TOWNSHIP OF HAMPTON

ORDINANCE NO. 829

AN ORDINANCE OF THE TOWNSHIP OF HAMPTON ALLEGHENY COUNTY, PENNSYLVANIA, ESTABLISHING A FEE FOR STORMWATER COLLECTION, MANAGEMENT, AND POLLUTION CONTROL.

WHEREAS, the Township of Hampton ("Township") is incorporated under the Second Class Township Code, 53 P.S. § 65101, et seq.; and

WHEREAS, the Township has constructed and/or maintains, and will continue to construct and maintain, a system including sewers and drains to collect and manage stormwater; and

WHEREAS, pursuant to the authority vested in the Township by the Second Class Township Code, 53 P.S. § 65101, et seq., the Township is desirous of adopting an Ordinance establishing a fair and equitable user fee for stormwater collection and management that assures all properties that are connected with, use, are serviced by, or are benefited by such system will pay a proportionate share of costs of operation, maintenance, repair, administration, replacement and improvement.

NOW, THEREFORE, be it resolved as follows:

SECTION 1. TITLE

This Ordinance shall be known as the Stormwater Management and Pollution Control Fee Ordinance for the Township of Hampton.

SECTION 2. PURPOSE

The purpose of this Ordinance is to provide dedicated funding needed to ensure the proper development and maintenance of stormwater management and pollution control practices within the Township of Hampton.

SECTION 3. AUTHORITY

The Township is empowered by the Second Class Township Code, 53 P.S. § 65101 et al., to assess reasonable and uniform fees for stormwater management activities and facilities.

SECTION 4. FINDINGS

The governing body of the Township finds that:

A. Federal and state regulations (including those found at 40 CFR Part 122) include requirements for municipalities to implement a program of stormwater controls. Regulated municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System ("NPDES"). In order to establish, operate, and maintain the stormwater infrastructure in the Township of Hampton in accordance with the said NPDES permit, as well as all systems upon which the stormwater infrastructure depends, sufficient and stable funding is required to fund these public services.

B. Inadequate development and maintenance of stormwater facilities increases stormwater runoff rates and volumes, contributes to erosion and sedimentation, overtaxes the carrying capacity of storm sewers and streams, increases the cost of public facilities to carry and control stormwater, undermines flood plan management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases pollution of water resources.

C. A comprehensive program of stormwater management, including the generation of funding to pay for effective stormwater best management practices, is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.

D. Stormwater is an important water resource which provides groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

E. Approaches to water management that protect, restore, and mimic natural water cycles have significant environmental, social, and economic benefits and should be encouraged.

F. Development within the Township historically used materials including large amounts of corrugated metal pipe which has reached its useful life and must be replaced, and the decay of such materials interferes with the ability to properly convey stormwater and threatens public safety.

G. The Township intends to establish a stormwater management and pollution control fee to assure that each lot within the Township of Hampton will pay its proportionate share of the

costs of operation, maintenance, repair, administration, replacement, and improvement of all stormwater services provided or paid for by the Township.

H. The charges as determined herein are fair and equitable and are based upon the following findings:

1. An annual fee of $115.00 per residential unit is reasonable.

2. The basis for an equivalent residential unit of 3,300 square feet of impervious surface was determined through a statistical sampling of single-family properties in the Township of Hampton RA, RB, RC, and RD Zoning Districts.

3. The requirement that a property have at least 500 square feet of impervious surface based upon the use of aerial photography is a reasonable threshold to define what constitutes a developed property that is subject to the minimum fee.

4. The monthly charge per Equivalent Residential Unit (ERU) is reasonably based upon the size of the building, all accessory structures and all other impervious surfaces including parking areas, driveways, and walkways.

SECTION 5. DEFINITIONS

Words and terms used in this Ordinance and not given specific definition shall be defined as set forth in the applicable statutes of the Commonwealth of Pennsylvania or ordinances of the Township of Hampton, if any, and shall otherwise be given their ordinary and common meaning. For purposes of this Ordinance, the following words and terms shall be defined as set forth below:

BASE ERU RATE – The total fee assessed to one equivalent residential unit, as proposed and approved by the Township. The Base ERU Rate shall be less than or equal to the Township's total anticipated stormwater expenses divided by the number of ERU's in the municipality.

BEST MANAGEMENT PRACTICES – Methods, procedures, and analyses specified in Pennsylvania's Department of Environmental Protection's Stormwater Best Management Practices Manual ("Stormwater BMP Manual"), Commonwealth of Pennsylvania, Department of Environmental Protection, No. 363-0300-002 (December 2006), as amended and updated, to reduce flooding potential and control the volume, flow rate, and water quality of stormwater.

DEVELOPED – Manmade changes made to a property or lot, which may include, but are not limited to, buildings or other structures for which a building permit must be obtained under the

requirements of the Uniform Construction Code, mining, dredging, filling, grading, paving, excavation or drilling operations, or the storage of equipment or materials.

DUPLEX/TWO-FAMILY RESIDENTIAL PROPERTY – A property that shares the same essential characteristics of a single-family residential property but contains two separate dwelling units on a single common parcel.

DWELLING UNIT – A single unit providing complete independent living facilities for one or more persons, but no more than one family, including permanent provisions for living, sleeping, eating, cooking and sanitation.

EQUIVALENT RESIDENTIAL UNIT ("ERU") – The measure of impervious surface on a typical single-family residential property in the Township of Hampton. The ERU shall be determined by generating a random, statistically significant sample of single-family residential properties and calculating the impervious surface on each property in the sample. The median of impervious surface area across the sample property shall be the ERU. The ERU has been determined to be 3,300 square feet of impervious area. The ERU is used in determining the fees assessed for each lot/property in the municipality.

IMPERVIOUS SURFACE – Any surface on a property that, because of the surface's composition or compacted nature, impedes or prevents natural infiltration of water into the soil, including, but not limited to, roofs, solid decks, driveways, patios, swimming pools, sidewalks (other than public walks located in the Township's right-of-way), parking areas, tennis courts, concrete, asphalt, or crushed stone streets or paths, or compacted material of any kind as determined by the Township.

IMPERVIOUS SURFACE AREA – As recorded or calculated by the Township, the number of square feet of horizontal surface on a lot covered by an impervious surface. In determining the impervious surface area of a lot, the Township may use any appropriate methods, including but not limited to aerial photography and surface feature evaluation processes.

LOT/PROPERTY – Each separate and distinct parcel, tract, or area of land having its own tax parcel identification number.

NON-SINGLE-FAMILY RESIDENTIAL PROPERTY – Any property that does not fit the definition of Single-Family Residential Property as defined by this ordinance, including but not limited to, apartment buildings, commercial buildings, industrial buildings, schools, churches, government buildings and other similar structures or improvements constituting 500 or more square feet of impervious surface.

OWNER – The owner of record of a lot or property in the Township as shown on the Allegheny County tax records for the respective tax parcel identification number.

PUBLIC RIGHT-OF-WAY – A right-of-way that consists of land utilized for the benefit of the general public, such as to provide for utilities, roads, and railroads.

RENTAL, RATES AND CHARGES – Sums necessary for the maintenance and improvement of the Township of Hampton Storm Sewer System which shall be assessed, imposed and collected from each property which directly or indirectly uses, benefits from, or is serviced by the system.

SINGLE-FAMILY RESIDENTIAL PROPERTY – A separate and distinct lot or property having its own tax parcel identification number and containing no more than two residential dwelling units, specifically including Duplexes/Two-Family Residential Property as defined by this ordinance, and specifically excluding condominiums and mobile homes that are limited to the living area of the dwelling unit such that they require the use and access of commonly held property.

STORMWATER – Runoff from the surface of the land resulting from precipitation, including snow or ice melt.

STORMWATER MANAGEMENT AND POLLUTION CONTROL FEE – The rental, rates and charges imposed by the Township in relation to the provision of stormwater management and pollution control services as set forth in this Ordinance.

STORMWATER MANAGEMENT AND POLLUTION CONTROL FEE CREDIT – A conditional reduction in the amount of a stormwater management and pollution control fee in accordance with the Township of Hampton Stormwater Management and Pollution Control Credit Manual (attached hereto as "Exhibit A" and as may be amended by Resolution).

