharge caused by a leaking force main. Vactor truck remained on-site to clean affected area until repairs were made. Contractor made repair to force main.
03/22/18	P-100-14	Holme Avenue and Longford Street Wooden Bridge Run	3009	Sewage	03/22/18	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate 5 gpm discharge. Debris removed from manhole. Affected area cleaned.
03/29/18	S-059-04	Krams Avenue and Mitchell Street Manayunk Canal	3008	Sewage	03/29/18	Sewer Maintenance unit flushed 8" diameter sanitary sewer causing W/C at multiple properties. Repairs made to damaged sanitary and storm sewers.

Source Codes:
3008 - Spill to Ground Only
3009 - Spill to Storm Sewer
3010 - Spill to Sanitary Sewer
3011 - Spill to Receiving Stream

STORM WATER MANAGEMENT PROGRAM
NPDES PERMIT NO. PA0054712

DEFECTIVE LATERAL CONNECTION STATUS REPORT
(Covering Period from April 1, 2018 to June 30, 2018)

Submitted to

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER QUALITY MANAGEMENT

By

CITY OF PHILADELPHIA
PHILADELPHIA, PA

August 14, 2018

DLC Program Update
2nd Quarter 2018

I. INTRODUCTION

This Defective Lateral Connection Status Report is submitted to the Pennsylvania Department of Environmental Protection (PADEP) as part of the reporting requirements of the City of Philadelphia NPDES Storm Water Management Permit No. PA 0054712. The report covers the three-month period beginning April 1, 2018 and ending June 30, 2018.

The body of this report will describe the recent activities of the City during the past quarter within the 1998 COA Priority Outfall areas and at other significant outfalls on the Stormwater Outfall Priority Score list. Additionally, goals for the next quarter will be listed.

Table 1 provides a summary of the program with respect to Complete tests, Cross-connections identified, and Abatements performed. Table 2 provides a listing of all laboratory analyses of samples taken at stormwater outfalls or within the stormwater system during the previous quarter. Table 3 provides a listing of properties with cross-connections outstanding greater than 120 days. Finally, Table 4 provides a listing of reported wastewater spills to the stormwater system or receiving streams.

II. PAST QUARTER REVIEW

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

DLC program activities have performed 2,831 Complete tests in this sewershed, identifying 134 Cross-connections, all but one of which have been Abated.

Eight (8) sites intercepting flow are listed below.

1. CFD-01 Plymouth St. west of Pittsville St.
2. CFD-02 Pittsville St. south of Plymouth St.
3. CFD-03 Elston St. east of Bouvier St.
4. CFD-04 Ashley St. west of Bouvier St.
5. CFD-05 Cheltenham Ave. east of 19th St.
6. CFD-06 Verbena St. south of Cheltenham Ave.
7. CFD-07 Cheltenham Ave. east of 7th St.
8. CFD-08 7th St. south of Cheltenham Ave.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	17	1	0
CFD-02	20	0	0
CFD-03	18	0	0
CFD-04	6	0	0
CFD-05	13	0	0
CFD-06	10	0	0
CFD-07	26	0	0
CFD-08	26	2	0

The most recent fecal sample value was 97 MPN per 100 ml. at the outfall on May 2, 2018.

2. Monastery Ave. Outfall (W-060-01)

DLC program activities have performed 611 Complete tests in this sewershed, identifying 16 Cross-connections, all of which have been Abated.

Two (2) sites intercepting flow are listed below.

1. MFD-01 Jannette St. west of Monastery Ave.
2. MFD-02 Green La. north of Lawnton St.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
MFD-01	8	0	0
MFD-02	8	0	0

The most recent fecal sample value was 10 MPN per 100 ml. at the outfall on May 2, 2018.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

DLC program activities have performed 2,748 Complete tests in these sewershed areas, identifying 94 Cross-connections, all of which have been Abated. The majority of the efforts have been in the W-068-05 sewershed area which is by far the largest in terms of drainage area and properties served.

The most recent fecal sample value was 17329 MPN per 100 ml. at the W-068-05 outfall on May 1, 2018.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

DLC program activities have performed 2,479 Complete tests in these sewershed areas, identifying 62 Cross-connections, all of which have been Abated. The majority of the efforts have been in the S-059-04 sewershed area.

