West Chester Borough Stream Protection Fee Program Residential Credit and Rebate Policies and Procedures Manual

NOVEMBER 2017

Table of Contents

Introduction

In 2016, the Borough enacted Ordinance No. 10-2016, titled the "Stream Protection Fee Ordinance" which establishes a Stream Protection Fee (SPF) to provide a dedicated funding source for ongoing expenses associated with the Borough's stormwater management system and compliance with its regulatory permit requirements. All developed parcels (properties), including both residential and non-residential properties, in the Borough are required to pay the stream protection fee, with the fee amount directly proportional to the total impervious surface area of the parcel.

Overview

The Borough has developed an incentive program ("credit program") for property owners who undertake specific stormwater management activities. The credit program has been developed per Section 10 – "Stormwater Credits" of Ordinance No. 10-2016 to allow owners to apply for credits and/or rebates for implementing and maintaining eligible stormwater management practices (SMPs) on their parcel(s) that mitigate the volume, peak discharge rate or runoff pollution that leaves their parcel. By implementing such measures, property owners are helping to reduce the demand on the existing stormwater management system and related Borough services, and helping to achieve permit compliance. This manual, called the "Stream Protection Fee Program Non-Residential Credit Policies and Procedures Manual ("Credit Manual"), is called for in Section 10 of the SPF Ordinance along with its residential companion, "Residential Credit and Rebate Policies and Procedures Manual."

The primary goals of the Borough's credit program are to:

- Encourage private investment in installing and maintaining private SMPs.
- Ensure the SPF is equitable and fair by recognizing that stormwater management activities on private property can result in cost savings for the Borough which should translate into a reduced fee for the property owner.

Applicability

The Credit program has two components, a Residential Rebate and Credit Program, and a Non-Residential Credit Program. **This document provides detail on the policy and procedures for the Residential Program.** Property owners of Residential Properties are permitted to apply for a rebate and/or credit listed under the Residential Rebate/Credit Program or the Non-Residential Credit Program. Property owners of Non-Residential and Multi-Family Residential Properties are permitted to apply for a credit listed under the Non-Residential Credit Program only. For more information about the Residential Credit Program, property owners should view the Stream Protection Fee Page of the West Chester Borough website.

Definitions

Words used herein shall be defined in accordance with their definition in the SPF Ordinance. If a word used in this manual is not defined in the SPF Ordinance, it shall be defined as follows:

Apartment - a building on a separate lot containing three or more dwelling units.

Credit - a recurring discount on the SPF which is applied to the property owner's bill to reduce the SPF on a recurring basis. The credit is valid for a set period of time (currently three years), after which time the property owner must reapply.

Dwelling Unit - One or more rooms in a building, designed for occupancy by one family for living purposes and having its own permanently installed cooking and sanitary facilities, with no enclosed space (other than vestibules. entrances or other hallways or porches) in common with any other dwelling unit. No dwelling unit shall have more than 50% of its exterior below the level of the exterior grade. A dwelling unit may be contained in any of the following structures:

A. SINGLE-FAMILY DETACHED - A building designed for and occupied exclusively as a residence for only one family and having no party wall in common with an adjacent building.

B. SINGLE-FAMILY DETACHED, MOBILE HOME - A transportable single-family detached dwelling unit intended for permanent occupancy, contained in one unit or in two units designed to be joined into one integral unit capable of again being separated for repeated towing, which arrives at a site complete and ready for occupancy except for minor and incidental unpacking and assembly operations and is constructed as permitted in Article VI, with the same, or equivalent, electrical, plumbing and sanitary facilities as for a conventional single-family detached dwelling. A mobile home shall include any addition or accessory structure, such as porches, sheds, decks or additional rooms, which is attached to it. A mobile home does not include recreational vehicles or travel trailers.

C. SINGLE-FAMILY SEMIDETACHED - A building designed for and occupied exclusively as a residence for only one family and having one party wall in common with an adjacent building.

D. SINGLE-FAMILY ATTACHED - A building designed for and occupied exclusively as a residence for only one family and having two party walls in common with an adjacent building, except for end units.

E. TWO-FAMILY DETACHED - A building designed for and occupied exclusively as a residence for two families, with one family living wholly or partly over the other, and having no party wall in common with an adjacent building.

F. TWO-FAMILY SEMIDETACHED - A building designed for and occupied exclusively as a residence for two families, with one family living wholly or partly over the other, and having one party wall in common with an adjacent building.

G. TWO-FAMILY ATTACHED - A building designed for and occupied exclusively as a residence for two families, with one family living wholly or partly over the other, and having two party walls in common with adjacent buildings.

H. MULTIFAMILY - See "apartment."

Impervious Drainage Area (IA) – the impervious surfaces within the land contributing runoff to a single point (including but not limited to the point/line of interest used for hydrologic and hydraulic calculations) and that is enclosed by a natural or man-made ridge line.

Multi-Family Residential Property- a property which is improved with a building that is used as an apartment of multi family dwelling. Multi-Family Residential Properties are only eligible to apply for a credit under the Non-Residential Credit Program. Apartment units are considered Multi-Family Residential under the SPF Credit Program.

Non-Residential Property - a property which is improved with a building that is used in any manner other than as a Residential Property or a Multi-Family Residential Property as defined herein. This term shall include but not be limited to buildings used for commercial, industrial and institutional uses.

Non-Structural Stormwater Management Practices or measures – operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural SMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff.

Rebate - a one-time refund per Residential Property that is issued for installing a stormwater practice. The amount of the refund is based on the drainage area managed and the constructed stormwater management practice. One Residential Property can have multiple rebates.

Residential Property - a property which is improved with a building that is used as any form of Dwelling other than a Multi-Family Dwelling or Apartment.

Stormwater Management Practice (SMP) – Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to provide water quality treatment, infiltration, volume reduction, and/or peak rate control, to promote groundwater recharge, and to otherwise meet the purposes of the Stream Protection Fee Program and associated ordinance. SMPs are commonly grouped into one (1) of two (2) broad categories or measures: “structural” or “non-structural.”

Structural Stormwater Management Practices or measures - include, but are not limited to, a wide variety of practices and devices from large-scale retention ponds and constructed wetlands to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural SMPs are permanent appurtenances to the Site.

Objectives

The objective of the credit program is to provide a way for property owners who install qualifying stormwater management practices (SMPs) on their property to reduce their SPF payment amount. SMPs are measures or facilities that prevent or reduce the transport of pollutants and/or control stormwater runoff volume or rate. Implementing such measures reduces the impact a developed property has on the downstream storm drainage system, which includes both natural features such as streams and man-made features such as pipes.

Additional Resources

Property owners are encouraged to research and utilize the following free resources found online:

- Homeowner’s Guide to Stormwater Management prepared by the Philadelphia Water Department in 2006

- Homeowner's Guide to Stormwater produced by the Lancaster County Conservation District in 2013
- The Alliance for the Chesapeake Bay has developed a website, Reduce Your Stormwater, which provides do-it-yourself guidance for SMPs.
- The Chesapeake Stormwater Network has developed a Homeowner Guide that provides excellent step-by-step guidance on designing, constructing and maintaining rain gardens, rain barrels, pervious pavers, and planting trees.

General Credit Program Policies

The property owner must own and maintain a qualifying stormwater facility or approved non-structural control. Property owners are required to submit an application and documentation of construction or installation, as well as documentation regarding operation and maintenance (O & M) of the stormwater management facility. The property owner must pay their fee in full, and not be past due on their SPF payments. General policies for the Residential credit and rebate program are provided below.

Types of Projects Eligible for Credit/Rebate

To be eligible for a SPF credit or rebate, a property owner must treat impervious area (IA) with a qualifying stormwater management practice (SMP) that is owned and maintained by the property owner. The property owner must have an approved eligible stormwater management feature, as listed in Table 1. Residential property owners are more likely to have installed one or more of the six SMPs listed in Table 1 due to cost and ease of installation and maintenance, therefore, only those SMPs are described in detail in this Manual. Residential property owners who have or plan to invest in more extensive SMPs, such as those noted for non-residential/multi-family in Table 1, are not excluded from obtaining that credit however, may have to demonstrate a higher degree of engineering feasibility. In the event that residential property owners are interested in obtaining credit under the Non-Residential Program, they should reach out to the Public Works Department to discuss their application with staff early in the process.

Table 1: Eligible types of SMPs for the Residential and Non-Residential Credit Programs

Credit Category	Stormwater Management Practice (SMP)	Residential *	Non-Residential and Multi-Family Residential **
Green Infrastructure / Runoff Volume Controls	Pervious pavement with infiltration bed	X	X
	Infiltration basin		X
	Rain garden/bioretention	X	X
	Subsurface infiltration bed		X
	Green Roof		X
	Infiltration trench/ Tree Infiltration Trench		X
	Runoff Capture & Reuse – Cistern or Rain Barrel	X	X
	Dry Well/ Seepage Pit	X	X
Peak Runoff Rate (Flood) Controls	Constructed wetland		X
	Wet pond/ retention basin		X
	Dry extended detention basin		X
	Special Detention areas (parking lots/roof)		X
Water Quality Treatment	Constructed wetland		X
	Constructed Filter		X
	Proprietary Water Quality Filters & Hydrodynamic Devices		X
	Vegetated Swale		X
	Vegetated Filter Strip		X
Non-Structural Controls	Tree Canopy Cover	X	X
	Downspout Disconnection	X	X
	Approved Adopt-a-Stream volunteer program		X
	Approved environmental education/outreach program		X
National Pollutant Discharge Elimination System (NPDES) Stormwater Permit	Facilities with an active, fully-compliant NPDES Permit from PADEP (this is not the same as a NPDES Construction Permit)		X

Notes:

** Single family residential property owners are eligible for SMPs listed in the non-residential categories.*

*** Non-residential and multi-family residential are excluded from obtaining the Rain Barrel rebate, but can obtain a cistern credit*

Maximum Credit Amount

The maximum credit that any one property can receive is 60% percent of their fee. No property will receive 100% credit or reduction of the fee, and the maximum is set at 60% because the Borough needs to fund programmatic elements, public stormwater facilities, and perform standard maintenance, repair and rehabilitation of publicly owned stormwater facilities. Even if a property manages 100% of the stormwater runoff on their site, the Borough still has obligations under its MS4 permit and needs to maintain the public drainage system to protect the health and safety of the public.