STORMWATER SERVICES – The Township's program for stormwater quality and for the partial control and conveyance of stormwater, including, but not limited to: public education; monitoring; removing, and regulating stormwater pollutants; other activities described in the Township of Hampton's NPDES permit; mapping; planning; regulating, reviewing and inspecting private stormwater infrastructure; operating, constructing, improving, cleaning, and maintaining the Township of Hampton's stormwater system; and any and all expenses deemed reasonably necessary to the management of stormwater within the Township of Hampton in the judgment of the Township, including but not limited to the payment of principal and debt service, and the establishment of a reserve fund, to pay for these services.

STORMWATER SYSTEM – The system of natural and constructed conveyances for collecting, managing, treating, and transporting stormwater, including but not limited to lakes, ponds, rivers, perennial, intermittent, and/or channeled streams, connected wetlands, open ditches, catch basins, and other inlets, pipes, storm sewers, drains, culverts and created storm-water management facilities that provide partial treatment by passive means such as wet detention ponds, detention basins, and stormwater wetlands.

TOWNHOUSE/TOWNHOME – For the purposes of this ordinance, a building which contains at least three (3) single family dwelling units, each of which are separated from an adjoining unit by a continuous, common wall extending from the basement to the roof, each unit having independent access directly to the outside, and having no units above or below. For the purpose of this definition each dwelling unit is located on an independent tax parcel containing no other dwelling units.

TOWNSHIP – The Township of Hampton, Pennsylvania, a home rule municipality, originally incorporated under the Second Class Township Code, 53 P.S. § 65101.

USER – Any person, firm, corporation, individual, partnership, company, association, society or group using, benefiting from or being serviced by the Township of Hampton Storm Sewer System.

ZONING DISTRICT – The classification of development as defined by the Township of Hampton Zoning Ordinance with boundaries as shown on the Township Zoning Map.

SECTION 6. UNIFORM APPLICATION OF RENTAL, RATES, AND CHARGES

Rental, rates, and charges shall be assessed, imposed, liened and collected as to all property, owners, lots, parcels, building units, and users.

SECTION 7. STORMWATER MANAGEMENT AND POLLUTION CONTROL FEE

A. Stormwater Management and Pollution Control Fee

1. Each property in the Township of Hampton shall be subject to a monthly stormwater management and pollution control fee equal to the product of the Base ERU Rate and the number of ERU's of impervious surface area on the lot as calculated in subsection (B) below, less any credits for the lot approved by the Township pursuant to Section 8 of this Ordinance.

    a. Each Single-Family Residential Property as defined by this ordinance will be deemed to have one ERU.

b. Each Non-Single-Family Residential Property, shall be assessed at a rate based upon the number of square feet of impervious surface, as determined by measurement through aerial photography and surface feature evaluation, expressed in increments of one-fourth (0.25) of one ERU by rounding to the next highest one-fourth (0.25) of an ERU, however, no Non-Single-Family Residential Property shall be assessed at a rate of less than one (1) ERU. The charge shall be computed by multiplying the number of ERU's for a given property by the unit rate as set forth below in subpart "2" or as later adopted by Resolution of the Township of Hampton.

2. The Base ERU Rate shall be reviewed and, if necessary, revised at least once every five (5) years after the effective date of this Ordinance. The Base ERU Rate as established by this Ordinance shall be $115.00 per ERU per year.

B. Measurement of impervious surfaces

1. An owner of Non-Single-Family Residential Property may file an application with the Township contesting the calculation of impervious surface area on the lot as of the date of the application. The applicant must submit satisfactory evidence as required by the Township, such as square footage measurements and descriptions of the relevant buildings or materials. Any approved changes in calculations will take effect on the first day of the billing period beginning after the application was submitted, even if retroactive as of date of approval; no refunds or credits shall be granted for amounts billed prior to submission of the application. The applicant may appeal the determination of the Township as set forth in Section 11.

2. The Township shall review and update the impervious surface data as necessary.

3. Upon close-out of any building permit under which the associated documentation or other data indicate that impervious surface has been constructed upon a lot, the Township of Hampton Building Code Administrator shall provide the Township notice of the number of square feet of impervious surface added, in net, to the lot, as indicated on documentation associated with said permit, together with the applicable tax lot number. The Township shall thereafter update the data to reflect the adjusted impervious surface area on the lot.

SECTION 8. EXEMPTIONS AND CREDITS APPLICABLE TO RENTAL, RATES AND CHARGES: STORMWATER MANAGEMENT AND POLLUTION CONTROL FEE

Credits against rental, rates, and charges are appropriate means for adjusting fees, rates, rental, charges, fines and penalties, under some circumstances, to account for applicable mitigation measures. Credit mechanisms are set forth in the Stormwater Management and Pollution Control Fee Credit Manual attached hereto as "Exhibit A" and as may be amended by Resolution of the Township of Hampton. No exception, credit, offset, or other reduction in rental, rates, and charges shall be granted based upon age, race, tax status, political affiliation, economic status, or religion of the customer or other condition unrelated to the demand for a cost of services provided by the Township.

SECTION 9. STORMWATER ACCOUNT AND BILLING

A. The Township shall create and maintain a dedicated stormwater account separate from all other Township accounts or funds. All stormwater management and pollution control fees, and any penalties or interest on such fees, shall be deposited into that account, and shall be used by the Township solely to provide stormwater services.

B. Billing

1. The Township shall issue bills for stormwater management and pollution control fees three times a year, or another regular periodic basis, not less than annually. The stormwater management and pollution control fees may be billed separately.

    a. All properties subject to the payment of stormwater management and pollution control fees shall be entitled to a discount of two (2%) from the amount of such fee upon making payment of the whole amount thereof within the first thirty (30) days of the calendar year.

    b. If the fee is not paid at a discount, the face amount may be paid in three (3) equal installments. The first installment is due the last day of January of the calendar year. The second installment is due the last day of May of the calendar year billed. The third and final installment is due the last day of September of the calendar year.

    c. If a property owner elects to pay via installments, the two percent (2%) discount shall not apply. If a property owner is delinquent in making an installment payment, penalty and interest, as outlined in Section 10, will be applied on the outstanding balance upon delinquency.

2. Bill recipient

   a. The Township shall bill the stormwater management and pollution control fee to the owner of each lot or property, unless such other agreement is made by the Township.

   b. In all cases, the owner is finally responsible for any unpaid stormwater management and pollution control fees, including penalties and/or interest.

3. If a lot is incorrectly billed, or not billed, or a bill is sent to the wrong party, the Township may back-bill the owner for a period not to exceed two years.

4. The Township is authorized to develop billing forms, guidelines, and practices not inconsistent with this section.

SECTION 10. ENFORCEMENT AND PENALTIES

A. Effects of nonpayment

1. The stormwater management and pollution control fee shall be payable without penalty for thirty (30) days following the bill date.

2. Effective on the 31st day following the bill date, a penalty of five (5%) percent of the billed amount for that billing period shall be added for nonpayment within the time allowed.

3. On all amounts remaining unpaid after sixty (60) days following the bill date, and after each period of thirty (30) days or portion thereof thereafter, one (1%) percent of the amounts unpaid (including penalties assessed for non-payment) shall be added and collected.

4. In accordance with the Municipal Claim and Tax Lien Law, 53 P.S. § 7101, et seq., any uncontested portion of the stormwater management and pollution control fee, with any added penalty or interest, shall constitute a lien upon and against the subject lot from the date of the bill date.

SECTION 11. REVIEW AND APPEAL PROCESS

A. Any owner who believes the provisions of this Ordinance have been applied in error may appeal in the following manner and sequence.

1. Any person aggrieved by the Township's determination pursuant to Sections 7 and 8 of this Ordinance (appealing impervious surface or credit

determination) may appeal such decision to the Township Council within sixty (60) days of the date of the adverse decision. Such appeal must be in writing and explain why the Township's decision should be reversed. The appeal will be considered at the next regular meeting of the Township Council occurring at least ten (10) days after receipt of the appeal by the Township. The aggrieved person may present evidence at the open meeting at which the appeal is considered, but such evidence must be limited to the matters stated in the written appeal. The Township will issue a written determination within thirty (30) days of the open meeting at which the appeal was considered.