The most recent fecal sample value was 428 MPN per 100 ml. at the S-058-01 outfall, 155310 MPN per 100 ml. at the S-059-01 outfall, 68670 MPN per 100 ml. at the S-059-02 outfall, 1956 MPN per 100 ml. at the S-059-03 outfall, >241960 MPN per 100 ml. at the S-059-04 outfall, 9208 MPN per 100 ml. at the S-059-05 outfall and the S-059-09 outfall was found almost dry, all on April 19, 2018.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

DLC program activities have performed 5,832 Complete tests in this sewershed, identifying 87 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. PFD-01 Sandyford Run (Brous and Lexington Aves.)

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
PFD-01	28	0	0

The most recent fecal sample value was 41 MPN per 100 ml. at the outfall on May 1, 2018.

2. Franklin and Hasbrook Outfall (T-089-04)

DLC program activities have performed 1,017 Complete tests in this sewershed, identifying 46 Cross-connections, all of which have been Abated.

One (1) site intercepting flow is listed below.

1. CFD-01 Franklin and Hasbrook Aves.

The number of inspections, blockages cleared and discharges noted during this quarter are listed below.

Flap Gate	Inspections	Blockages	Discharges
CFD-01	31	2	3

The outfall was found dry on May 2, 2018.

3. A current summary of additional outfalls from the Stormwater Outfall Priority Score list that the City has performed complete testing or abatements this quarter is as follows.

Outfall #	Complete Tests	Cross-Connections	Abatements
P-083-03	1	0	0
P-091-08	2	0	0
P-100-11	10	2	1
P-100-15	1	0	0
P-100-17	1	0	1
P-108-12	1	0	0
P-108-21	1	0	0
P-116-01	(12)	(1)	(1)
P-116-02	66	1	1
Q-101-04	1	0	0
Q-101-05	1	0	0
Q-106-22	1	0	0
Q-109-07	6	0	3
Q-114-10	1	0	0
Q-120-01	1	0	0
S-046-06	1	0	0
S-051-08	1	0	1
S-052-04	283	19	15
S-052-05	2	0	0
T-080-02	0	0	1
T-089-03	0	0	1
T-01	2	0	0
W-086-01	1	0	0
W-086-02	1	1	0
W-086-06	1	0	0

III. NEXT QUARTER GOALS

A. Priority Outfalls

1. 7th & Cheltenham Outfall (T-088-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

2. Monastery Ave. Outfall (W-060-01)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatuses.
- Continue sampling at the outfall with dry-weather flow.

3. Monoshone Creek Outfalls (W-060-04, W-060-08, W-060-09, W-060-10, W-060-11, W-068-04 and W-068-05)

Goals for the Quarter

- Continue sampling at outfall W-068-05 with dry-weather flow.

4. Manayunk Canal Outfalls (S-051-06, S-058-01, S-059-01 through S-059-11)

Goals for the Quarter

- Continue sampling at the outfalls with dry-weather flow.

B. Other Outfalls

1. Sandyford Run Outfall (P-090-02)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

2. Franklin and Hasbrook Outfall (T-089-04)

Goals for the Quarter

- Continue to monitor the operation of the diversion apparatus.

3. Continue to perform abatements of identified cross-connections within the following outfalls.

- P-100-11
- Q-109-07
- S-051-08
- S-052-04
- S-052-05
- T-088-01
- W-067-01
- W-077-02
- W-086-02

4. Continue to perform property testing within the following outfalls.

- P-091-06
- P-116-02
- Q-110-13
- S-052-04

Table 1
DLC Program Summary
April 1, 2018 to June 30, 2018

Complete Tests:

- 61,782 Complete tests have been performed under the DLC program
- **374 Complete tests were performed this past quarter**
- 1 Complete test was performed in outfall P-083-03
- 2 Complete tests were performed in outfall P-091-08
- 10 Complete tests were performed in outfall P-100-11
- 1 Complete test was performed in outfall P-100-15
- 1 Complete test was performed in outfall P-100-17
- 1 Complete test was performed in outfall P-108-12
- 1 Complete test was performed in outfall P-108-21
- (12) Complete tests were performed in outfall P-116-01
- 66 Complete tests were performed in outfall P-116-02
- 1 Complete test was performed in outfall Q-101-04
- 1 Complete test was performed in outfall Q-101-05
- 1 Complete test was performed in outfall Q-106-22
- 6 Complete tests were performed in outfall Q-109-07
- 1 Complete test was performed in outfall Q-114-10
- 1 Complete test was performed in outfall Q-120-01
- 1 Complete test was performed in outfall S-046-06
- 1 Complete test was performed in outfall S-051-08
- 283 Complete tests were performed in outfall S-052-04
- 2 Complete tests were performed in outfall S-052-05
- 2 Complete tests were performed in outfall T-01
- 1 Complete test was performed in outfall W-086-01
- 1 Complete test was performed in outfall W-086-02
- 1 Complete test was performed in outfall W-086-03