Maximum Rebate Amount

There is no maximum SPF rebate for residential property owners, except within each SMP category as described below. The rebate can only be applied to one SMP for a given area of IA. For example, if a downspout is disconnected to a rain garden, the homeowner is only eligible for one rebate associated with that specific rooftop drainage area (i.e., the homeowner could receive the higher rain garden rebate, but not the disconnection rebate as well). The rebate is a one-time refund, per property. If the property is sold, the new owner is not eligible for an additional rebate.

Residential Credit Types

The residential rebate/credit program incentivizes residential property owners to manage their stormwater on site and/or reduce the amount of impervious area (IA) on their property. This program includes two types of incentives which can be applied to reduce a residential property owner's SPF:

Residential Rebate - A rebate provides a one-time refund per property per impervious area for installing a stormwater practice. The rebate is applicable to the impervious drainage area managed, and one property can have multiple rebates. The rebate can only be applied to one SMP for a given area of IA. For example, if a downspout is disconnected to a rain garden, the homeowner only receives the rain garden rebate ($100 per 500 SF) for that IA managed, not both a rain garden rebate and a downspout disconnect rebate ($25 per 500 SF). However, if a second downspout that manages a different IA is disconnected to a vegetated area, the homeowner would receive the downspout disconnect rebate ($25 per 500 SF) in addition to the rain garden rebate. In general, Rebates cannot be applied for SMPs built or constructed prior to the enactment of the SPF Ordinance in 2016.

Residential Credit - A credit is a recurring discount on the stream protection fee, and is applied to the property owner's bill to reduce the SPF payment amount on a recurring basis. The credit is valid for three years, after which time the property owner must reapply. Using the example above, the homeowner could apply for the rain garden credit ($20 per 500 SF) and the downspout disconnection credit ($5 per 500 SF). Credits can be applied for SMPs built or constructed prior to the enactment of the SPF Ordinance in 2016.

The amount of rebates or credits earned by each SMP is based on the type and capacity of SMP(s) installed. More intensive practices such as rain gardens typically treat a larger amount of stormwater, and therefore give property owners a larger credit. Less intensive practices such as rain barrels are eligible for a smaller incentive proportional to their stormwater management treatment potential. Table 2 lists the eligible practices for rebates/credits under the residential program, and includes the specific rebate and credit amounts per unit area managed. Further detail is provided below for each specific SMP.

Table 2. Rebates & Credits for Residential Properties

Stormwater Management Practice (SMP)	One-Time Rebate Amount	Annual Recurring Credit Amount	Credit Description
Rain Barrel	$30	Not Applicable	Rebate is calculated based on per eligible rain barrel and/or tree installed
Tree Planting	$50	Not Applicable	
Downspout Disconnection	$25	$5	Rebate/Credit is calculated based on per 500 square feet (SF) of IA disconnected or per 500 SF of IA captured
Rain Garden	$100	$20	
Permeable Pavement / Dry Well	$100	$20	

Calculation of Residential Credits

The Residential Credit is calculated based on the amount of IA treated by one or more SMPs that are owned and maintained by a property owner. For each SMP selected, the fee associated with the amount of IA treated is reduced by the credit applicable to that type of SMP. A description of each SMP type and example calculations for each follow.

Rain Barrel Rebate

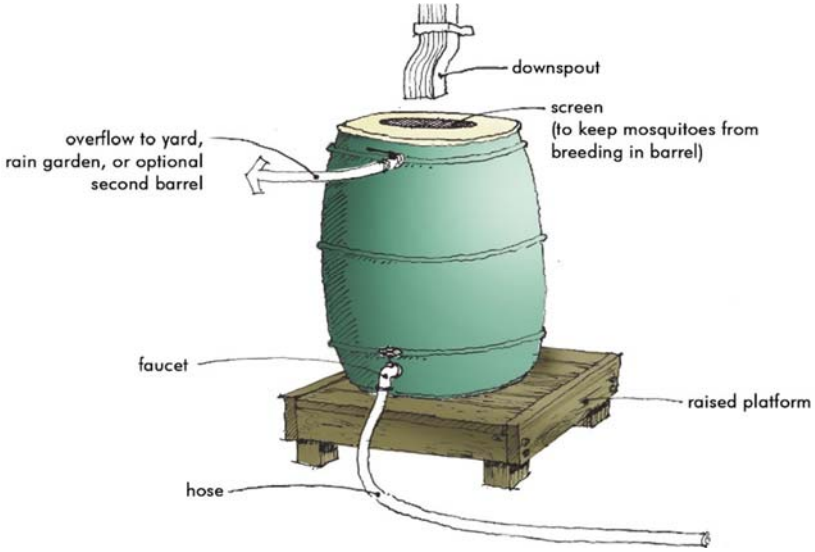
Rain barrels are containers that provide temporary storage of rain water typically for landscape irrigation or other non-potable water needs. Rainwater flows into rain barrels via gutters or downspouts. Collecting rainwater in a rain barrel reduces runoff volumes and can allow for greater infiltration and evaporation of stormwater runoff. For smaller structures, such as shed/garage roofs, rain barrels are typically able to fully manage the stormwater runoff generated during small storm events.

When installing a rain barrel, a property owner must abide by the specific requirements outlined in the table below to qualify for a rebate.

Example of a typical 45-gallon size rain barrel

Rain Barrel Rebate Requirements

#	Requirement	Summary of Requirement
1	Maximum # of Rain Barrels Eligible for Credit	A maximum of 2 barrels per property will be eligible for rebates.
2	Rain Barrel Size and Storage Capacity	The rain barrel must have a minimum storage capacity (storage volume) of 45 gallons. This is a typical size among rain barrels that are available for purchase.
3	Rain Barrel Capture Volume	To qualify for a rebate, each rain barrel must capture runoff from an adjacent roof area of at least 100 square feet (e.g., 10 x 10 feet).
4	Rain Barrel Overflow	The barrel must provide an overflow outlet near the top of the barrel to discharge excess water during large storm events.
5	Plan for How to Use Stored Water	There must be a use for the stored water so that the rain barrel's storage capacity is replenished over time. Note that the water collected in rain barrels is not suitable for human consumption.
6	Rain Barrel Location	When locating the rain barrel, consider site topography. For example, placing a rain barrel up-gradient of a garden will allow watering to work with gravity and enable easy use of stored water.
7	Mosquito Control	All rain barrel openings must have screens to prevent the growth of mosquitoes (or other vector-control must be provided).



Rain Barrel Rebate Calculation Example

A property owner installs two (2) eligible rain barrels to manage runoff from their house roof and garage roof. The following example calculation shows the methodology used to determine this property owner's one-time Rain Barrel rebate.

Total Rain Barrel Rebate = Rain Barrel Rebate Amount ($/barrel) x # of Rain Barrels (Up to 2)

Total Rain Barrel Rebate = $30 × 2

Total Rain Barrel One-Time Rebate = $60

Application Example

Rain Barrel Rebate

Credit limit: Maximum of 2 barrels per property

Number of eligible barrels installed: 2 (2 Max)

Rain Barrel Rebate: $30 per barrel

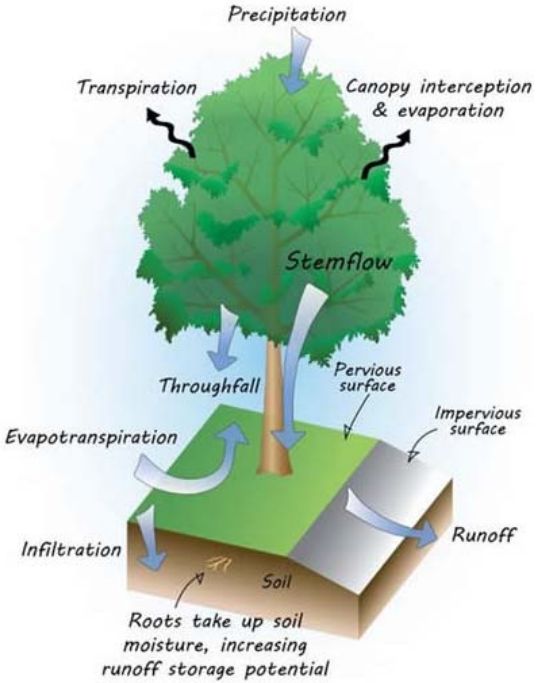
Total Rebate = (Rebate, $) x (Number of Barrels)

Total Rebate: $60

Tree Planting Rebate

For the purposes of the Borough's SPF, tree planting refers to the practice of planting trees in areas where trees are likely to thrive and create a tree canopy that intercepts rainfall and reduces stormwater runoff. This means that trees planted in a grassed lawn, not near any impervious area, will not be covered under this Rebate program. Native tree species are preferred and species should be selected that will grow best given the specific site conditions, such as soil conditions and the amount of sun exposure at the planting site. Trees can be planted by either a property owner or a hired landscape contractor. Interested applicants are encouraged, but not required, to work with the Borough Arborist and the Sustainability Advisory Committee to review the Borough's list of preferred trees and consult them regarding species selection prior to planting. Trees purchased and/or installed through the Borough's tree planting program may qualify for the Tree Planting Rebate. Trees planted prior to the enactment of the Stream Protection Fee Ordinance (2016) are not eligible for the tree planting rebate to incentivize additional plantings. A photo must be submitted to verify its location.