2. Any person with a direct interest who is aggrieved by the Township's written determination of an appeal, or by the failure of the Township to make a written determination within thirty (30) days of the meeting at which an appeal was considered, shall have the right to appeal to the Court of Common Pleas.

B. Whenever any stormwater management and pollution control fee charged under the provisions of this Ordinance is set aside, then the Township is authorized to issue a new fee with the same force and effect and complying with any legal requirements.

SECTION 12. FLOODS AND LIABILITY

Floods from stormwater runoff may occur occasionally that exceed the capacity of the stormwater system maintained and financed with the stormwater management and pollution control fee. This Ordinance does not imply that properties subject to the stormwater management and pollution control fee shall always be free from flooding or flood damage, or that all flood control projects to control runoff can be constructed cost-effectively. Nothing whatsoever in this Ordinance shall deem the Township of Hampton liable for any damages incurred in a flood or from adverse water quality. Further, payment of a stormwater management and pollution control fee does not relieve an owner or third party from any local, state, or federal requirements to obtain flood insurance or other law applicable to the lot.

SECTION 13. REPEALER

That any and all previous Ordinance(s) which are inconsistent with the terms and provisions of this Ordinance are hereby repealed.

SECTION 14. SEVERABILITY

That if any sentence, clause, section, or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not affect or impair any of the remaining provisions, sentences, clauses, sections or parts of this Ordinance. It is hereby declared as the intent of the Township of Hampton Council that this Ordinance would have been adopted had such unconstitutional, illegal or invalid sentence, clause, section or part thereof not been included herein.

SECTION 15. EFFECTIVE DATE

That this Ordinance shall take effect January 1, 2020 as provided by law.

ADOPTED AND ENACTED into law this 4th day of December, 2019 at a special meeting of Hampton Township Council, a quorum being present and a majority assenting hereto.

ATTEST:

Municipal Manager

TOWNSHIP OF HAMPTON

By: President of Council

APPROVED TO AS TO FORM

Vincent A. Tucceri, Esquire
Township Solicitor

REVISED AS December 3, 2019

Township of Hampton
Stormwater Management and Pollution Control Fee
Credit Manual

Prepared By:

The Gateway Engineers, Inc.

Approved December 4, 2019

W. Christopher Lochner, Municipal Manager

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1 INTRODUCTION AND OVERVIEW

The Township of Hampton established a municipal wide stormwater management and pollution control fee. The fee is intended to provide a stable source of revenue for the Township's stormwater management program that allocates the costs of stormwater services across stormwater "users" in the Township through a stormwater management and pollution control fee (or user fee). Ordinance No. 829 that enacted the user fee contains much of the rationale for the fee and the credits detailed herein and is incorporated herein by reference.

The Township has structured the user fee and potential credits into two categories based on the property usage: **Single Family Residential Property** and **Non-Single Family Residential Property**. The potential credits are for stormwater service customers who take an approved action that reduces the demand for stormwater service on the public stormwater system. This manual will detail the policies and procedures for fees and credits.

The following is a brief overview of each category.

Single Family Residential Property

Definition: A Single Family Residential Property can be described as a separate and distinct lot or property having its own tax parcel identification number and containing no more than two residential dwelling units, specifically including Duplexes/Two-Family Residential Property as defined by Ordinance No. 829, and specifically excluding condominiums and mobile homes that are limited to the living area of the dwelling unit such that they require the use and access of commonly held property.

Credits Available For: Properties that discharge stormwater (such as downspouts, inlets, swales or channels) to a rock sump, rain garden or compliant stormwater basin.

Fee: A one-time $25 application fee will be collected with the Stormwater Credit Application.

Homeowner's Association (HOA): A HOA may apply for a credit for a facility servicing the HOA or portion thereof; individual property owners cannot apply for the HOA facility. Upon approval, up to 25% credit will then be applied to each of the single family residential properties the facility

is servicing. The requirements for Operation and Maintenance (O&M) of the facility must be met (see credit manual for requirements). A list of all parcel numbers serviced by the facility must be included with the Stormwater Credit Application.

Maximum Credit: The credit for a single family residential property shall be 25% of the annual fee. Duplicate credits are not available, such as on-lot system and HOA facility.

Credit application: Is due by 3-31 each year and the credit, if approved will be applied starting with the next year's bill.

Non-Single Family Residential Property

Definition: A Non-Single Family Residential Property can be described as any property that does not fit the definition of Single-Family Residential Property as defined by Ordinance No.829, including but not limited to, apartment buildings, commercial buildings, industrial buildings, schools, churches, government buildings and other similar structures or improvements constituting 500 or more square feet of impervious surface.

Credits Available For: Peak Flow Attenuation (detention facilities that control the rate of runoff to pre-development levels).

Fee: A fee will be collected with the Stormwater Credit Application for Peak Flow Attenuation based on $25 per ERU of service for evaluation, up to a maximum of $250.

Maximum Credit: The Peak Flow Attenuation credit shall not exceed 50% of the property's stormwater fee upon approval. The credit shall only be applied to the portion of the property's impervious area serviced by the stormwater facilities.

Credit application: Is due by 3-31 each year and the credit, if approved will be applied starting with the next year's bill.

Ongoing O&M Requirements:

The facilities must be owned, operated, and maintained by the applicant.

Maintenance must be routinely performed and documented to the Township every other year.

2 GENERAL POLICIES

These policies and conditions apply to both categories, Single Family Residential Property and Non-Single Family Property. Certain conditions must be met, and credit applications must be submitted that will determine what properties qualify for a credit and the amount of credit. General policies for credits are listed below, the specific policies for each category will then follow.

1) Credit is given to eligible properties only, as presented in this manual and/or in the credit application(s).
2) Credit application forms are available at the Township Building located at 3101 McCully Road, Allison Park, PA 15101 and the Township's website http://hampton-pa.org/
3) Credit application forms must be submitted to the Department of Community Development, 3101 McCully Road, Allison Park, PA 15101, 412-486-0400 by March 31 of each year.
4) The application will be evaluated only after all information has been received and within 4 weeks to determine the amount of credit that the applicant is entitled and if approved, it will commence to be applied on the following year's bill.
5) It is the responsibility of the property owner to apply for stormwater credits, and to provide the necessary substantiating information with the credit application.
6) Credits for past due accounts or past years will not be considered.
7) Questions regarding credits should be referred to the Land Use Administrator. Township staff are not responsible for initiating, performing engineering calculations, or otherwise assisting with preparation of credit applications.
8) Credits are maintained on a property as long as the activity is being performed in accordance with Township requirements, or the stormwater facility is properly functioning in accordance with applicable Township codes and ordinances, or the policies stated herein and/or confirmation by the Township's Engineer.
9) Termination of credits based upon Township inspection may occur. If a BMP or stormwater facility has been found to be operating inadequately. A written notice will be issued by the Township, and If corrections have not been made within 30 days of notification by the Township in writing the credits will be terminated.
10) Appeal of the credit determination can be made in accordance with Section 11 of the ordinance.

11) Credit applications for new developments can occur as part of the normal development plan review procedures. The completed credit application should accompany the final plan for a Subdivision or land development for the property. Any credit would not be available until the peak flow attenuation facility has been installed and inspected by the Township Engineer.
12) For these credits, a Right-of-Entry or easement, as applicable, must be granted to the Township in order for the Township to review and approve the credit and to perform occasional inspections to see that the stormwater management facility is maintained and operating as designed. Right-of-entry is granted via the applicant's or property owner's signature on the credit application.
13) The credits will remain in place with automatic renewal unless the required operational provisions are not met.

3 CATEGORIES OF FEE

3.1 Single Family Residential Property

A Single Family Residential Property can be described as a separate and distinct lot or property having its own tax parcel identification number and containing no more than two residential dwelling units, specifically including Duplexes/Two-Family Residential Property as defined by Ordinance No.829, and specifically excluding condominiums and mobile homes that are limited to the living area of the dwelling unit such that they require the use and access of commonly held property.