Cross-Connections Found:

- 1,576 Cross-connections have been identified under the DLC program
- **22 Cross-connections were identified this past quarter**
- 2 Cross-connections were identified in outfall P-100-11
- (1) Cross-connection was identified in outfall P-116-01
- 1 Cross-connection was identified in outfall P-116-02
- 19 Cross-connections were identified in outfall S-052-04
- 1 Cross-connection was identified in outfall W-086-02

Abatements:

- 1,479 Abatements have been performed under the DLC program
- **24 Abatements were performed this past quarter**
- 1 Abatement was performed in outfall P-100-11
- 1 Abatement was performed in outfall P-100-17
- (1) Abatement was performed in outfall P-116-01
- 1 Abatement was performed in outfall P-116-02
- 3 Abatements were performed in outfall Q-109-07
- 1 Abatement was performed in outfall S-051-08
- 15 Abatements were performed in outfall S-052-04
- 1 Abatement was performed in outfall T-080-02
- 1 Abatement was performed in outfall T-088-01
- 1 Abatement was performed in outfall T-089-03

Outfall/Manhole Screening and Sampling:

- 10 outfall inspections were made as part of the **Priority Outfall Inspection Program** this past quarter
- 9 outfall samples were taken due to observed dry-weather flow during the above inspections

- 27 outfall inspections were made as part of the **Permit Inspection Program** this past quarter
- 17 outfall samples were taken due to observed dry-weather flow during the above inspections

Table 2
Lab Analysis of Water at Outfalls and/or in the Storm Sewers
April 1, 2018 to June 30, 2018

Outfall	Date	Time	Location	Sewer Size (in)	Flow (gph)	Fluoride (mg/l)	Fecal Count (MPN per 100 ml)	Comments
A. Priority Outfalls								
T-088-01	5/2/2018	10:36	Outfall: 7th & Cheltenham	84	NR	0.13	97	
W-060-01	5/2/2018	11:13	Outfall: Monastery Lane	5'-0" x 4'-4"	3600	0.44	10	clear, no sheen, slight chlorine odor
W-068-05	5/1/2018	12:22	Outfall: Lincoln & Morris	90	NR	0.24	17329	slight solids
S-058-01	4/19/2018	10:50	Outfall: Domino Lane	54	NR	0.18	428	river influence
S-059-01	4/19/2018	11:06	Outfall: Parker	60	2100	0.22	155310	tan color
S-059-02	4/19/2018	11:15	Outfall: Fountain	42	NR	0.12	68670	
S-059-03	4/19/2018	11:25	Outfall: Wright	42	NR	0.12	1956	
S-059-04	4/19/2018	11:50	Outfall: Leverington	51	NR	0.19	>241960	river influence
S-059-05	4/19/2018	11:52	Outfall: Leverington (east)	4'-0" x 2'-8"	NR	0.14	9208	river influence
S-059-09	4/19/2018	11:40	Outfall: Green Lane	36	<1	NS	NS	flow too low to sample
B. Permit Inspection Program								
P-090-02	5/1/2018	11:35	Outfall: Brous & Lexington (Sandyford)	156	60	0.47	41	clear, sewage odor
T-089-04	5/2/2018	10:24	Outfall: W of Franklin Ave & County Line	3'-0" x 5'-6"	NF	NS	NS	no flow from city side
S-051-08	6/8/2018	10:25	Manhole: Main & Shurs	9'-0" x 7'-0"	NR	0.14	61310	manhole S-051-08-0010, moderate suspended solids
S-052-05	6/8/2018	10:50	Manhole: Sumac & Rochelle	42	NR	0.27	100	manhole S-052-05-0015, clear
P-090-01	5/1/2018	11:43	Outfall: Brous & Lexington	21	<60	<0.10	20	
P-100-13	4/23/2018	10:45	Outfall: Holme & Longford	18	NR	NS	NS	
P-100-14	4/23/2018	10:40	Outfall: Holme & Longford	42	NR	0.48	24196	
P-100-15	4/23/2018	11:20	Outfall: Cloverly & Arlan	30	NF	NS	NS	
P-100-16	4/23/2018	11:20	Outfall: Maxwell & Tremont	54	720	0.15	6488	
P-100-17	4/23/2018	11:50	Outfall: Willits & Cloverly	27	1800	0.53	473	mild sweet odor
P-100-18	4/23/2018	12:20	Outfall: Willits & Cloverly	15	60	0.35	1050	
P-100-19	4/23/2018	11:55	Outfall: Willits & Cloverly	24	NF	NS	NS	
P-100-20	4/23/2018	12:20	Outfall: Ryerson Rd. & Ryerson Pl.	30	NF	NS	NS	
P-100-21	4/23/2018	12:25	Outfall: Woodenbridge & Cloverly	27	NF	NS	NS	
P-100-22	4/23/2018	12:20	Outfall: Angus Rd. & Angus Pl.	18	NF	NS	NS	
P-100-23	4/24/2018	10:24	Outfall: Angus & Woodenbridge	36	60	0.34	26130	
P-100-24	4/23/2018	12:35	Outfall: Angus & Woodenbridge	27	60	0.33	86640	
P-100-25	4/23/2018	12:45	Outfall: Annapolis & Cloverly	21	NF	NS	NS	
P-105-06	5/3/2018	11:20	Outfall: Gregg & Old Bustleton	6'0" x 9'0"	4500	NS	NS	clear
P-106-01	6/26/2018	10:30	Outfall: Ashton & Grant	60	30	0.10	<1	
P-106-02	6/26/2018	10:50	Outfall: Ashton & Saxton	36	NR	<0.10	860	creek influence
S-051-03	6/8/2018	11:45	Outfall: Main & Cotton	48	NR	0.10	292	river influence
S-051-05	6/8/2018	12:15	Outfall: Main & Gay	48	NR	0.12	3076	river influence
S-051-06	6/8/2018	11:20	Outfall: Main & Rector	10	<60	0.10	1210	moderate sewage odor
T-056-03	6/14/2018	13:00	Outfall: E of Aramingo & Ashton	5'0" X 4'0"	NR	0.87	4611	creek influence
T-056-03	6/15/2018	11:00	Outfall: E of Aramingo & Ashton	5'0" X 4'0"	30	0.98	627	
T-056-04	6/15/2018	10:55	Outfall: NW of Aramingo & Ashton	5'0" X 4'0"	NF	NS	NS	