When planting trees as part of the Borough's SPF program, a property owner must abide by the specific requirements outlined in the table below to qualify for a rebate.



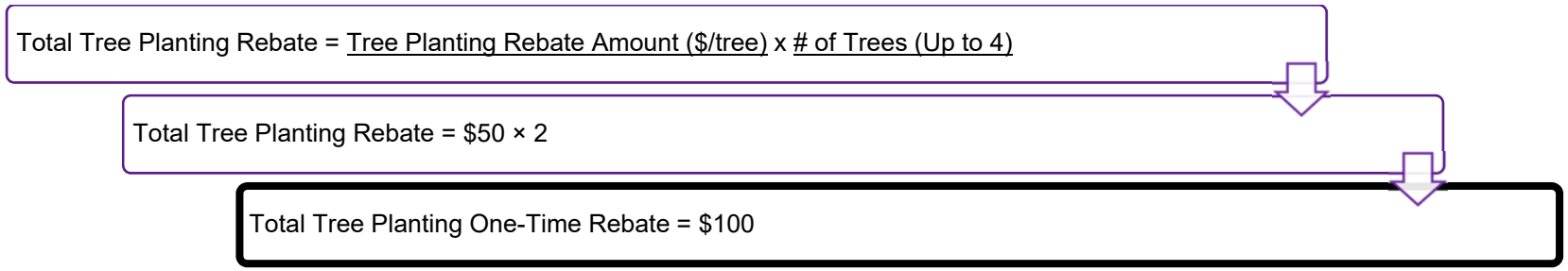
Tree Planting Rebate Requirements

#	Requirement	Summary of Requirement
1	Maximum # of Trees Eligible for Rebate	A maximum of 4 trees per property are eligible for rebates. Only trees planted since 2016 are eligible for a rebate.
2	Minimum Tree Size at Time of Planting	Trees must have a minimum of a 2-inch caliper at time of planting. Caliper is the diameter of the tree trunk measured at six inches above the ground. (Refer to example image to right.)
3	Tree Planting Location – Setbacks, Clearances, and Soil Volume	Trees should be planted with adequate overhead clearance (setback from overhead wires) and appropriate root zone area. If the planting site is surrounded by pavement (e.g., between the street and sidewalk), the recommended minimum tree pit size is 4 x 4 feet or 3 x 6 feet. Ideally, tree pits should be larger (e.g., 6 x 6 feet) or trees roots should have access to adjacent landscaped areas to provide more soil volume for root growth.
4	Tree Canopy Location	A planting location should be selected that will enable the tree canopy to eventually grow and cover an impervious area (IA) such as a sidewalk, driveway, or roof. The maximum distance between the tree trunk and IA should be 25 feet.
5	Avoiding Underground Utility Conflicts	It is critical that the property owner minimizes any conflict with existing underground utility infrastructure, therefore, **owners are required to utilize the Call Before You Dig Pennsylvania One-Call service** for utility mark-outs prior to installing a new tree. For more information: http://www.pa1call.org/pa811/Default.aspx.

Caliper is the diameter of the tree trunk measured at 6" above the ground

Tree Planting Rebate Calculation Example

A property owner plants two (2) eligible trees. The following example calculation shows the methodology used to determine the one-time Tree Planting rebate.



Application Example

Tree Planting Rebate

Credit limit: Maximum of 4 trees per property

Number of eligible trees planted: 2 (4 Max)

Tree Planting Rebate: $50 per tree

Total Rebate = (Rebate, $) x (Number of Trees)

Total Rebate: $100

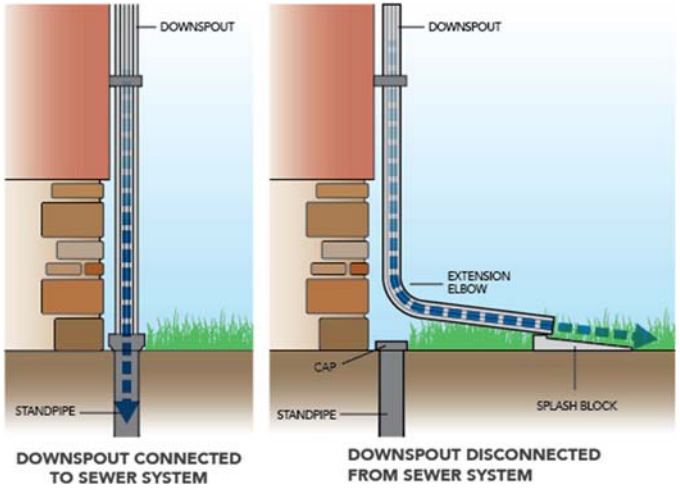
Downspout Disconnection Rebate/Credit

In West Chester, roof runoff typically is collected in gutters and then flows off the roof via downspouts. Many downspouts are directly connected to the storm sewer system or discharge stormwater onto an impervious surface (i.e., a driveway, sidewalk, or street) that conveys the runoff to a Borough storm inlet. Disconnecting downspouts is the process of physically separating roof downspouts from the sewer system and redirecting roof runoff to discharge onto pervious, landscaped surfaces where the water can naturally infiltrate into the ground. This reduces the amount of directly connected impervious area (IA) on a property. If done correctly, downspout disconnections can reduce peak flow rates, runoff volume, and pollution.

For disconnection to be safe and effective, each downspout must discharge into a suitable receiving area. Roof runoff can be redirected to a garden, yard, planter, or a rain barrel or cistern for eventual reuse. Runoff must not flow toward building foundations or adversely impact adjacent properties.

Note that downspouts that were already adequately disconnected prior to enactment of the Stream Protection Fee Ordinance (2016) are eligible for the credit but not for the rebate. A photo must be submitted to verify the condition of the downspout in question.

When considering a downspout disconnection, a property owner must follow specific design requirements. The Key Design Requirements for downspout disconnections are summarized in the table below.



Step-by-step process of disconnecting a downspout

Splash blocks absorb the energy of the water and prevent erosion.

Downspout Disconnection Rebate/Credit Requirements

#	Requirement	Summary of Requirement
1	Existing Downspout Characteristics	To qualify for a downspout disconnection rebate, the existing downspout must be currently directly draining into a storm sewer, either flowing via pipe or over impervious surfaces to a storm inlet. **Downspouts that are already adequately disconnected are eligible for a credit but not a rebate.**
2	Contributing Rooftop Area	Limit the contributing rooftop area to a maximum of 500 square feet (e.g., 20 x 25 feet) per downspout disconnection.
3	Required Distance from Structures	After disconnection, the extension, splash block and ground should all discharge water a minimum of 3 feet away from structures (i.e. basements, porch steps, or garages) or discharge directly into a rain barrel, cistern, or other structure.
4	Splash Block	It is recommended to use a splash block to absorb the energy of falling water, spread the water out, and prevent erosion. (See image for an example of a typical splash block).

5	Disconnecting to Stable Slopes	Do not disconnect downspouts to steep slopes over 10% (i.e., areas with a vertical drop of more than 1 foot every 10 feet horizontally) unless the slopes are adequately stabilized.
6	Disconnecting to Pervious, Landscape Area	Make sure there is enough pervious area for the roof runoff to be absorbed into the ground. The pervious/landscaped area must be at least 20% of the roof area that drains to the disconnected downspout.

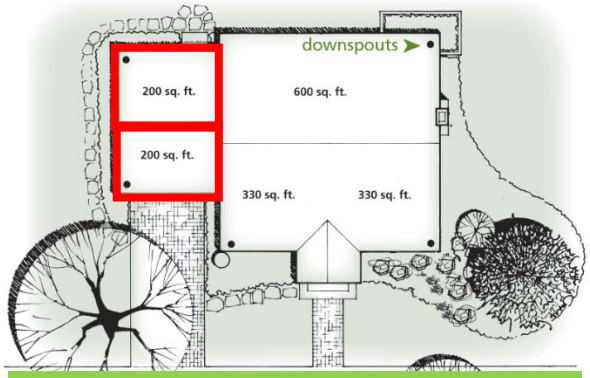


Figure 1. Example site plan noting locations of existing downspouts and their associated roof areas.

Downspout Disconnection Rebate/Credit Calculation Example

The calculation of the downspout rebate/credit is based on the amount of rooftop area that is disconnected. To estimate the rooftop area draining to a downspout, the property owner should sketch a site plan of the property (refer to Appendix A: How to Create a Site Plan). Sources for an aerial site map include a view from Google or Bing maps or any other online mapping program. The locations of downspouts and the roof line should be marked as shown in the example graphic. The area of the rooftop can be estimated by measuring the area of the roof (length x width). Calculate or estimate the area of rooftop that drains to the downspout that has been selected for disconnection. If there is only one downspout, the property owner can utilize the entire roof area. If there are gutters with downspouts on both ends, assume that half of the roof area drains to each downspout.

Example: A property owner installs two (2) downspout disconnections draining a total of 400 square feet (SF) of rooftop (e.g., the 2 garage downspouts shown on Figure 1, with their rooftop IA outlined in red). The following example calculation shows the methodology used to determine the downspout disconnection one-time rebate and recurring annual credit.

Downspout Disconnection Rebate Calculation

Total Rebate = Downspout Disconnection Rebate Amount ($/500 SF) x (Rooftop Area Disconnected ÷ 500 SF)

Total Disconnection Rebate = $25 x (400 square feet ÷ 500 square feet)

Total Disconnection One-Time Rebate = $25 x 0.8 = $20

Downspout Disconnection Annual Credit Calculation

Total Annual Disconnection Credit = Annual Credit Amount ($/500 SF) x (Impervious Area Disconnected ÷ 500 square feet)

Total Annual Credit = $5 x (400 square feet ÷ 500 square feet)

Total Annual Credit = $5 x 0.8

Total Annual Disconnection Credit = $4

Application Example

Downspout Disconnection

Provide sketch of roof area being disconnected, downspout locations, and the vegetated area that will receive the stormwater runoff. Note that only 1 residential credit/rebate can be applied to a given impervious area. For example, if a downspout is disconnected to a rain garden, apply for the higher rain garden credit/rebate below.