3.1.1 Single Family Residential Property BMP Credit

A BMP, Best Management Practice, is a practice, procedure or structure that helps reduce or prevent the discharge of pollutants into the public storm sewer system. Individual BMPs available for a credit include rock sumps, rain gardens, permeable pavement, green roof, underground detention, infiltration basin, bed, or trench, channel or swale, and individual detention/retention ponds. For illustrations of the available BMPs (see attached Exhibit No. 2). Credit for the individual BMP is available only to properties that discharge stormwater to the these BMPs which are to be in compliance with Appendix F of Ordinance No. 815 Hampton Township (see attached Exhibit No. 1). The maximum credit for a Single Family Residential Property shall be 25% of the annual stormwater fee.

3.1.2 Single Family Residential Property Application Process

To qualify for credits, the single family residential property owner, applicant, must fill out a credit application form. The credit shall remain valid, and in effect, until such time as the BMP is found to not be operational by Hampton Township. A onetime application for credit must be submitted to the Township along with the application fee of $25.

Credits shall be established as follows:

1) If the applicant's information regarding the construction of a BMP on their property is in the Township files, the credit shall be granted.
2) If the applicant has constructed a BMP and the information is not on file, an on-site verification must be performed by a Township designated party.
3) If a single family home wishes to construct a BMP, the new BMP facility shall be installed in accordance with the Pennsylvania Stormwater BMP Manual and be verified during construction by the Township or its designated representative. The credit shall be applied to the following year's bill.
4) Credit applications for existing facilities shall be made by March 31st and will commence in the following year.
5) The maximum single family residential property credit shall be 25% of the annual fee. Duplicate credits are not available, such as an individual BMP and HOA facility.

3.1.3 Homeowner's Association Application Process

A homeowner's association (HOA) may apply for a credit for a detention/retention facility that services a neighborhood of single family residential properties. The credit will be applied uniformly to the number of single family residential properties within the HOA in which the facility is located for up to 25%, provided that the requirements for operation and maintenance for detention/retention facilities is met, see Non-Single Family Residential Property. A list of the tax parcel numbers for each of the single family residential properties serviced by the facility must be submitted with the credit application.

To qualify for credits, the HOA, applicant, must fill out a credit application form and submit it to the Department of Community Development, 3101 McCully Road, Allison Park, PA 15101, 412-486-0400. The application will be evaluated to determine the amount of credit that the applicant is entitled. The credit shall remain valid, and in effect, until such time as the BMP is found to not

be operational by Hampton Township or its designated representative. Appeal of the credit determination can be made in accordance with Section 11 of the ordinance.

The maximum credit given to the individual lot owner shall be 25% of the annual fee for a single family dwelling. Duplicate credits are not available, such as an individual BMP credit and HOA facility credit.

3.2 Non-Single Family Residential Property

A Non-Single Family Residential Property can be described as any property that does not fit the definition of Single-Family Residential Property as defined by Ordinance No.829, including but not limited to, apartment buildings, commercial buildings, industrial buildings, schools, churches, government buildings and other similar structures or improvements constituting 500 or more square feet of impervious surface.

3.2.1 Peak Flow Attenuation Credit

A Peak Flow Attenuation Credit is available only to properties that discharge stormwater to a detention or retention facility that is in compliance with Ordinance No. 815 and that are constructed and maintained properly. The credit will be assessed for the portion of the property serviced by stormwater facility. The stormwater facility's design must be documented by a professional engineer, retained by the applicant, and a report and calculations on the performance of the system must be submitted for review by the Township.

3.2.2 Peak Flow Attenuation Credit Criteria

1) A Peak Flow Attenuation credit will be available to non-residential properties that have onsite stormwater detention/retention ponds or other structural BMPs designed to control the peak flow from the property in accordance with the Stormwater Management Ordinance No. 815 of Hampton Township.
2) The facility must, at a minimum, be designed in accordance with Township requirements at the time of approval of the development. A facility design, that is not designed for all the storms, will receive no credit, partial or otherwise.

3) Sufficient information including as built plans and an engineering analysis must be supplied to the Township Manager or his designee to verify that the controls meet the following criteria: the peak runoff rate under post development conditions must be in accordance with Township requirements at the time of approval of the development
4) Credit applications for new installation of facilities may be submitted to the Township Manager or his designee at any time during the construction process. However, the credit will not be approved based on site plans alone. The credit application requires that the detention/retention facility must be constructed and working in proper operating condition as certified by a professional engineer retained by the applicant and be under the ownership of the applicant.
5) The total credit percentage for the Peak Flow Attenuation shall not exceed a 50% credit of the property's stormwater fee.
6) A credit shall only be applied to the portion of the property's impervious area served by the stormwater facilities. Thus, if only 80% of the impervious area is served by a functioning facility, and a 50% credit is applied, the entire parcel credit will be 80% * 50% = 40%.
7) All detention/retention systems for which credit is applied must be working in proper operating condition at the time that the application is submitted.

3.2.3 Ownership and Maintenance Requirements

1) The non-single family property stormwater facilities must be owned, operated and maintained, either by the owner or record or by third party agreement, by the applicant. The applicant must provide documentation of the above to the Township at the time of application for credit. An inspection and maintenance schedule must be provided, and records kept such that a report can be submitted to the Township every other year documenting its performance and certified by a professional engineer.
2) The stormwater detention/retention facilities must be operated and maintained in proper condition to control the peak runoff rate as demonstrated in the credit application, in accordance with the maintenance standards presented in this manual. If the applicant does not operate and maintain the facility as required, the credit will be discontinued, if when notified by Department of Community Development in writing that the corrections are not made within 30 days credits may be terminated.
3) In order for stormwater retention and detention facilities to operate as they were intended, maintenance must be routinely performed and documented to the Township on an every

other year basis. Improperly maintained stormwater facilities do not reduce stormwater impacts effectively and are therefore ineligible for credit. The following items are the basic minimum maintenance requirements for all applicable stormwater facilities:

a) Sediment shall be removed when it is affecting the proper operation of the facility.
b) No woody vegetation shall be allowed to grow on any planted embankments without special design provisions approved by the Township.
c) Detention control devices should be checked a minimum of two times a year and after heavy rain events for debris accumulation and clogging. Debris shall be removed as soon as possible from blocking inlet and outlet structures and from other areas of potential clogging (i.e., weirs, pipes, grates, etc.). This is especially important after major storms.
d) The control structures shall remain unaltered and be kept structurally intact and functioning as originally designed.
e) Maintenance records of all such activities shall be maintained and submitted with a report from a professional engineer every other year documenting facility performance.

3.2.4 Non-Single Family Residential Application Process

To qualify for credits, the non-single family property owner, applicant, must fill out a credit application form and pay an application fee equal to $25 per ERU of service, up to a maximum of $250.00. Documentation by a licensed professional engineer, secured by the applicant, in the form of a report and surveyed as-built plan must be submitted with the credit application.

The application will be evaluated to determine the amount of credit that the applicant is entitled. Multiple credits may be given to eligible properties. However, the total credit available to any one property shall not exceed 50% of the stormwater management and pollution control fee.

The credit shall remain valid, and in effect, on a property as long as the stormwater facility is being maintained and properly functioning in accordance with Township requirements. Termination of credits based upon Township inspection may occur. If the facility is found to be operating inadequately a written notice will be issued by the Township. If corrections have not been made within 30 days of notification by the Township in writing the credits will be terminated.

4 DEFINITIONS

Base ERU Rate – The total fee assessed to one equivalent residential unit, as proposed and approved by the Township. The Base ERU Rate shall be less than or equal to the Township's total anticipated stormwater expenses divided by the number of ERU's in the municipality.

Best Management Practices (BMP): Methods, procedures, and analyses specified in Pennsylvania's Department of Environmental Protection's Stormwater Best Management Practices Manual ("Stormwater BMP Manual"), Commonwealth of Pennsylvania, Department of Environmental Protection, No. 363-0300-002 (December 2006), as amended and updated, to reduce flooding potential and control the volume, flow rate, and water quality of stormwater.

