The Philadelphia Water Department (PWD) Stormwater Management Guidance Manual (Manual) is a comprehensive resource for the development community in complying with PWD Stormwater Regulations (Stormwater Regulations). The Stormwater Regulations require on-site stormwater management for development projects above a certain size, helping to improve the health and vitality of Philadelphia’s waterways along with the City’s own sizable clean water investments. Other types of construction activities may also trigger portions of the Stormwater Regulations, including demolition and voluntary stormwater retrofit projects.

At its core, the Manual provides detailed guidance for the applicant on how to most quickly and efficiently comply with the Stormwater Regulations for development and other construction projects. Using this Manual, the applicant will be able to do the following:

- Determine if a project is regulated under the Stormwater Regulations and, if so, what specific requirements need to be met;
- Learn about new ways to incorporate green approaches to stormwater management that provide benefits for development projects and expedite the stormwater approval process;
- Design specific stormwater management practices (SMPs) to meet PWD’s standards;
- Prepare and submit application materials;
- Learn how to ensure proper installation and protection of SMPs during construction activity; and
- Obtain information on post-construction and operations and maintenance (O&M) requirements.
**Manual Organization and Purpose**

The Manual provides the development community with detailed guidance on designing stormwater management systems to meet the Stormwater Regulations, understanding PWD's stormwater-related requirements and approval processes, and preparing submissions to the PWD Stormwater Plan Review unit. The Manual also provides guidance on topics relating to the proper construction and maintenance of SMPs.

The Manual has six Chapters and a series of Appendices. Chapters 1 through 4 focus on the stormwater design, submittal, and approval process, while Chapters 5 and 6 discuss construction and post-construction topics. As design, submittal, and review processes are closely related, the applicant will find cross-referencing throughout the Manual, particularly between Chapters 2 and 3. The applicant should use each Chapter as follows:
### Table 1: How to Use the Chapters in this Manual

<table>
<thead>
<tr>
<th>Chapter</th>
<th>How to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1 – Regulatory Requirements</td>
<td>Learn about the Stormwater Regulations, determine if a project is subject to the Stormwater Regulations, and find out which requirements need to be met.</td>
</tr>
<tr>
<td>Chapter 2 – Submission, Review, and Approval Procedures</td>
<td>Understand the submission and review process for a project and get detailed guidance in preparing submissions to PWD.</td>
</tr>
<tr>
<td>Chapter 3 – Site Design and Stormwater Management Integration</td>
<td>Learn how to perform site assessments, including infiltration testing, and design stormwater management controls, including disconnected impervious cover and SMPs, to comply with the Stormwater Regulations.</td>
</tr>
<tr>
<td>Chapter 4 – Stormwater Management Practice Guidance</td>
<td>Obtain SMP-specific guidance on use, applicability, components, design requirements, materials specifications, construction sequencing, and O&amp;M.</td>
</tr>
<tr>
<td>Chapter 5 – Construction Guidance</td>
<td>Understand PWD’s construction inspection process, identify common problems with SMP and Erosion and Sediment Control (E&amp;S) construction, and prepare a Construction Certification Package and Record Drawings.</td>
</tr>
<tr>
<td>Chapter 6 – Post-Construction and Operations &amp; Maintenance Guidance</td>
<td>Understand PWD’s SMP maintenance requirements, learn how to inspect, operate, and maintain SMPs and other stormwater controls, get detailed guidance on O&amp;M Agreements, and apply for stormwater billing credits.</td>
</tr>
</tbody>
</table>

The Appendices contain additional resources, including watershed and Flood Management District mapping, submission checklists, worksheets, a sample Record Drawing, and landscape guidance. A list of Appendices is provided in the Manual table of contents.
**Stormwater Regulations**

PWD requires that many development sites in the City implement stormwater management controls. The Stormwater Regulations define the specific requirements that need to be met for various types of development in the City. PWD’s Stormwater Regulations fall into two categories, Post-Construction Stormwater Management (PCSM) Requirements and an Erosion and Sediment Control (E&S) Requirement.

PCSM Requirements regulate how stormwater runoff leaves a project site in the built, or post-development, condition.

There are four components of PWD’s PSCM Requirements:

- **Water Quality**, to recharge the groundwater table and reduce pollution in stormwater runoff;
- **Channel Protection**, to minimize channel erosion resulting from stormwater runoff by controlling the peak flow rates for medium-sized storms;
- **Flood Control**, to prevent, through peak flow rate control, flooding caused by large storm events that could cause damage to life or property; and
- **Public Health and Safety Release Rate**, to minimize the impact of flooding in areas of the City with infrastructure capacity restrictions through peak flow rate control.