Total Rooftop area disconnected:	400	square feet
Downspout Disconnection Rebate:	$25	per 500 SF disconnected
Downspout Disconnection Annual Credit:	$5	per 500 SF disconnected

Total Rebate = (Rebate, $) x (Rooftop Area Disconnected / 500 SF)

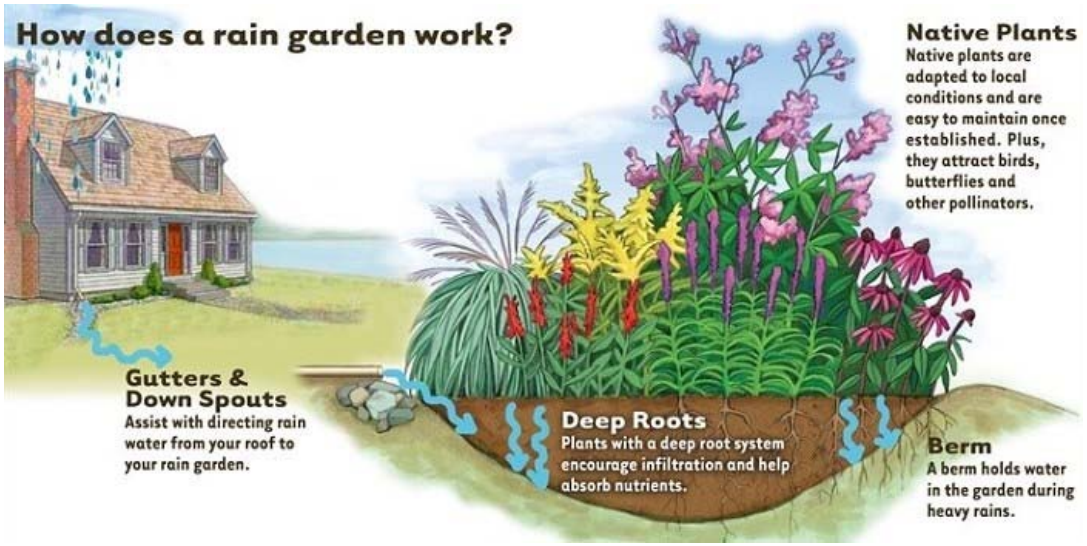
Total Rebate: $20.00

Total Annual Credit = (Credit, $) x (Impervious Area Disconnected / 500 SF)

Total Annual Credit: $4.00

Rain Garden Rebate/Credit

A rain garden (or "bioretention area") is a depressed landscaped area designed to capture and filter stormwater runoff. In addition to managing stormwater runoff volume and mitigating peak discharge rates, a rain garden can improve water quality by removing pollutants as the water percolates through the soil. Rain gardens can be designed with a range of shapes and sizes, allowing for easy integration into many yards/landscapes. Rain gardens typically require relatively little maintenance once established and often replace areas that were previously intensively landscaped. Vegetation for rain gardens should include hardy native plants that are tolerant of varying hydrologic conditions (i.e., both wet and dry conditions) and environmental stressors such as salts (i.e. if there is potential for exposure to deicing salts). Plants should be chosen for the appropriate sun/shade conditions as well.



A variety of helpful resources for designing residential rain gardens are available online, including the following:

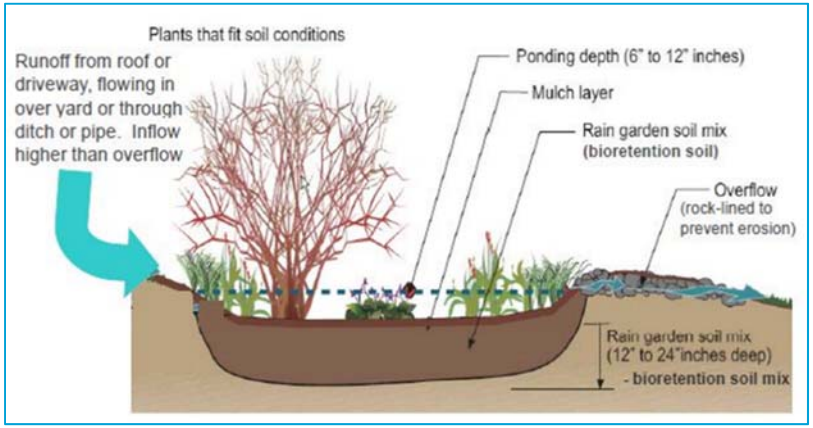
- Creating Your Rain Garden prepared by Pennsylvania Environmental Council
- Philadelphia Water Department's "How to Build a Rain Garden" online guide
- "Start to Finish Rain Garden Design: A Workbook for Homeowners" from Faribault County, MN

When designing a residential rain garden, a property owner must follow specific design requirements to qualify for a rebate or credit. The Key Design Requirements for a residential rain garden are summarized in the following table and explained in further detail on the following pages.

Residential rain gardens can be easily integrated into existing yards and typically require little maintenance once established.

Rain Garden Rebate/Credit Requirements

#	Requirement	Summary of Requirement
1	Rain Garden Size (Square Feet)	Rain garden must be sized appropriately relative to contributing impervious area. *Refer to the Additional Design Information section on the next page.*
2	Rain Garden Volume (Cubic Feet)	Rain garden must be sized to capture 1" of runoff from contributing IA. *Refer to the Additional Design Information section on the next page.*
3	Rain Garden Depth (Inches)	Rain garden must have a ponding area depth of no more than 12 inches.
4	Soil Drainage Testing	Soil drainage tests must be conducted prior to constructing a rain garden to confirm that the rain garden will be able to handle the amount of water draining to it and that the rain garden will empty (drain down) within 48 hours. This is important for public health and safety reasons. ***Refer to Appendix B: How to Perform a Drainage Test.***
5	Rain Garden Overflow	The rain garden should be designed to have a way to release excess water during extreme storm events through a secondary pathway (e.g., a rock channel, an overflow drain, or swale).
6	Avoiding Underground Utility Conflicts	It is critical that the property owner minimizes any conflict with existing underground utility infrastructure, therefore, **owners are required to utilize the Call Before You Dig Pennsylvania One-Call service** for utility mark-outs prior to digging a rain garden. For more information: http://www.pa1call.org/pa811/Default.aspx.



Rain gardens must have a ponding depth of no more than 12 inches and must have an overflow to enable water to exit during heavy storms.

Typical Native Plants for Rain Gardens in Eastern Pennsylvania

Perennials

Bee-balm—*Monarda didyma*
Black-eyed Susan—*Rudbeckia hirta*
Blazing star—*Liatris spicata*
Blue flag iris—*Iris versicolor*
Boneset—*Eupatorium perfoliatum*
Butterfly weed—*Asclepias tuberosa*
Cardinal flower—*Lobelia cardinalis*
Early goldenrod—*Solidago bicolor*
Golden alexander—*Zizia aurea*
Joe-pye weed—*Eupatorium purpureum*
New England aster—*Aster novae-angliae*
New York ironweed—*Veronia novaborescensis*
Obedient plant—*Physostegia virginiana*
Ox-eye—Heliopsis helianthoides
Solomon's seal—*Polygonatum biflorum*
White snakeroot—*Eupatorium rugosum*

Grasses and Grass-like plants

Big bluestem—*Andropogon gerardii*
Bottle brush grass—*Elymus hystrix*
Canada wild rye—*Elymus canadensis*
Path rush—*Juncus tenuis*
Purple-top—*Tridens flavus*
Soft rush—*Juncus effusus*
Switch-grass—*Panicum virgatum*
Virginia wild rye—*Elymus virginicus*

Ferns

Christmas fern—*Polystichum acrostichoides*
Hay-scented fern—*Dennstaedtia punctilobula*
Rattlesnake fern—*Botrychium virginianum*
Sensitive fern—*Onoclea sensibilis*

Shrubs

Gray dogwood—*Cornus racemosa*
Highbush blueberry—*Vaccinium corymbosm*
Mountain laurel—*Kalmia latifolia**
Ninebark—*Physocarpus opulifolius*
Pasture rose—*Rosa carolina*
Red osier dogwood—*Cornus sericea*
Spicebush—*Lindera benzoin*
Sweet pepperbush—*Clethra alnifolia*

*Pennsylvania's state flower

When purchasing plants, pay close attention to the scientific names to ensure the correct species are selected.