Credit: Two types of credits exist:

> **Peak Flow Attenuation Credit:** The reduction of the peak flow in accordance with Township requirements at the time of approval of the development for a portion of the property affected by use of a structural stormwater control system as documented by a professional engineer, retained by the applicant, through a report and calculations on the performance of the system.
>
> **Single Family Residential Property BMP Credit:** The verification of installation by Township of Hampton of existing BMP's installed or the construction of a new BMP, which is inspected by Township of Hampton. BMP's shall be installed in accordance with the Hampton Township BMP Manual (Appendix F of Ordinance No. 815) which is attached as Exhibit 1.

Detention facility: A stormwater structure, by means of a single control point, which provides temporary storage of stormwater runoff in ponds, parking lots, depressed areas, rooftops, buried underground vaults or tanks, etc., for future release, and is used to delay and attenuate peak flow and/or reduce the discharge of pollutants from land.

Equivalent Residential Unit ("ERU"): The measure of impervious surface on a typical single-family residential property in the Township of Hampton. The ERU shall be determined by generating a random, statistically significant sample of single-family residential properties and

calculating the impervious surface on each property in the sample. The median of impervious surface area across the sample property shall be the ERU. The ERU has been determined to be 3,300 square feet of impervious area. The ERU is used in determining the fees assessed for each lot/property in the municipality.

Impervious Surface: Any surface on a property that, because of the surface's composition or compacted nature, impedes or prevents natural infiltration of water into the soil, including, but not limited to, roofs, solid decks, driveways, patios, swimming pools, sidewalks (other than public walks located in the Township's right-of-way), parking areas, tennis courts, concrete, asphalt, or crushed stone streets or paths, or compacted material of any kind as determined by the Township.

Non-Single Family Residential Property: Any property that does not fit the definition of Single-Family Residential Property as defined by Ordinance No.829, including but not limited to, apartment buildings, commercial buildings, industrial buildings, schools, churches, government buildings and other similar structures or improvements constituting 500 or more square feet of impervious surface.

Retention Facility: A stormwater facility that provides storage of stormwater runoff and is designed to eliminate subsequent surface discharges. These facilities can be effective in reducing downstream flooding because they do not allow discharge of stormwater runoff to downstream locations except in extreme flood events where the storage volume of the facility is exceeded. Retention facilities can also be effective in reducing stormwater pollution since the pollutants contained in stormwater are not released downstream.

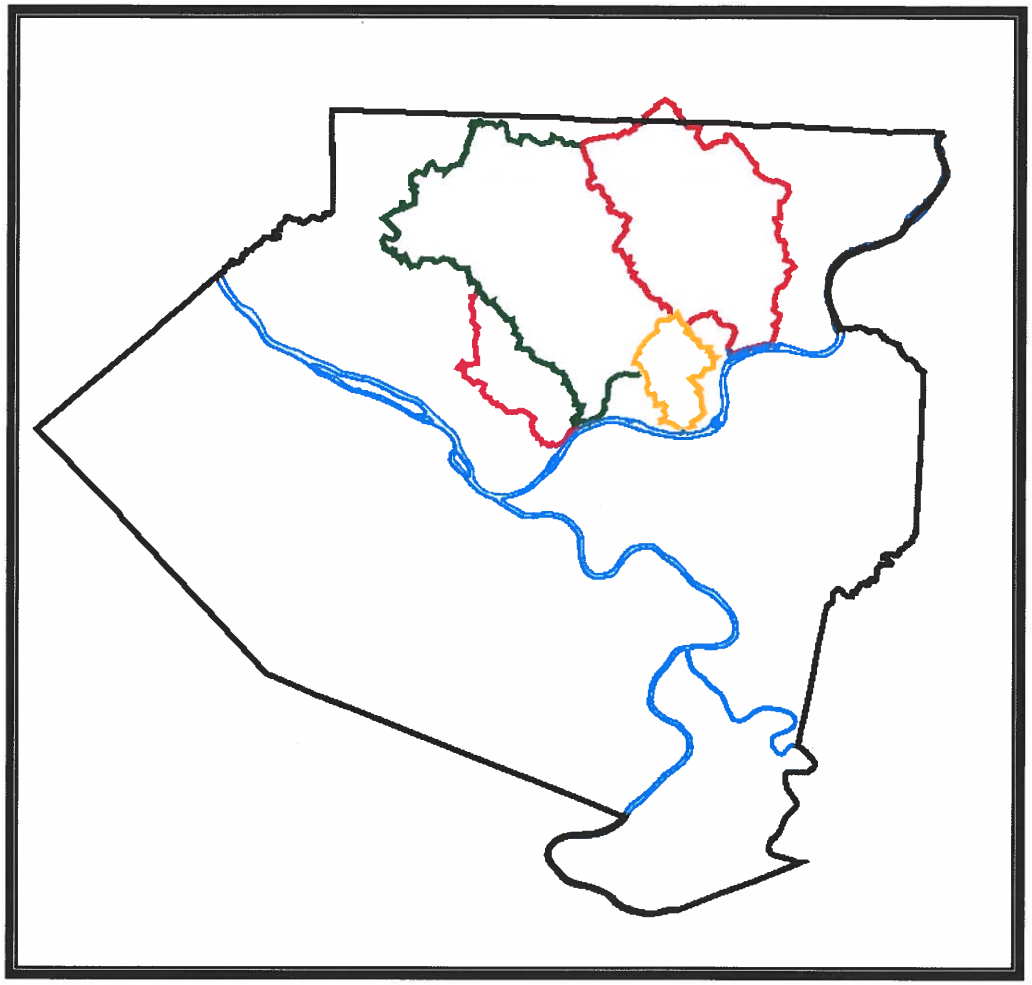
Single Family Residential Property: A separate and distinct lot or property having its own tax parcel identification number and containing no more than two residential dwelling units, specifically including Duplexes/Two-Family Residential Property as defined by Ordinance No.829, and specifically excluding condominiums and mobile homes that are limited to the living area of the dwelling unit such that they require the use and access of commonly held property.

Stormwater: Includes runoff water from all precipitation events, snowmelt and springs.

Exhibit No. 1

Appendix F Ordinance No. 815 (42 pages)

Small Project
Standardized Stormwater Management Planning Guidance



Act 167 Stormwater Management Plan Update
Girtys Runs, Pine Creek, Squaw Run and Deer Creek Watersheds
Allegheny County, Pennsylvania

Standardized Stormwater Management Planning Guidance For Small Projects

Applicability

These criteria may be used to develop a stormwater management (SWM) plan for small projects, having a disturbed area of less than 2500 square feet, in an area where a comprehensive subdivision SWM plan has not been planned or constructed. It is not to be used to plan for multiple lots without the written approval of the Municipal Engineer.

This guidance may not be appropriate for all locations (e.g., in areas on or adjacent to steep slopes, in areas on or adjacent to fill slopes, in areas having unsuitable soil conditions (e.g., clayey soils) or in areas having a high water table). The Municipal Building Inspector or Engineer may require that a more detailed stormwater management plan be prepared by a qualified design professional if, in their opinion, unusual site conditions exist.

These standardized SWM facilities, if properly sized and installed, should provide the water quality volume, infiltration volume and extended detention protections required by the municipality's SWM Ordinance. These standardized facilities are not specifically sized to provide for the peak flow reduction requirement, if any, but will generally provide peak flow control of storm events that do not exceed a 10 year – 24 hour return period.

What are the Standardized SWM facilities?

The Standardized SWM facilities (Standardized BMPs) are a set of three methods, or best management practices (BMPs), that have been selected because of their potential for being sited on individual residential lots. Each of the methods has been sized using a specific set of design assumptions. A list of the Standardized SWM facilities and the basic design assumptions used are outlined below. A more detailed set of the design assumptions used to size the Standardized SWM facilities is provided later in this Guide. It is the Applicant's responsibility to verify that the assumptions are appropriate for the subject property. Construction details and more detailed information about the design installation and maintenance requirements for of each of the facilities are also provided later in this document.

SWM Facility Name	Basic Design Assumptions		
Bioretention	4' Filter Bed Depth	0.5' Ponding Depth	Drain Time = 2 Days
Rock Sump	4' Rock Depth		
Porous Pavement	2' Gravel Depth	0.32 Gravel Porosity	Fill Time = 2 Hours

What is required?

A. Install "Stormwater Management Facilities (BMPs)" to reduce downstream flooding and protect the water quality of our streams.