The E&S Requirement stipulates that practices be employed during construction to reduce any erosion and sedimentation that occur as a result of development activities.
PWD Stormwater Plan Review

PWD Stormwater Plan Review is responsible for administering the Stormwater Regulations. PWD Stormwater Plan Review provides a range of services relating to the enforcement and implementation of the Stormwater Regulations, including the following:

- Reviewing development plans for compliance.
- Ensuring that SMPs are correctly designed, installed, and maintained in accordance with the Stormwater Regulations.
- Acting as PWD’s link to the larger development process in the City, most critically the Zoning and Building Permit process administered by the City of Philadelphia Department of Licenses and Inspections (L&I). The applicant must receive approvals from PWD before a Zoning or Building Permit may be issued.
- Coordinating with other reviewing entities such as the Philadelphia City Planning Commission (PCPC), Philadelphia Streets Department (Streets Department), and the Pennsylvania Department of Environmental Protection (PA DEP), to ensure that consistent information is provided by the applicant to all agencies.
- Administering inspection activities to ensure that SMPs are installed according to the approved plans.
- Conducting post-construction meetings to walk the site and record information about the project’s as-built conditions, which the applicant must incorporate into a Record Drawing.

Contacting PWD Stormwater Plan Review

PWD Stormwater Plan Review encourages the applicant to contact staff throughout the project lifecycle, from preliminary planning through O&M. If additional clarity or discussion is required, the applicant is encouraged to request in-person meetings. Staff can be reached during normal business hours (8 am to 5 pm) at (215) 685-6387 or pwd.planreview@phila.gov. The general phone line and email account are both monitored regularly by PWD Stormwater Plan Review staff. Before a reviewer has been assigned to the project, the applicant should use the general email account for all inquiries to ensure an efficient response time.

Website

The PWD Stormwater Plan Review website (www.pwdplanreview.org) is geared toward the applicant and the development community at large and is the best place to find all applicant resources. Using the website, the applicant can access technical resources, such as process flow charts, Standard Details, design worksheets, and informational fact sheets. Copies of the Manual can be downloaded from the website. The applicant may
use the website to submit their application for review and monitor the review status.
Stormwater Management in Philadelphia

Unmanaged stormwater runoff—rainfall in developed areas that quickly “runs off” of impervious surfaces rather than soaking into the ground—negatively affects the aquatic and streamside habitats of streams and rivers in Philadelphia. These water bodies suffer from a variety of problems and as a result, many of Philadelphia’s streams do not support healthy aquatic communities. Similarly, pollution from unmanaged stormwater that reaches the drinking water intakes on the Schuylkill and Delaware Rivers threatens the City's potable water supply.

In contrast, healthy streams and rivers have lower rates of erosion, plenty of flow during dry periods for fish and aquatic life, high water quality that supports both recreational uses such as swimming and fishing and potable water use, and flood less frequently and less severely. Clean, healthy rivers are a valuable community amenity that attracts residents and enhances the overall quality of life for residents. The goal of healthy, clean rivers in Philadelphia is an ambitious one, but one that PWD and its partners are aggressively working toward.

Stormwater and Land Development

Land development activities, such as the construction of new buildings, roads, driveways, and parking lots, can lead to increased stormwater runoff and pollution. As land is developed, increases in impervious areas (hard surfaces like rooftops, roads, and parking lots) limit the amount of rainfall infiltrating into the ground. Rates of evaporation are also reduced due to a lack of vegetation. Conversely, in “natural,” undeveloped conditions, the vast majority of rainfall either infiltrates or evaporates back into the air. As rainfall flows across the developed land surfaces, it picks up pollutants, such as sediment, fertilizers, pesticides, bacteria, metals, and oils, and flows directly into streams, rivers, or other bodies of water. Every acre of impervious cover in Philadelphia produces about 1 million gallons of polluted runoff per year, causing sewer overflows, degraded stream habitat, and water quality problems.
These problems are not unique to Philadelphia. Stormwater regulations are changing around the country to address these and similar problems. These changing regulations include new approaches to stormwater management, which often require improvements in stormwater quality prior to discharge, reductions in the volume and rate of runoff, and reductions in stormwater-related erosion and sedimentation. Through these regulations, cities and developers are working together to prevent additional pollution and damage to waterways by controlling stormwater. The updated Stormwater Regulations in Philadelphia ensure that the City has an effective, comprehensive stormwater program that meets State and Federal requirements and is adaptable to a changing regulatory context.

**PWD’s Regulatory Context**

The City of Philadelphia is required, by a series of State and Federal regulations and mandates, to clean up its waterways. While PWD is investing billions of dollars to implement the bulk of the required upgrades, PWD, through the Stormwater Regulations, also requires the development community to do its part to help manage stormwater. The following Table 2 provides an overview of the many State and Federal laws that require PWD to work toward cleaning up Philadelphia’s waterways.
The Clean Water Act (CWA) of 1972 aims to restore and maintain the chemical, physical, and biological integrity of the nation’s waterways. PWD is primarily charged with ensuring CWA compliance in Philadelphia and does so through a variety of activities, such as building and maintaining public stormwater infrastructure, regulating development, implementing municipal pollution prevention best practices, meeting pollutant discharge standards at sewage treatment plants, and monitoring industrial and commercial dischargers.