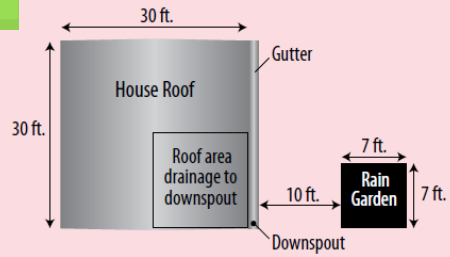
Rain Garden Requirements - Additional Design Information

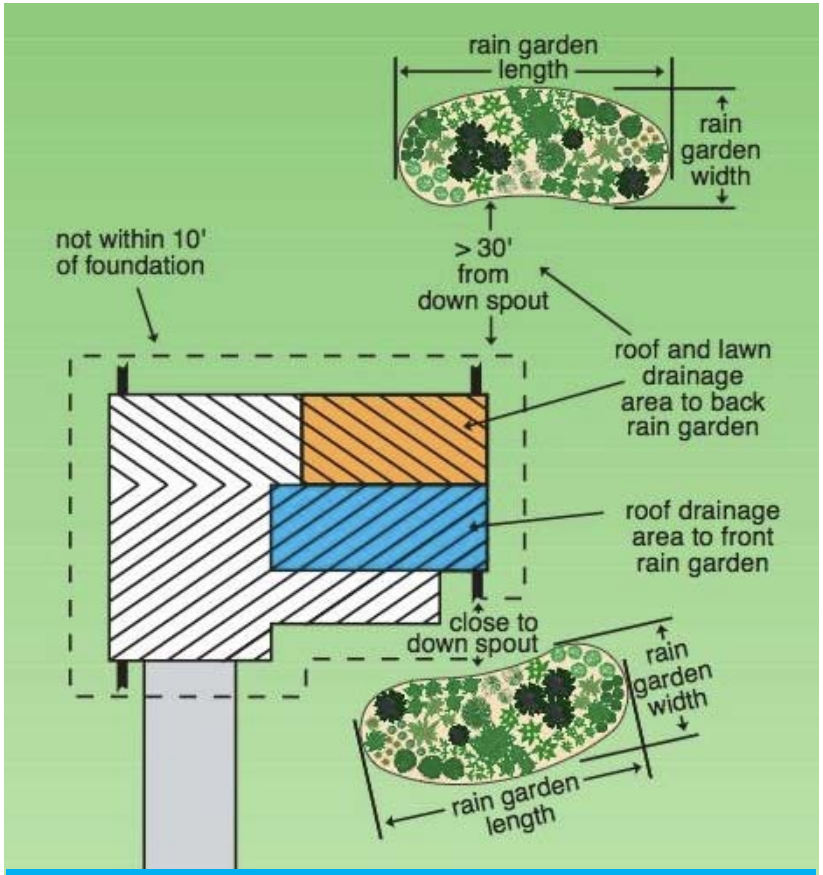
1. Rain Garden Area: The size of the rain garden shall be directly based on the amount of contributing impervious area (IA).
    - The maximum ratio of impervious drainage area (IA) to rain garden area should be 15:1 (e.g., a 50 SF rain garden can manage up to 750 SF of IA).
2. Rain Garden Volume: For full rebate/credit, the rain garden must capture 1 inch of runoff from the impervious area draining to it (a minimum of 0.25 inches must be captured for any credit).
    - One (1) inch of runoff from 500 SF is equivalent to 41.7 cubic feet (312 gallons) of water
        - 500 SF x 1 inch x 1 foot/12 inches = 41.7 cubic feet (CF)

    A simple way to estimate the capacity of the surface rain garden is to take the ponding area and multiply it by ½ of the ponding depth (multiplying by ½ accounts for the fact that there is shallower ponding around the perimeter as the sides slope up from the bottom of the rain garden). The ponding depth should be no more than 12 inches.
    - For example, an 8-foot diameter (50 SF) rain garden with 12 inches (1 foot) of ponding can store approximately 25 CF of runoff on the surface
        - 50 SF x ½ x 1 foot = 25 CF
    - Rain garden soils (12 inches thick) can typically store another 0.25 CF per square foot.
    - Therefore, 50 SF of soil can hold approximately 12.5 CF
        - 50 SF x 0.25 CF per SF = 12.5 CF
    - The total capacity of this example 50 SF rain garden would be 37.5 CF, enough to capture 1 inch of runoff from 450 square feet or 0.9 inches from 500 SF.
        - 25 CF surface storage + 12.5 CF soil storage = 37.5 CF total storage
    - If additional storage is provided through deeper rain garden soils or a gravel storage layer, that storage should be accounted for as well.

Rain Garden Sizing Example

If the area of the house is 30 ft. x 30 ft. and ¼ of this area drains to one downspout:
15 ft. x 15 ft. = 225 ft.²
20% of 225 ft.² = 45 ft.²
30% of 225 ft.² = 67.5 ft.²
The rain garden area should be between 45 and 67.5 square feet, depending on soil type (use 20% for sandier soils).





Rain Garden Placement Guidelines

Rain Garden Rebate/Credit Calculation Example

A property owner installs a 50 square foot rain garden draining a total of 750 square feet of IA, capable of capturing 1 inch of runoff from their contributing IA. The following example calculation shows the methodology used to determine the rain garden one-time rebate and recurring credit.

Rain Garden Rebate Calculation

Total Rebate = Rain Garden Rebate Amount ($/500 SF) x (Impervious Area Captured in square feet ÷ 500 square feet)

Total Rebate = $100 x (750 square feet ÷ 500 square feet)

Total Rebate = $100 x 1.5

Total One-Time Rebate = $150

Rain Garden Annual Credit Calculation

Total Annual Credit = Annual Credit Amount ($/500 SF) x (Impervious Area Captured in square feet ÷ 500 SF)

Total Annual Credit = $20 x (750 square feet ÷ 500 square feet)

Total Annual Credit = $20 x 1.5

Total Annual Credit = $30

Application Example

Rain Garden Rebate/Credit

On a separate sheet, provide sketch of the rain garden location and the impervious area being managed by each rain garden. Note that only 1 residential credit/rebate can be applied to a given impervious area.

Contributing impervious area to rain garden(s): 750 square feet

Rain Garden Rebate:	$100	per 500 SF IA captured
Rain Garden Annual Credit:	$20	per 500 SF IA captured

Total Rebate = (Rebate, $) x (Impervious Area Captured / 500 SF)

Total Rebate: $150.00

Total Annual Credit = (Credit, $) x (Impervious Area Captured / 500 SF)

Total Annual Credit: $30.00

Permeable Pavement (Drywell) Rebate/Credit

NOTE: *It is recommended that residential owners who are considering this rebate/credit contact the Public Works Department, as engineering review is strongly encouraged. Due to the likely amount of land disturbance involved for these types of practices, an owner may need to consult with the Building and Housing Department to determine if a permit is required.*

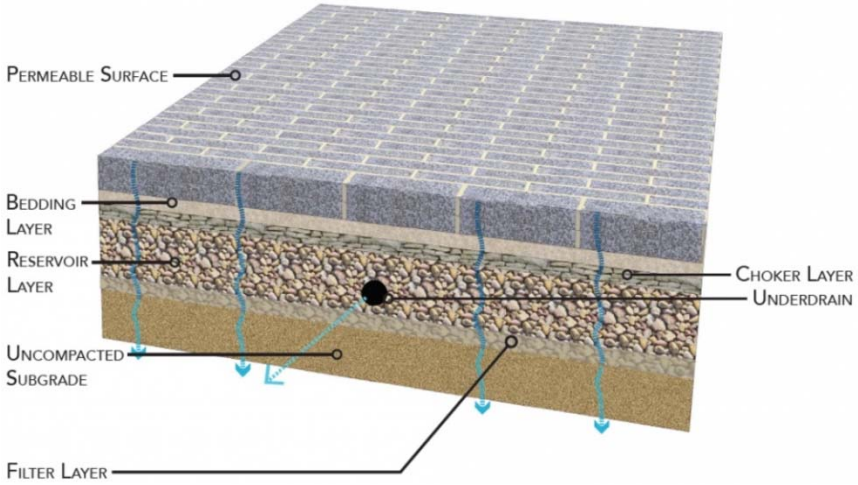
In general, permeable pavements (also called porous or pervious pavements) are designed to allow stormwater to infiltrate through the pavement surface, into an underground gravel/crushed stone storage bed or reservoir, and finally down into the underlying soil.

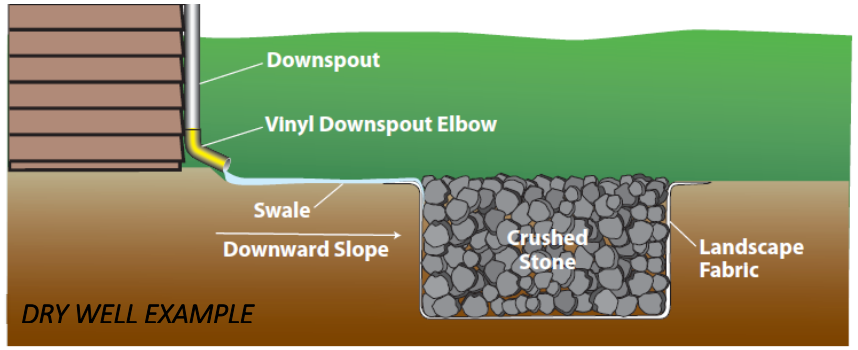
Dry wells are underground structures or gravel pits that collect rainwater and let it absorb into the soil.

Types of permeable pavements may include paving blocks, grid pavers, pervious concrete, porous asphalt, and a variety of proprietary materials. Installing crushed gravel alone as a surface is not considered permeable pavement and is not eligible for a credit, unless it is designed as part of an engineered system specifically intended for stormwater storage and infiltration. Permeable pavement can potentially be used for driveways, patios, parking lots, walking paths, sidewalks, playgrounds, basketball courts, and other similar uses.

The storage bed should generally be placed on an uncompacted base to facilitate stormwater infiltration. The subsurface storage bed may consist of uniformly graded, clean and washed coarse aggregate (stone or large gravel) with a void space of approximately 40%, or manufactured structural storage units. It is recommended that a qualified engineer and/or installer with knowledge of hydrology and hydraulics be consulted for applications using permeable hardscapes for driveways to ensure desired results and to ensure proper support for vehicles.

When installing a permeable pavement or dry well system on a residential property, the property owner must follow specific design requirements. The Key Design Requirements for a residential permeable pavement system are summarized in the following table and explained in further detail on the following pages.