B. Install erosion and sedimentation control devices during construction to keep silt and sediment from washing into the storm sewers, ditches or streams on or adjacent to the site.

C. Properly record a maintenance agreement to insure the continued maintenance and protection of the SWM facilities.

When is it required?

Applicants will be required to file a SWM plan with their building permit or land disturbance / grading permit application as per the municipality's requirements.

Are professional services required?

Yes, the SWM facilities must be designed by a licensed professional engineer or other Qualified Professional experienced in the design of stormwater management.

Are the Standardized SWM facilities in this Guide required?

No, any SWM facilities meeting the municipality's Stormwater Management Regulations will be acceptable.

How should this Guide be used?

Step 1 – Determine the Impervious Area and the Disturbed

Area Calculate the following:

1. The total area in square feet of roofs, driveways, sidewalks, paved areas and any other impervious surfaces proposed for the lot.
2. The total area in square feet of the lot that is to be disturbed. "Disturbed Area" is all area that is to be stripped of natural vegetation and converted to lawn, roof, pavement, sidewalk or driveway.

Step 2 – Determine the required surface area of the Standardized BMPs

Go to the Determination of SWM Facility Sizing Tables (Disturbed Area Table) and find the table that is titled with a "Disturbed Area = [Value] SF" where [Value] is equal to or greater than the proposed "Disturbed Area" for the lot. For example, if the lot will have a disturbed area of 2200 SF, use the table titled "Disturbed Area = 2500 SF or Less" as shown below.

Using the correct Disturbed Area Table, determine the sizing of the standardized SWM facility or facilities to be used, using the area in square feet of **all** impervious surface tributary to the SWM facility or facilities. This area is referred to as "Area Impervious" on the Table and is found in Column "1".

Go down Column "1" to the "Area Impervious" value that is greater than or equal to the impervious area tributary to the SWM facilities. For example, if it is determined that the total area of all roof and pavements tributary to the SWM facilities will be 1921 square feet (SF), use a value of 2000 square feet to determine the SWM facility sizing for the three standardized best management practices provided in Columns 3, 4 and 5 of the table. NOTE: If runoff from existing impervious areas will also be tributary to the SWM facilities, that area must also be included in the calculations.

For this example where the Disturbed Area is 2200 SF and the Area Impervious is 1921 SF, the surface area (foot print size) of the Standardized BMP Options provided are:

Column 3 - Bioretention Surface Area = 151 SF
Column 4 – Rock Sump Foot Print = 212.5 SF
Column 5 – Porous Pavement Surface Area = 222 SF

Disturbed Area = 2500 SF or Less

Determination of SWM Facility Sizing AG 3/3/7

Note: Disturbed area is all area that is to be stripped of natural vegetation and converted to lawn, roof, pavement, sidewalk or driveway.

Bioretention Assumptions
k = 0.5 ft/day for silt loam
df = filter bed depth = 4'
hf = half of ponding depth = 0.25'
tf = filter drain time = 2 days

Rock Sump Assumptions
Assume 4' Sump Depth

Pourous Pavement Assumptions
n = porosity of gravel = 0.32
d = gravel depth = 2'
k = percolation = 0.5 in/hour
T = fill time = 2 hours

1			2					3	4	5
Area Impervious (Square Feet)	Area Impervious (acre)	Disturbed Area (acre)	Disturbed Area (Square Feet)	Percent Impervious (%)	Volumetric Runoff Coeficient (Rv)	Water Quality Volume (acre - feet)	Water Quality Volume (cubic feet)	Bioretention Surface Area (Square Feet)	Rock Sump Surface Foot Print (Square Feet)	Pourous Pavement Surface Area (Square Feet)
250	0.005739	0.0573921	2500	10.00%	0.1400	0.0006696	29	27	26.6	40
300	0.006887	0.0573921	2500	12.00%	0.1580	0.0007557	33	31	31.9	46
400	0.009183	0.0573921	2500	16.00%	0.1940	0.0009278	40	38	42.5	56
500	0.011478	0.0573921	2500	20.00%	0.2300	0.0011000	48	45	53.1	66
600	0.013774	0.0573921	2500	24.00%	0.2660	0.0012722	55	52	63.8	77
700	0.016070	0.0573921	2500	28.00%	0.3020	0.0014444	63	59	74.4	87
800	0.018365	0.0573921	2500	32.00%	0.3380	0.0016165	70	66	85.0	97
900	0.020661	0.0573921	2500	36.00%	0.3740	0.0017887	78	73	95.6	108
1000	0.022957	0.0573921	2500	40.00%	0.4100	0.0019609	85	80	106.3	118
1100	0.025253	0.0573921	2500	44.00%	0.4460	0.0021331	93	87	116.9	128
1200	0.027548	0.0573921	2500	48.00%	0.4820	0.0023052	100	95	127.5	139
1300	0.029844	0.0573921	2500	52.00%	0.5180	0.0024774	108	102	138.1	149
1400	0.032140	0.0573921	2500	56.00%	0.5540	0.0026496	115	109	148.8	160
1500	0.034435	0.0573921	2500	60.00%	0.5900	0.0028218	123	116	159.4	170
1600	0.036731	0.0573921	2500	64.00%	0.6260	0.0029940	130	123	170.0	180
1700	0.039027	0.0573921	2500	68.00%	0.6620	0.0031661	138	130	180.6	191
1800	0.041322	0.0573921	2500	72.00%	0.6980	0.0033383	145	137	191.3	201
1900	0.043618	0.0573921	2500	76.00%	0.7340	0.0035105	153	144	201.9	211
2000	0.045914	0.0573921	2500	80.00%	0.7700	0.0036827	160	151	212.5	222
2100	0.048209	0.0573921	2500	84.00%	0.8060	0.0038548	168	158	223.1	232
2200	0.050505	0.0573921	2500	88.00%	0.8420	0.0040270	175	165	233.8	243
2300	0.052801	0.0573921	2500	92.00%	0.8780	0.0041992	183	172	244.4	253
2400	0.055096	0.0573921	2500	96.00%	0.9140	0.0043714	190	179	255.0	263
2500	0.057392	0.0573921	2500	100.00%	0.9500	0.0045435	198	186	265.6	274

Figure -Example Table "Determination of SWM Facility Sizing (Disturbed Area Table)

Applicants may use a single option to satisfy the SWM requirements or a combination of options.

For example, a single type of facility, say Bioretention, could be installed as set forth below:

SWM Facility Type	Total Required	Actual SF Installed	Percentage of SWM Requirement
	(SF)	(SF)	(%)
Bioretention	151	151	100%
Rock Sump	212.5	0	0%
Porous Pavement	222	0	0%
			100%

or multiple SWM facility types could be proposed:

SWM Facility Type	Total Required	Actual SF Installed	Percentage of SWM Requirement
	(SF)	(SF)	(%)
Bioretention	151	50	33%
Rock Sump	212.5	35	16%
Porous Pavement	222	111	50%
			100%

Step 3 – Preparing the SWM Site Plan

Applicants shall submit three (3) copies of a plot plan survey or site plan drawn on a single sheet no larger than 8 1/2" x 14" (or folded to 8 1/2" x 11") containing all of the following information. (Submission of one plan showing existing conditions and a second plan(s) showing proposed work generally will not be acceptable.)

1) Name and address of owner(s).

2) Lot number, name of subdivision, size of lot, street address, scale, date.

3) North arrow.

4) All existing and proposed structures, including accessory structures, additions, driveways, decks, patios, utilities, storm sewers, sanitary sewers including laterals, fresh-air vents and cleanouts, storm water sumps, swimming pools and sports courts with all dimensions. When the existing sewer lateral is within the limit of disturbance, the site plan must show its exact location based on existing records. When no such records exist, laterals shall be located using underground pipe locator equipment.

5) Setback distances from all property lines. Building lines must be shown.

6) The distance and direction to the nearest intersection.

7) Existing topography by two-foot (2') contours and all proposed grading clearly shown.

8) The limits, type and degree of risk as shown on any Hazard Maps that the municipality has available.

9) Shading, coloring, cross-hatching, etc. between contour lines to clearly distinguish the areas of Steep Slopes (15% - 25%) and Very Steep Slopes (25%+).