Combined Sewer Overflow (CSO) Control Policy:
Published by the Environmental Protection Agency (EPA) in 1994, this policy established a national approach for controlling CSOs through the National Pollutant Discharge Elimination System (NPDES) Permit program. CSOs occur when combined sewers (sewers that convey both stormwater and sewage in the same pipe) reach capacity as a result of stormwater runoff entering the pipe network during rain and snowmelt events. When this happens, the PA DEP permits Philadelphia, as is common with other cities containing combined sewer systems, to discharge excess untreated wastewater into nearby waterbodies. Communities with combined sewer systems are required to develop a Long Term Control Plan to outline steps toward full compliance with the CWA. PWD submitted its original Long Term Control Plan in 1997. In 2006, PWD enacted Stormwater Regulations that included requirements to assist the City in addressing CSOs. Then, in June 2011, PWD and PA DEP entered into a Consent Order and Agreement (CO&A), a binding legal agreement that outlines the water quality targets the City needs to meet to reduce CSOs.

PWD prepared and submitted to PA DEP a Long Term Control Plan Update (LTCPU) known as Green City, Clean Waters (GCCW), to outline specific steps needed to implement the provisions of the CO&A. GCCW outlines a 25-year, $2.4 billion plan to protect and enhance Philadelphia’s combined sewer watersheds by managing stormwater with innovative green stormwater infrastructure. PWD’s approach is different from that which many other cities are using to address CSOs, which, typically, is building large underground tunnels and storage tanks to temporarily hold combined sewer water so that it can eventually be treated by wastewater plants. This approach was found to be cost prohibitive for Philadelphia residents and did not meet restoration goals for the City’s waterways.

Quick Tip
To determine if a project lies within a CSO area of the City, visit PhillyWatersheds.org.
<table>
<thead>
<tr>
<th>Regulation</th>
<th>Objectives</th>
<th>How PWD Meets These Objectives</th>
</tr>
</thead>
</table>
| Clean Water Act of 1972 | Restore and maintain the chemical, physical, and biological integrity of the nation’s waterways | • Implementing CSO control and MS4 permit programs (see descriptions below)  
• Reducing the quantity of sediment to Wissahickon Creek under siltation Total Maximum Daily Load |
| The Safe Drinking Water Act of 1974 | To ensure safe drinking water for the public by establishing standards for water quality | • Investing in identifying and reducing major potential sources of contamination, including stormwater runoff, which could affect the drinking water supply.  
• Reducing the amount of pollutants entering Philadelphia’s source waters and treatment facilities through implementation of the Stormwater Regulations |
| The Pennsylvania Stormwater Management Act of 1978 | Develop county-based stormwater management plans to ensure that stormwater is managed properly, particularly with regards to flooding | • Requires that development activities comply with the Stormwater Regulations and other measurable benchmarks  
• Aligning Stormwater Regulations with Act 167 Plan requirements for local waterways |
| National Pollutant Discharge Elimination System (NPDES) Municipal Separate Stormwater Sewer Systems (MS4) Stormwater Regulations | Reduce and eliminate sources of pollution coming from municipally-owned separate sewer systems into the Nation’s water bodies | • Implementing public water quality improvement projects such as SMPs and stream restoration projects  
• Implementing illicit discharge elimination programs  
• Implementing public outreach and education programs  
• Regulating development and Industrial dischargers  
• Monitoring industrial and commercial dischargers |
| Combined Sewer Overflow (CSO) Control Policy | Eliminate discharges of untreated wastewater through combined sewer overflows into the nation’s waterbodies | • Implementing green stormwater practices, wastewater upgrades, and other improvements through Green City, Clean Waters, PWD’s Long Term Control Plan Update  
• Regulating development |
Applicability and Submission Process

PWD’s Stormwater Regulations cover a wide spectrum of development and construction projects. Under the Stormwater Regulations, not all projects are subject to the same requirements. Some projects may need to meet multiple requirements, while others may be subject to only certain portions of the Stormwater Regulations (Figure 2). The application and review process are different for different types of projects, as described below.

Figure 2: Where to Find Further Information on Applications and the Review Process

Understanding Applicability

Stormwater Regulation applicability refers to which projects are subject to the Stormwater Regulations, which may not necessarily require on-site stormwater management. The Regulatory applicability factors include the amount of earth disturbance associated with a project, its development type, and its watershed. Understanding the Stormwater Regulations’ applicability to a project directly impacts the type of review PWD conducts and subsequent submission requirements. The applicant should thoroughly review Chapter 1 to understand PWD’s definitions of these factors, to determine if the Stormwater Regulations are applicable to a project, and to obtain guidance on how the Stormwater Regulations may be applicable (i.e., the requirements of the Stormwater Regulations to which a project would be subject).