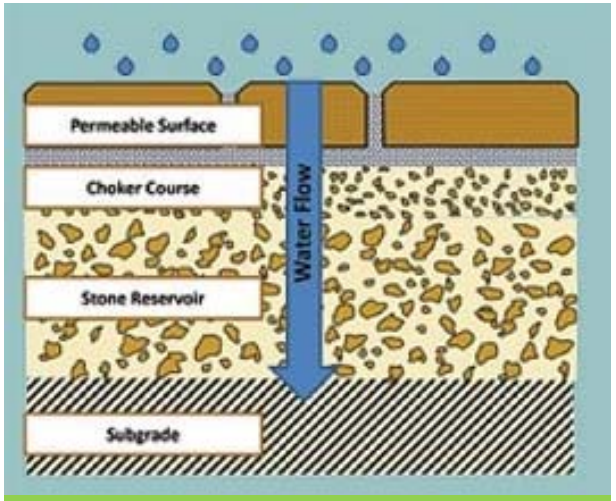




Permeable Pavement Rebate/Credit Requirements

#	Requirement	Summary of Requirement
1	Permeable Pavement Area (Square Feet)	Permeable pavement system must be sized appropriately relative to contributing impervious area (IA). *Refer to the Additional Design Information section on the next page.*
2	System Storage Capacity/Volume (Cubic Feet)	System must be sized to capture 1" of runoff from contributing IA.
3	Storage Bed Depth (Inches)	Bottom of storage bed must be a minimum of 2 feet above existing water table/bedrock.
4	Soil Drainage Testing	Rainwater must drain down (percolate) out of the permeable pavement system within 48 hours or less. *Refer to Appendix B: How to Perform a Drainage Test.*
5	Existing Site Characteristics	Site should have a fairly level or gently sloping surface with uncompacted soils. Provide level or slightly sloping storage beds.
6	Permeable Pavement System Overflow	Permeable pavement system should have an overflow mechanism to release excess water during extreme storm events.
7	Permeable Pavement Secondary inflow	A secondary mechanism for introducing water into the system is recommended.
8	Preventing Surface Clogging	Prevent sources of sediment and debris from clogging the permeable pavement system both during and after construction.
9	Surface Permeability	Pavement surface material should have a permeability of at least 20 inches per hour. The manufacturer of proprietary materials can provide this information.
10	Avoiding Underground Utility Conflicts	It is critical that the property owner minimizes any conflict with existing underground utility infrastructure, therefore, **owners are required to utilize the Call Before You Dig Pennsylvania One-Call service** for utility mark-outs prior to digging a rain garden. For more information: http://www.pa1call.org/pa811/Default.aspx.

Permeable pavers come in a variety of colors and sizes.



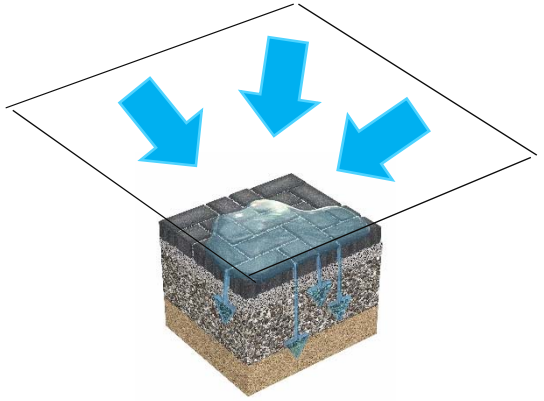
Typical cross-section of a permeable pavement system

Permeable Pavement and Drywell Rebate/Credit Requirements – Additional Design Information

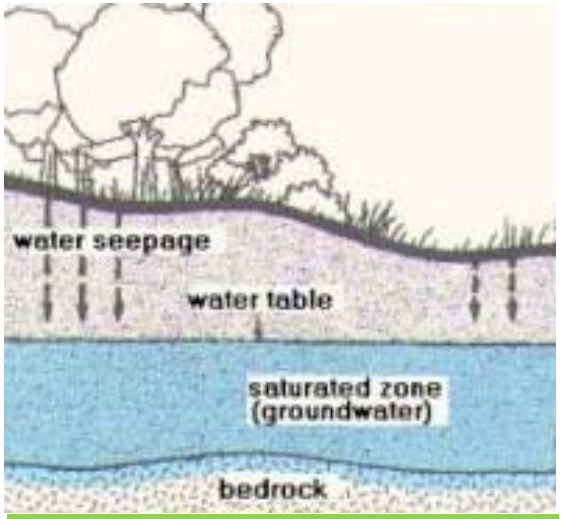
1. Permeable Pavement Area: The surface area of the proposed permeable pavement system must be directly based on the amount of contributing impervious area (IA).
    - The maximum ratio of drainage area to permeable pavement should typically be 5:1 (e.g,. a 100 SF permeable pavement surface can manage up to 500 SF of IA).
    - Figure A-3 in Appendix A to the Ch.94 Stormwater Management Ordinance includes a standard seepage bed detail that can be used for drywell sizing.
2. System Storage Capacity/Volume: Permeable pavement systems must have the storage capacity to capture a 1-inch storm event for a full rebate/credit.
    - A good rule of thumb is to consider that 10 inches of clean, uniformly-sized gravel with 40% void space can store 4 inches of water, enough to store 1 inch of stormwater from the pavement area itself plus runoff from an area 3 times as large (for example, an adjacent rooftop).
3. Storage Bed Depth: The bottom of the storage bed and/or dry well should be located at a minimum of 2 feet above the existing water table or bedrock.
    - To check out your property's general soil characteristics (depth to groundwater and depth to bedrock), visit the online USDA NRCS Web Soil Survey
    - If signs of a shallow water table or bedrock are encountered when digging on your property or when conducting a drainage test, consult a professional.
4. Soil Drainage Testing: Soil conditions are variable in an urban environment such as the Borough, and as such, it is required that a soil drainage test be undertaken to confirm that the permeable pavement system can empty within 48 hours. A simple drainage test can be performed per the instructions in Appendix B: How to Perform a Drainage Test.
5. Existing Site Characteristics: Permeable pavement systems should be constructed only on fairly level or gently sloping surfaces. They are not practical on steep slopes.

    During installation, construction equipment should be kept off the soil and other measures taken to prevent compaction of the soil and the accompanying reduction in permeability.

    Provide level or gently sloping storage bed bottoms to maximize storage and infiltration.
6. Permeable Pavement System Overflow: Provide a positive stormwater overflow structure/device from the system to release excess water during extreme storm events.



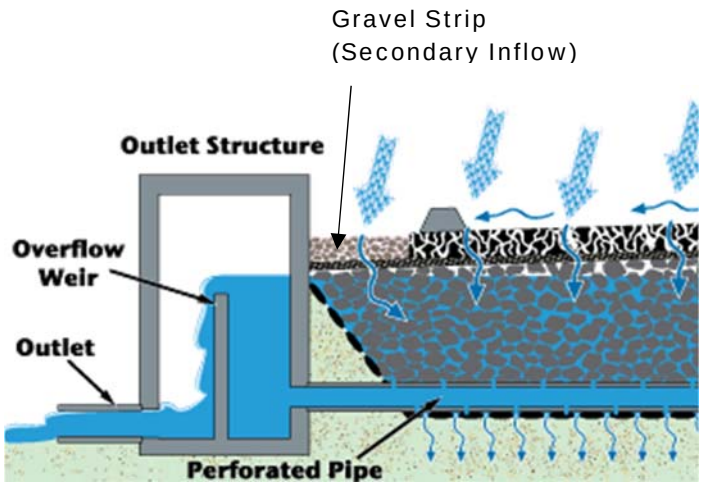
A permeable pavement system can potentially manage an area of runoff up to 5 times its surface area.



Permeable pavement storage beds should be a minimum of 2 feet above the existing water table or bedrock.

7. Permeable Pavement Secondary Inflow: It is recommended that the permeable pavement system be designed with a secondary inflow mechanism such as a gravel strip along the lower edge or a small area drain that connects to the storage bed under the pavement.

8. Preventing Surface Clogging: Prevent sediment-laden runoff (i.e., from un-stabilized pervious areas) from flowing towards the permeable pavement surface and consider how to prevent and/or remove other sources of debris (leaves, seeds, flowers, pollen, etc.) that may clog the permeable pavement. Avoid locating permeable pavements where they are likely to receive excessive sediment and/or debris.



Permeable pavement systems must have an overflow mechanism (e.g., an outlet structure) and should have a secondary way to capture runoff such as a gravel strip.

Permeable Pavement and Drywell Rebate/Credit Calculation Example

A property owner installs a permeable pavement driveway that is 10 feet wide by 25 feet long (250 square feet [SF]). It also manages the runoff flowing out of a garage downspout that collects runoff from 250 SF of the garage rooftop. Therefore, the total IA to be managed is 500 SF (permeable pavement driveway area plus garage rooftop area managed). The following example calculation shows the methodology used to determine the permeable pavement one-time rebate and credit.

Rebate Calculation

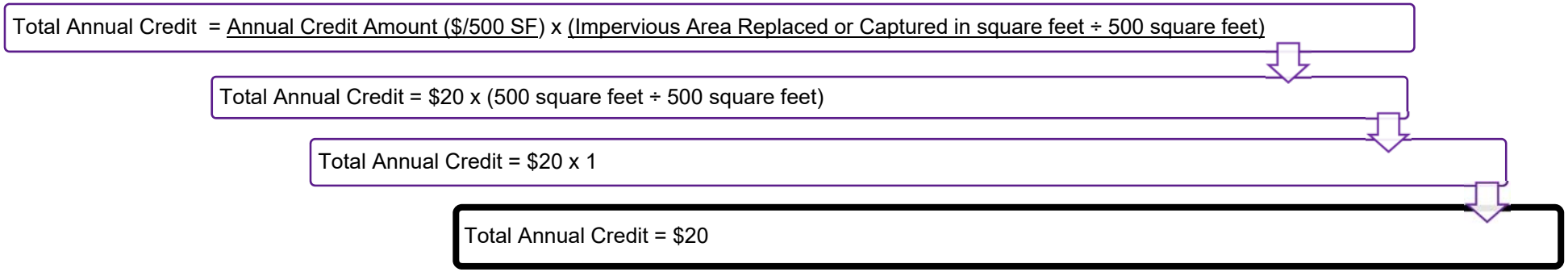
Total Rebate = Permeable Pavement Rebate Amount ($/500 SF) x (Impervious Area Replaced or Captured in square feet ÷ 500 square feet)

Total Rebate = $100 x (500 square feet ÷ 500 square feet)

Total Rebate = $100 x 1

Total One-Time Rebate = $100

Annual Credit Calculation



Application Example

Permeable Pavement / Dry Well

Provide sketch of the permeable pavement area or dry well and the impervious area being replaced/captured by the permeable pavement or dry well. Note that only 1 residential credit/rebate can be applied to a given impervious area.