PHILADELPHIA WATER DEPARTMENT

Table 3
Residential Cross Connections Not Abated Within 120 Days

A. Properties Abated & Confirmed Prior to Reporting:

Address			Outfall Code	Complete Date	Admin. Action	Abatement Confirmation Date	Comments
02757	Willits	Rd	P-100-17	08-12-2017		04-11-2018	
02751	Willits	Rd	P-100-17	09-02-2017		02-27-2018	
02741	Willits	Rd	P-100-17	09-20-2017		03-09-2018	
00105	Seville	St	S-051-08	09-25-2017		04-09-2018	
00466	Green	La	S-059-04	10-07-2017		02-22-2018	
02732	Mower	St	P-100-11	10-19-2017		04-18-2018	
01016	Gorman	St	P-113-03	10-28-2017		03-15-2018	
01856	Greymont	St	Q-109-07	10-28-2017		04-23-2018	
06925	Shelbourne	St	T-089-03	10-28-2017		05-03-2018	
01845	Sanford	St	Q-109-07	10-31-2017		03-29-2018	
03347	Ainslie	St	S-052-04	11-14-2017		06-07-2018	
03302	Ainslie	St	S-052-04	11-14-2017		05-29-2018	
03405 W	Coulter	St	S-052-04	11-15-2017		04-19-2018	
07030 N	Broad	St	T-088-01	11-22-2017		04-02-2018	
03320	Ainslie	St	S-052-04	11-25-2017		03-27-2018	
03426 W	Coulter	St	S-052-04	11-29-2017		04-24-2018	
10122	Clark	St	Q-109-07	11-30-2017		05-11-2018	
03314	Ainslie	St	S-052-04	11-30-2017		05-29-2018	
03308	Ainslie	St	S-052-04	12-04-2017		04-23-2018	
03329	Ainslie	St	S-052-04	12-05-2017		04-12-2018	
06018	Newtown	Ave	T-080-02	12-20-2017		05-25-2018	
03531	Vaux	St	S-052-04	01-24-2018		06-13-2018	
02017	Foster	St	Q-109-07	01-29-2018		06-12-2018	