10) The PRECISE "Limit of Disturbance" and the area thereof.

11) All right-of-ways, easements, streams or ponds.

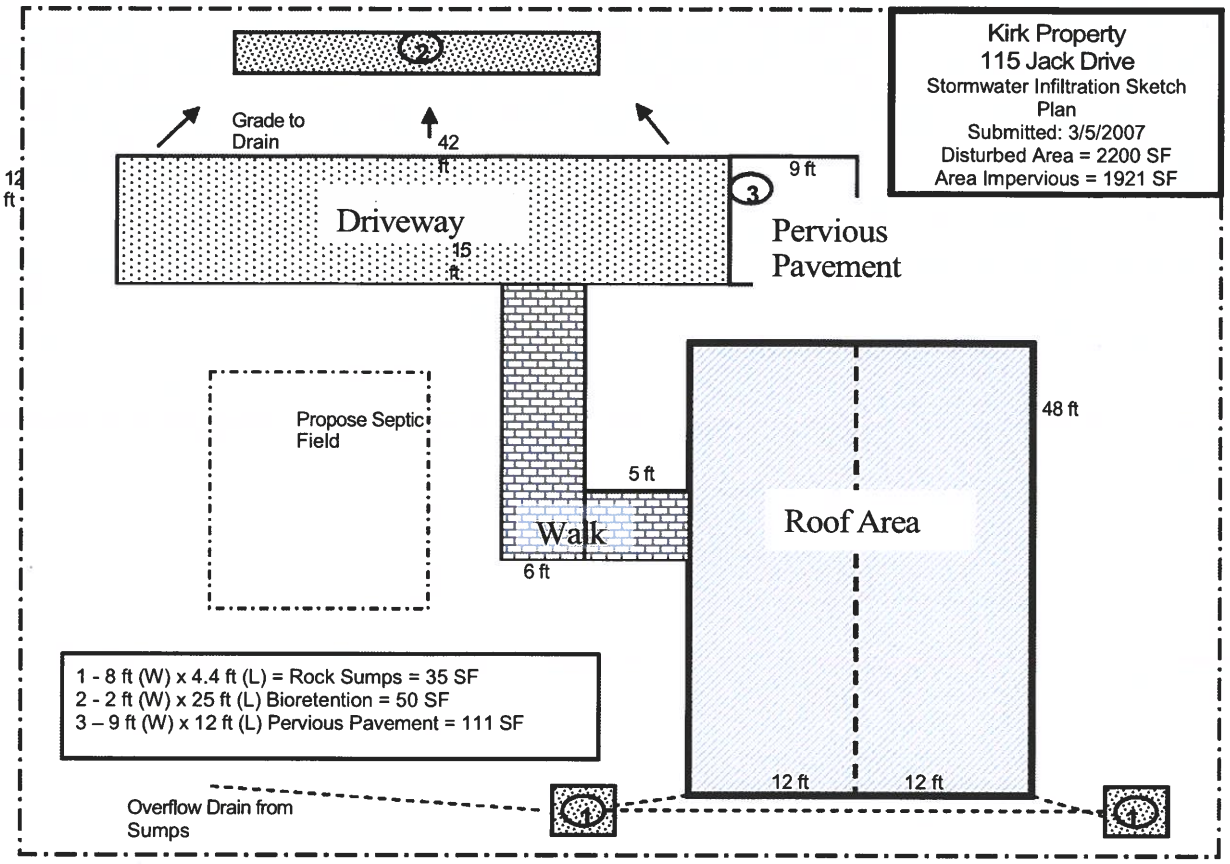
12) The location of all proposed utility lines and the associated "Limit of Disturbance".

13) The method of stormwater management in accordance with the requirements set forth in the municipality's Stormwater Management Regulations. The applicant shall include two (2) copies of the design criteria and method of stormwater management with the application.

14) Soil erosion and sedimentation control plan with construction details.

15) A registered Engineer's or other Qualified Professionals seal.

A simple example site plan is provided on the next page.



Step 4 – Submitting the SWM Plan

The following information shall be submitted with the application for a building permit or, if applicable, the Environmental Disturbance / Grading Permit:

- The Standardized SWM Permit Application
- A fully executed "Stormwater BMPs Operations and Maintenance Agreement"
- The SWM site plan.
- A copy of the "Guidance Sheet" for each type of BMP used.

Step 5 – Installing the Standardized BMPs

Insure that each SWM facility is installed as per the requirements of the "Guidance Sheet" for the type(s) of facilities proposed.

Step 6 – Understanding your maintenance responsibilities

In order to insure that the BMPs will continue to be protected and properly maintained, applicants will be required to enter into a "Stormwater Best Management Practices Operations and Maintenance Agreement". A copy of the agreement is provided in the Appendix C of this document.

Disturbed Area = 1000 SF or Less

Determination of SWM Facility Sizing AG 3/3/7

Note: Disturbed area is all area that is to be stripped of natural vegetation and converted to lawn, roof, pavement, sidewalk or driveway.

Bioretention Assumptions
k = 0.5 ft/day for silt loam
df = filter bed depth = 4'
hf = half of ponding depth = 0.25' tf = filter drain time = 2 days

Rock Sump Assumptions
Assume 4' Sump Depth

Porous Pavement Assumptions
n = porosity of gravel = 0.32
d = gravel depth = 2'
k = percolation = 0.5 in/hour
T = fill time = 2 hours

1			2					3	4	5
Area Impervious	Area Impervious	Disturbed Area	**Disturbed Area**	Percent Impervious	Volumetric Runoff Coefficient	Water Quality Volume	Water Quality Volume	**Bioretention Surface Area**	**Rock Sump Surface Foot Print**	**Porous Pavement Surface Area**
(Square Feet)	(acre)	(acre)	**(Square Feet)**	(%)	(Rv)	(acre - feet)	(cubic feet)	**(Square Feet)**	**(Square Feet)**	**(Square Feet)**
250	0.005739	0.02295684	**1000**	25.00%	0.2750	0.0005261	23	**22**	**NA**	**32**
300	0.006887	0.02295684	**1000**	30.00%	0.3200	0.0006122	27	**25**	**NA**	**37**
400	0.009183	0.02295684	**1000**	40.00%	0.4100	0.0007844	34	**32**	**42.5**	**47**
500	0.011478	0.02295684	**1000**	50.00%	0.5000	0.0009565	42	**39**	**53.1**	**58**
600	0.013774	0.02295684	**1000**	60.00%	0.5900	0.0011287	49	**46**	**63.8**	**68**
700	0.016070	0.02295684	**1000**	70.00%	0.6800	0.0013009	57	**53**	**74.4**	**78**
800	0.018365	0.02295684	**1000**	80.00%	0.7700	0.0014731	64	**60**	**85.0**	**89**
900	0.020661	0.02295684	**1000**	90.00%	0.8600	0.0016452	72	**67**	**95.6**	**99**
1000	0.022957	0.02295684	**1000**	100.00%	0.9500	0.0018174	79	**75**	**106.3**	**109**

Disturbed Area = 2500 SF or Less

Determination of SWM Facility Sizing AG 3/3/7

Note: Disturbed area is all area that is to be stripped of natural vegetation and converted to lawn, roof, pavement, sidewalk or driveway.