Replaced / captured impervious area: 500 square feet

Permeable Pavement / Dry Well Rebate:	$100	per 500 SF replaced / captured
Permeable Pavement / Dry Well Annual Credit:	$20	per 500 SF replaced / captured

Total Rebate = (Rebate, $) x (Impervious Area Replaced / 500 SF)

Total Rebate: $100.00

Total Annual Credit = (Credit, $) x (Impervious Area Captured / 500 SF)

Total Annual Credit: $20.00

Credit Program Procedures

The following procedures are common to both the Residential Credit Program and the Non-Residential Credit Program.

Application Forms

Residential and non-residential application forms are available on the Borough's website www.west-chester.com, searching Stream Protection Fee.

Application Deadline

The Borough has determined that all approved credits will be applied retroactively based on the year the application was submitted using a deadline of July 31. All rebate/credit applications will be accepted year-round on a rolling basis. If the application is received by July 31, approved credits/rebates will be applied retroactively based on the year of the application submittal date. If the application is received after July 31, then the property owner must wait one year before the credit appears.

Application Fee

Payment of a Rebate/Credit Application Fee may be required for Borough review of the credit application. The fee is listed in the Borough's current fee schedule, which is available on the Borough's website. SPF credit application fees are non-refundable regardless of the outcome of the credit application. Borough council may choose at their discretion to waive the application fee, and as of November 2017, Council has waived the application fee.

Operations and Maintenance (O&M) Agreement

A signed maintenance agreement between the Borough and the property owner is required for credit approval. Under the Operations and Maintenance (O&M) agreement, the owner must allow the Borough access to the site to view and inspect the SMP according to the Borough's inspection cycle. The Agreement can be found on the Borough website.

To receive the residential or non-residential SPF credit, a property owner must be able to demonstrate the stormwater facility is being properly maintained. A property owner can demonstrate maintenance of a stormwater facility by including with the SPF Credit Application available maintenance records showing the maintenance activities and date, or the most recent invoice from a qualified maintenance vendor. If the applicant does not maintain the facility as required, the Department of Public Works will notify the property owner in writing that they have 30 days to take corrective action otherwise the credit will be discontinued.

Application Documentation Requirements

The property owner must provide the following documentation:

- Completed and signed application form.
- Photograph(s) of SMP
- A sketch (site plan, plot plan, map, aerial image or similar illustration) showing parcel lot lines, built features including all impervious areas, and location of the existing/proposed SMPs, and drainage areas to the SMP.

    - Refer to Appendix A: “How to Create a Site Plan” for instructions
    - The property owner should utilize the Borough’s online mapping program which allows users to search for their property address and view their mapped parcel and impervious area. The website also allows for the user to print on a page size sheet suitable for inclusion in the application.
- Documentation of purchase and/or installation of the SMP including receipts, invoices, packing slips, or other records if available.
- Calculations or other documentation of impervious drainage area and SMP capacity estimates
- Maintenance logs noting the past inspection and maintenance records (or receipts from vendors hired to perform maintenance), or for newly constructed SMPs, a description of the proposed seasonal maintenance activities that the property owner will undertake.

In the event the credit application is missing information; Borough staff will request additional documentation to aid in review of the credit application.

Submission of Credit Application

Electronic submissions can be made to spf-program@west-chester.com. Submit a copy of the completed credit application, the checklist, all supporting documentation and the non-refundable application fee (if applicable) to:

Borough of West Chester Department of Public Works

Attention: Stream Protection Fee Program – Credit Program

205 Lacey Street

West Chester, PA 19382

Determination

Borough staff will review the credit application and issue a determination no later than November 1. The applicant will be notified by letter and/or email of the decision.

Appeal of Determination

Appeal of the credit determination can be made in accordance with Section 11 – “Appeals” of the Borough’s Stream Protection Ordinance. Typically, a credit application will be primarily denied due to technical inadequacies. Should those inadequacies be addressed, the property owner may resubmit their application to the Borough.

Issuance of Credits

Rebates and/or Credits will be applied in the form of a credit and will be applied to subsequent bills.

Credit Renewal

Residential SPF credits will be valid for three years, after which they will require renewal by the property owner. This renewal policy does not apply to the SPF Rebate which is a one-time refund per property. To continue to receive the SPF credit, property owners are required to reapply before the credit period expires within 3 years. Should the owner fail to submit a renewal application, the credit(s) will expire. When reapplying, the property owner must update their demonstration of stormwater facility maintenance by including sufficient documentation in the application package.

Site Inspections

Upon receipt of a credit application, the Borough or its designated appointee, may inspect the parcel to verify all information and supporting documentation. Efforts will be made to notify the property owner in advance. If the Borough's site inspection determines that the SMP is not being maintained appropriately, the credit could be denied. The Borough may choose to withhold the credit until the property owner demonstrates that the SMP is being appropriately maintained.

Termination of Credits

Approved credits may be terminated at any time if the SMPs are found to be not functional, improperly maintained, or if the owner fails to restore the SMPs per Borough notification.

Change in Property Ownership

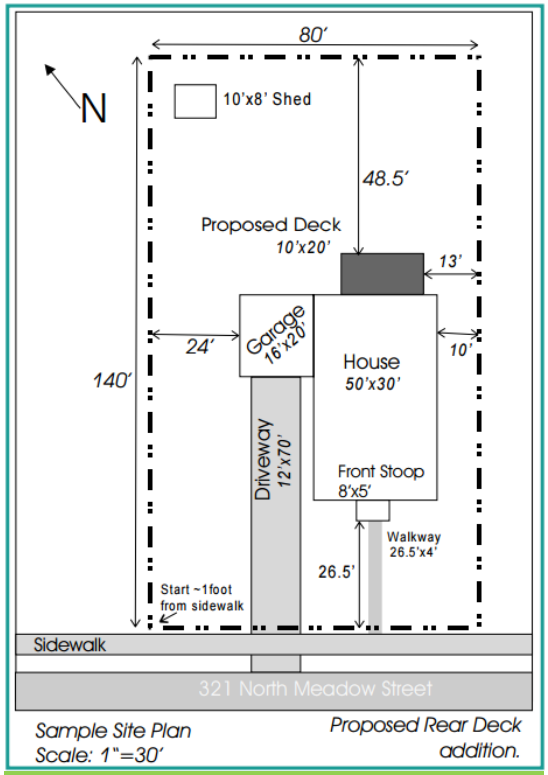
If a property is sold and there is a change in ownership, the credit (residential or non-residential) will remain in place until the three-year credit term is completed. The new property owner will be required to resubmit the credit application in accordance with the Credit Renewal policy described in this Manual. As the residential rebate is a one-time refund amount provided per property per eligible SMP, a new owner is not eligible for previously awarded rebates once a property changes hands.

Appendix A: How to Create a Site Plan

A site plan is a scaled map/diagram that graphically depicts a property's existing and/or proposed physical structures and landscape features. Site plans are drawn showing a bird's eye view of your property as if you were looking down at it from above. A site plan shows significant things that are on your property currently, such as the footprint of any buildings (home, garage, storage shed, or decks) and any other features such as driveways, patios, walkways, fences, swimming pools, etc. on the property.

Dimensions should be included for significant items and be used to show distances between existing items. The drawing should be done to a scale (e.g., 1 inch on the plan is equal to 30 feet on the ground). Site plans also should indicate the orientation of the plan using a North Arrow symbol that indicates which direction North is.

The following steps will help you in preparing your site plan.



Example of a Site Plan

Step 1: Determine your property boundaries and lot dimensions (choose from one listed below).

Option 1 – Use Online Tax Assessor's Map

Using an address or property owner name, you can look up your property on the Chester County Tax Assessor's Map website (accessible through "ChescoViews" application). Assessor's maps are regularly updated maps drawn to scale and based on the latest recorded surveys and plats of the area. The maps have an aerial photography background and they offer a measuring tool so you can measure the dimensions for all sides of your property.

Option 2 – Use Subdivision Plat Information or Deed Records

Like the Tax Assessor's map, you may also look up your lot on the recorded plat that your property is within. The legal description of your property, which should be included on the deed, usually contains your property's lot or parcel number and the subdivision name in which your lot is located. In cases where the property is not within a subdivision plat, the legal description will likely be a 'metes and bounds' description that describes the perimeter of the property in greater detail, without reference to a plat. To find a copy of your deed, you can contact the Chester County Historical Society, which has inventories of deeds dating back to 1688. Note – this option is not likely to be the most efficient option, however, it is included here in the even that applicants choose to use it.

Option 3 – Use Recent Building Records

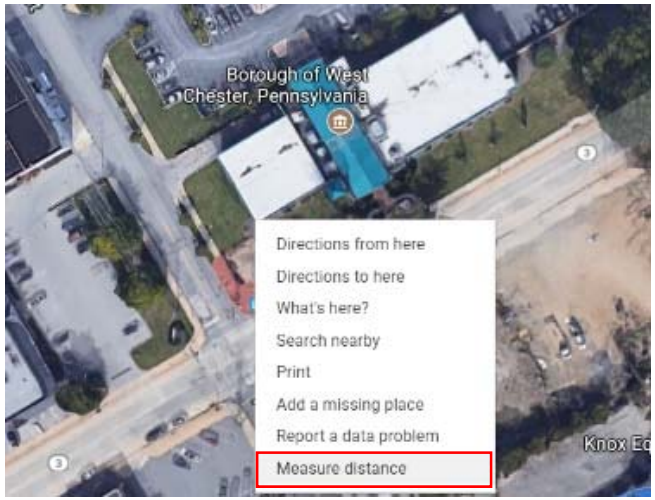
For newer constructed properties, using a previously approved site plan can save time when preparing your documentation. If there is a new structure on the property which required building permits, there is a possibility that the Borough may have an archived copy of the original building plans on file, including a site plan. You should make a request through the Borough's Department of Building, Housing, and Code Enforcement to obtain record site plans.