B. Properties Active As Of Reporting:

Address	Outfall Code	Complete Date	Admin. Action	Comments

PHILADELPHIA WATER DEPARTMENT

Table 3
Residential Cross Connections Not Abated Within 120 Days

Address				Outfall Code	Complete Date	Admin. Action	Comments
03438	W	Coulter	St	S-052-04	11-15-2017		
03344		Ainslie	St	S-052-04	11-17-2017		
03425	W	Coulter	St	S-052-04	11-18-2017		
07028	N	Broad	St	T-088-01	11-22-2017		
03415	W	Coulter	St	S-052-04	11-28-2017		
03340		Ainslie	St	S-052-04	12-01-2017		
03357		Ainslie	St	S-052-04	12-02-2017		
00116	W	Mermaid	La	W-077-02	12-06-2017		
02860		Welsh	Rd	P-100-11	12-22-2017		
03310		Ainslie	St	S-052-04	12-27-2017		
00015		Osborn	St	S-052-05	01-17-2018		
01942		King Arthur	Rd	Q-109-07	01-19-2018		
01941		Kentwood	St	Q-109-07	01-19-2018		
03525		Vaux	St	S-052-04	01-24-2018		
03434		Osmond	St	S-052-04	01-29-2018		
03453	W	Penn	St	S-052-04	02-05-2018		
03411	W	Penn	St	S-052-04	02-13-2018		
03344	W	Penn	St	S-052-04	02-14-2018		
03400	W	Penn	St	S-052-04	02-16-2018		
03313	W	Penn	St	S-052-04	02-16-2018		
03423	W	Penn	St	S-052-04	02-17-2018		
00116		Roumfort	Rd	W-086-02	02-17-2018		
03404	W	Penn	St	S-052-04	02-17-2018		
03424	W	Penn	St	S-052-04	02-17-2018		
03433	W	Penn	St	S-052-04	02-21-2018		
03436	W	Penn	St	S-052-04	02-21-2018		

Table 3
Residential Cross Connections Not Abated Within 120 Days

Address				Outfall Code	Complete Date	Admin. Action	Comments
03334	W	Penn	St	S-052-04	02-21-2018		
03426	W	Penn	St	S-052-04	02-21-2018		
03465	W	Penn	St	S-052-04	02-23-2018		
03338	W	Penn	St	S-052-04	02-24-2018		
03431	W	Penn	St	S-052-04	02-24-2018		
03336	W	Penn	St	S-052-04	02-24-2018		
03324	W	Penn	St	S-052-04	02-24-2018		
03331	W	Penn	St	S-052-04	02-24-2018		
03432	W	Penn	St	S-052-04	02-26-2018		
03333	W	Penn	St	S-052-04	02-26-2018		
03332	W	Penn	St	S-052-04	02-26-2018		
03300	W	Penn	St	S-052-04	02-26-2018		
03337	W	Penn	St	S-052-04	02-28-2018		
03363		Tilden	St	S-052-04	03-01-2018		
04026		Dexter	St	S-051-08	03-01-2018		
03425		Conrad	St	S-052-04	03-01-2018		

Table 4

Spills to Storm Sewers and/or Receiving Waters

April 1, 2018 to June 30, 2018

Date	Outfall	Address	Source Code	Material Involved	Completion Date	Remarks
05/02/18	S-01	W. Thompson and N. 42nd Streets Schuylkill River	3008	Sewage	05/02/18	Sewer Maintenance unit flushed 2'3" x 1'6" egg shaped combined sewer causing W/C due to approximate <1 gpm discharge.
05/02/18	S-059-04	Leverington Avenue and Fleming Street Manayunk Canal	3009	Sewage	05/02/18	Sewer Maintenance unit flushed 8" diameter sanitary sewer causing approximate <1 gpm discharge.
05/14/18	Q-117-05	1140 Byberry Road Byberry Creek	3008 3009	Sewage	05/14/18	Sewer Maintenance unit flushed 10" diameter sanitary sewer causing approximate 1 gpm discharge through FAI to street gutter. Street flushed with dechlorinated water.
06/05/18	S-052-05	15 to 29 Osborn Street Schuylkill River	3008 3009	Gray water	06/05/18	Industrial Waste unit investigated a gray water discharge to street gutter from multiple properties due to septic system problems. Health Department aware of this on-going issue.
06/07/18	S-051-08	Ridge Avenue and Gerhard Street Schuylkill River	3008 3009	Sewage	06/07/18	Sewer Maintenance unit flushed 8" diameter sanitary sewer causing W/C and approximate 2 gpm discharge.

Source Codes:

3008 - Spill to Ground Only

3009 - Spill to Storm Sewer

3010 - Spill to Sanitary Sewer

3011 - Spill to Receiving Stream