Understanding the Submission and Review Process

The final piece of understanding the Stormwater Regulations focuses on preparing submissions and navigating the review process. PWD organizes the different submission procedures and review processes into four Review Paths. Review Paths are a linear series of submission and review steps (Review Phases) taken to obtain stormwater management approval or exemption. There are four Review Paths, which are discussed in...
greater detail in Section 2.2. Figure 3 provides additional detail on the steps in PWD’s stormwater review and approval process that occur during the design process. These steps are discussed in more detail within Section 2.3.

**Figure 3**: Stormwater Approval Process for Projects on the Development Compliance Review Path Showing Relationship to Major City Approvals

Review Process Timelines and Milestones

It is understandable that the applicant would be interested in how long the review process will take. As with many other aspects of PWD’s program, it depends strongly on the type of project and the associated stormwater management requirements, submissions, and reviews. Depending on the project’s Review Path, there will be different Review Phases. For the Conceptual Review Phase, PWD strives to review all complete Conceptual Review Phase Submission Packages within five calendar days. For projects undergoing a Post-Construction Stormwater Management Plan (PCSMP), E&S, PCSMP field change, or Record Drawing review, a review of complete Submission Packages within 15 calendar days is targeted. The fastest way to get a project through the review process is to provide PWD with a high quality submission that meets all of the submission requirements. Other strategies to streamline the process are to meet with PWD prior to submissions of larger and complicated projects and to provide as much detail about the project as possible early in the review process.
Preferred Design Approach

Chapter 3 and Chapter 4 provide detailed guidance to the applicant in designing stormwater management systems that comply with the Stormwater Regulations. PWD offers the designer a standardized and systematic design process that is consistent for every project. This Section provides a first look at PWD’s preferred approach to stormwater management design.

Stormwater Management Practice Design Approach

The stormwater management practices (SMPs) discussed in this Manual incorporate a variety of technologies designed to manage stormwater. While non-structural options, such as reducing the amount of impervious cover and designing for disconnected impervious cover (DIC), are preferred strategies that the designer should consider before proposing SMPs, PWD recognizes that many development projects will need to use SMPs to comply with the Stormwater Regulations. In Chapter 3 and Chapter 4 of the Manual, PWD provides guidance for an array of SMPs that offer design solutions for many different types of sites.

Chapter 4 details nine SMPs, along with pretreatment, inlet control, and outlet control components. It provides SMP-specific information on applicability and uses, components, design requirements, material specifications, and construction and maintenance guidance.

Infiltration First

When using SMPs to meet PWD’s Water Quality requirement, the applicant must use infiltrating SMPs, which allow water to soak into the ground rather than holding and releasing it. Infiltration is the main focus of the Stormwater Regulations, as these SMPs also filter out pollutants and thus are the most beneficial for improving water quality. Infiltration SMPs must be utilized unless it is demonstrated that they are not feasible due to poor soils, bedrock, soil contamination or other site constraints. PWD requires that the applicant provides documentation of these conditions and submit an infiltration waiver for review. Specific requirements for soil and infiltration testing, a waiver request form, and other related issued are discussed in Section 3.3.

Not All SMPs are Created Equal

To help developers select SMPs, PWD developed a hierarchy that uses ranking factors to prioritize acceptable SMPs. The SMP Hierarchy uses factors important to PWD’s efforts to clean up Philadelphia’s waterways as well as those of primary concern to developers like ease of maintenance, cost, and impact on buildable area. A full discussion of the SMP Hierarchy is found in Section 3.2.4, but a brief discussion of high, medium, and low-preference SMPs is provided below.
- **Highest-preference SMPs** are bioinfiltration and bioretention basins, porous pavement, and green roofs. Projects using only highest-preference SMPs are eligible for an Expedited PCSMP Review (Section 2.4) and may elect to postpone infiltration testing until construction or be exempt from testing.

  A bioinfiltration basin represents Philadelphia Water's most preferred SMP.

- **Medium-preference SMPs** (subsurface infiltration, cisterns, blue roofs, and ponds and wet basins) often provide fewer triple bottom line benefits and may not last as long as more highly-preferred SMPs.

- **Lowest-preference SMPs** include various types of subsurface detention and media filter systems that are non-infiltrating and provide little-to-no triple bottom line benefits. Lowest-preference SMPs also tend to have relatively high O&M costs and may malfunction more frequently than other SMPs.
A subsurface detention basin represents one of Philadelphia Water's least preferred SMPs.