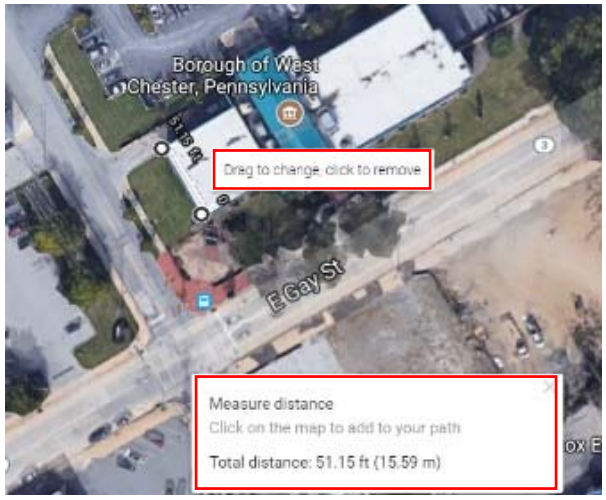
Option 4 – Measure Your Property Yourself

You can do this either by going outside with a tape measure and taking down measurements, or you can use an online program such as Google Maps' Measuring Tool on your computer.

Directions to Use Measuring Tool in Google Maps:

1. Open Google Maps in your internet browser.
2. Enter your address to zoom into your property.
3. Make sure you are in Satellite (aerial photography) mode so you can see your property's features.
4. Right-click on your starting point.
5. Choose **Measure distance**.
6. Click anywhere on the map to create and point and measure the distances between the two points. To add another point, click anywhere on the map. Drag the points to change/adjust your measurement or click any of the points to remove.





7. At the bottom of the Measure Distance dialogue box, you'll see the total distance in feet (ft) and/or total area in square feet (sf).
8. Right-click to find the Measuring Tool Menu and select **Print**. Print to a printer or Print to Save to a PDF if your computer has that option.

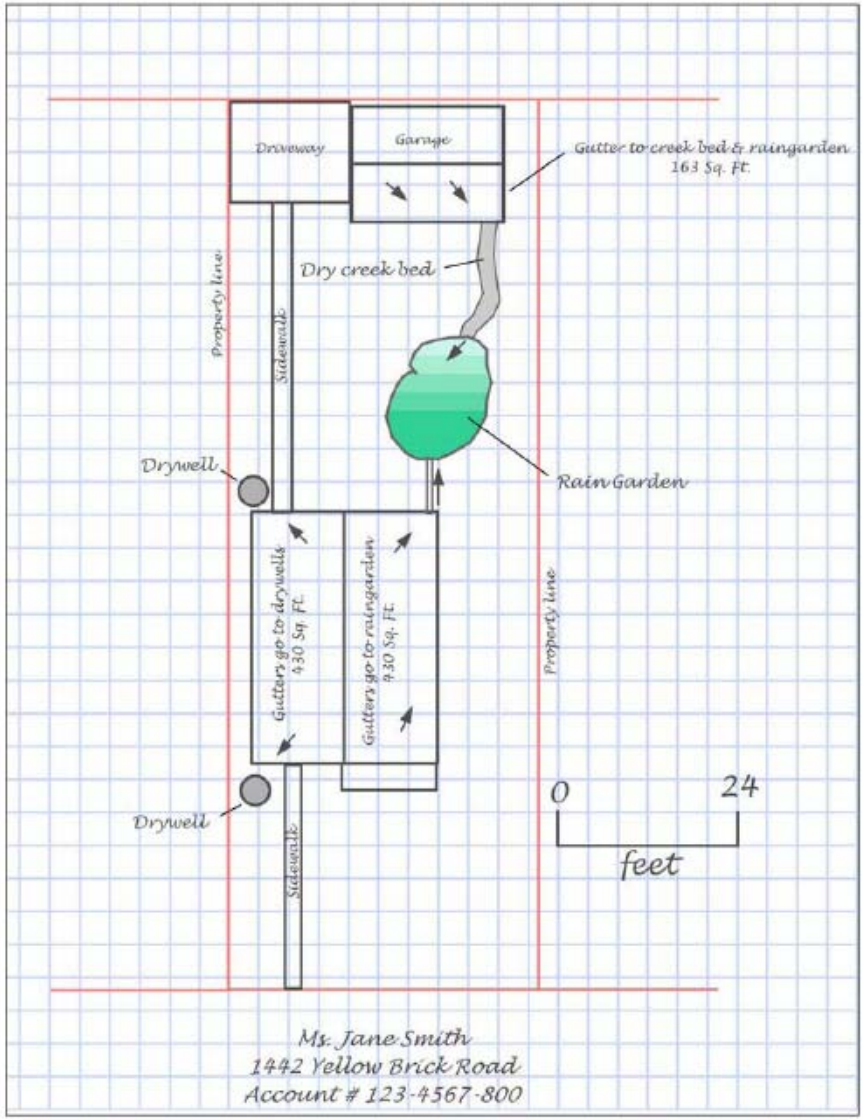
Step 2: Determine the location of structures and other site features in relation to the property boundaries.

Using the property boundary location and dimension information gathered in Step 1, you must next determine the location of applicable existing buildings, streets, driveways, sidewalks, trees, and other site features in relation to the property boundaries. Measure the distance from these site features to the surrounding property lines. You can do this either with a tape measure or you can use an online program such as Google Maps' Measuring Tool on your computer.

Step 3: Draw the plan.

Use the information gathered in Steps 1 and 2 to prepare your site plan. You may draw your site plan by hand or use a computer graphics or drafting program. An example site plan template is provided in this Appendix for you to print and use if desired.

1. Determine Your Site Plan Scale and Orientation
    a. Using graph paper, choose a scale of measurement for the plan drawing so that one square = X feet. To ensure all information will fit on the page and be easy to read, a good example would be to have each block of the graph paper equal five (5) feet (or 1 inch = 25 feet). After choosing your scale of measurement, draw lines to show the house, driveway and any sidewalks on the plan. Write in the closest distances in feet of the lot lines to the house (i.e. building setbacks), and draw an arrow pointing north.
2. Add other Items that must be on the Plan such as the Property Owner Name and Address.
3. Draw Property Lines and Label all dimensions in feet.
4. Draw all Existing Buildings and Structures on the Plan (i.e., House, Garages, Sheds, etc.). These are your property's impervious areas (IA). Show distances between buildings and property lines. Label all dimensions in feet.
5. Draw Driveways, Parking Areas, Patios, Decks, and Sidewalks on the Plan. These are your property's additional impervious areas. Label all dimensions in feet.
6. Locate Existing Trees and Significant Landscape Elements
    a. Use a dot to indicate the approximate location of the tree and a circle to indicate the canopy coverage
    b. Landscape areas and planting beds can be drawn as solitary masses rather than individual plants/shrubs
7. Identify and draw the area of the site that will contain the existing or proposed SMP (i.e., rain garden, downspout disconnection, permeable pavement/drywell).
8. Then draw arrows depicting the flow direction of water as it runs off the property. The arrows should point downhill in the direction of the storm water flow.



Example Site Plan

Aerial Site Sketch

Draw a bird's-eye-view of your property including all impervious surfaces and existing structures. Draw arrows depicting the flow of water on the property and the proposed site of the rain garden.

Scale: 1 square = _____ feet

KEY

Flow of Runoff

Structures/Surfaces

Rain Garden

Appendix B: How to Perform a Drainage Test

1. Know the exact location(s) on your property where you are planning to install your potential SMP(s) such as a rain garden. This potential SMP location will be where you conduct your drainage test. Drainage tests are done to test how fast your soil drains and determine suitability for stormwater SMPs.

2. **Do a PA One-Call at least three (3) business days prior to conducting your drainage test** so they can mark out all buried underground utilities, to reduce the risk of striking a utility line when digging.

   For more information: http://www.pa1call.org/pa811/Public/POCS_Content/About_Us/FAQS/FAQ.aspx or Dial 8-1-1 (or 1-800-242-1776).

3. Gather the following tools near the test location:
   a. Shovel or post-hole digger
   b. Hose and/or bucket (and water source)
   c. Yardstick, tape measure, or ruler
   d. Notepad and pen

Drainage Testing Process

Note: More elaborate testing procedures per the Pennsylvania Stormwater Manual or other approved guidance documents are also acceptable):

1. Use the shovel or post-hole digger to dig a hole and remove soil from the hole. Place the excavated soil nearby so the hole can be refilled after the test. Block off or otherwise prominently mark the hole location to prevent people from tripping/falling.

2. Dig a hole that is at least 12 inches deep and at least 4 inches in diameter. If desired, place 2 inches of clean sand or gravel in the bottom of the hole to prevent scour in the bottom when being filled.

3. Using your water source, gently fill the hole with water and let it sit overnight. This saturates the soil and helps give a more accurate test reading.

4. The next day, gently refill the hole to the top with water. Measure the water level by laying a stick, pipe, or other straight edge across the top of the hole, then use a tape measure or yardstick to determine the starting water level. Check what time it is.

5. After an hour has passed, return to your test location to measure and record the depth of the water in the hole. Ideally, continue taking measurements at hourly increments for a few more hours or until all they water has drained.

6. Check the hole to watch how long it takes to become empty. When it is empty, record the time.
    - If the hole took more than 48 hours to drain completely, this typically indicates the site is not suitable for a stormwater SMP that relies on infiltration. Another site will need to be chosen (and another drainage test conducted).
7. When the testing process is complete, the hole should be immediately backfilled with the excavated soil