Bioretention Assumptions
k = 0.5 ft/day for silt loam
df = filter bed depth = 4'
hf = half of ponding depth = 0.25' tf = filter drain time = 2 days

Rock Sump Assumptions
Assume 4' Sump Depth

Porous Pavement Assumptions
n = porosity of gravel = 0.32
d = gravel depth = 2'
k = percolation = 0.5 in/hour
T = fill time = 2 hours

1			2					3	4	5
Area Impervious	Area Impervious	Disturbed Area	**Disturbed Area**	Percent Impervious	Volumetric Runoff Coefficient	Water Quality Volume	Water Quality Volume	**Bioretention Surface Area**	**Rock Sump Surface Foot Print**	**Porous Pavement Surface Area**
(Square Feet)	(acre)	(acre)	**(Square Feet)**	(%)	(Rv)	(acre - feet)	(cubic feet)	**(Square Feet)**	**(Square Feet)**	**(Square Feet)**
250	0.005739	0.0573921	**2500**	10.00%	0.1400	0.0006696	29	**27**	**NA**	**40**
300	0.006887	0.0573921	**2500**	12.00%	0.1580	0.0007557	33	**31**	**NA**	**46**
400	0.009183	0.0573921	**2500**	16.00%	0.1940	0.0009278	40	**38**	**42.5**	**56**
500	0.011478	0.0573921	**2500**	20.00%	0.2300	0.0011000	48	**45**	**53.1**	**66**
600	0.013774	0.0573921	**2500**	24.00%	0.2660	0.0012722	55	**52**	**63.8**	**77**
700	0.01 6070	0.0573921	**2500**	28.00%	0.3020	0.0014444	63	**59**	**74.4**	**87**
800	0.018365	0.0573921	**2500**	32.00%	0.3380	0.0016165	70	**66**	**85.0**	**97**
900	0.020661	0.0573921	**2500**	36.00%	0.3740	0.0017887	78	**73**	**95.6**	**108**
1000	0.022957	0.0573921	**2500**	40.00%	0.4100	0.0019609	85	**80**	**106.3**	**118**
1100	0.025253	0.0573921	**2500**	44.00%	0.4460	0.0021331	93	**87**	**116.9**	**128**
1200	0.027548	0.0573921	**2500**	48.00%	0.4820	0.0023052	100	**95**	**127.5**	**139**
1300	0.029844	0.0573921	**2500**	52.00%	0.5180	0.0024774	108	**102**	**138.1**	**149**
1400	0.032140	0.0573921	**2500**	56.00%	0.5540	0.0026496	115	**109**	**148.8**	**160**
1500	0.034435	0.0573921	**2500**	60.00%	0.5900	0.0028218	123	**116**	**159.4**	**170**
1600	0.036731	0.0573921	**2500**	64.00%	0.6260	0.0029940	130	**123**	**170.0**	**180**
1700	0.039027	0.0573921	**2500**	68.00%	0.6620	0.0031661	138	**130**	**180.6**	**191**
1800	0.041322	0.0573921	**2500**	72.00%	0.6980	0.0033383	145	**137**	**191.3**	**201**
1900	0.043618	0.0573921	**2500**	76.00%	0.7340	0.0035105	153	**144**	**201.9**	**211**
2000	0.045914	0.0573921	**2500**	80.00%	0.7700	0.0036827	160	**151**	**212.5**	**222**
2100	0.048209	0.0573921	**2500**	84.00%	0.8060	0.0038548	168	**158**	**223.1**	**232**
2200	0.050505	0.0573921	**2500**	88.00%	0.8420	0.0040270	175	**165**	**233.8**	**243**
2300	0.052801	0.0573921	**2500**	92.00%	0.8780	0.0041992	183	**172**	**244.4**	**253**
2400	0.055096	0.0573921	**2500**	96.00%	0.9140	0.0043714	190	**179**	**255.0**	**263**
2500	0.057392	0.0573921	**2500**	100.00%	0.9500	0.0045435	198	**186**	**265.6**	**274**

Guidance Sheet - Bioretention Areas

Description: Shallow stormwater basin or landscaped area that utilizes engineered soils and vegetation to capture and treat runoff.

KEY CONSIDERATIONS

DESIGN CRITERIA:

- Maximum contributing drainage area of 5 acres
- Often located in "landscaping islands"
- Treatment area consists of grass filter, sand bed, ponding area, organic/mulch layer, planting soil, and vegetation
- Typically requires 5 feet of head

ADVANTAGES / BENEFITS:

- Applicable to small drainage areas
- Good for highly impervious areas, particularly parking lots
- Good retrofit capability
- Relatively low maintenance requirements
- Can be planned as an aesthetic feature

DISADVANTAGES / LIMITATIONS:

- Requires extensive landscaping
- Not recommended for areas with steep slopes

MAINTENANCE REQUIREMENTS:

- Inspect and repair/replace treatment area components

POLLUTANT REMOVAL

80%	**Total Suspended Solids**
60/50%	**Nutrients** - Total Phosphorus / Total Nitrogen removal
M	**Metals** - Cadmium, Copper, Lead, and Zinc removal
No data	**Pathogens** - Coliform, Streptococci, E.Coli removal

STORMWATER MANAGEMENT SUITABILITY

- **Water Quality**
- **Channel Protection**
- **Extreme Flood Protection**

Accepts Hotspot Runoff: *Yes (requires impermeable liner)*

- in certain situations

IMPLEMENTATION CONSIDERATIONS

M	**Land Requirement**
M	**Capital Cost**
L	**Maintenance Burden**

Residential Subdivision Use: *Yes*

High Density/Ultra-Urban: *Yes*

Drainage Area: *5 acres max.*

Soils: *Planting soils must meet specified criteria; No restrictions on surrounding soils*

Other Considerations:

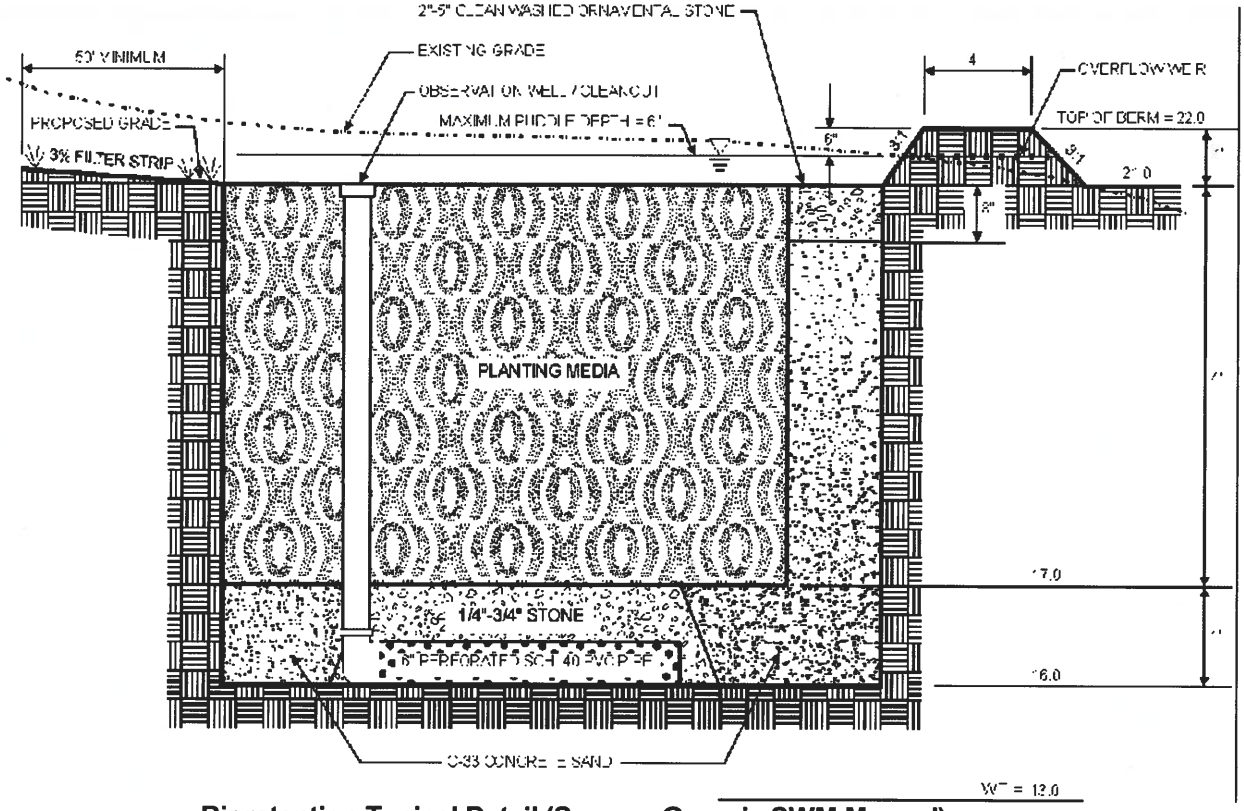
- *Use of native plants is recommended*

L=Low **M**=Moderate **H**=High

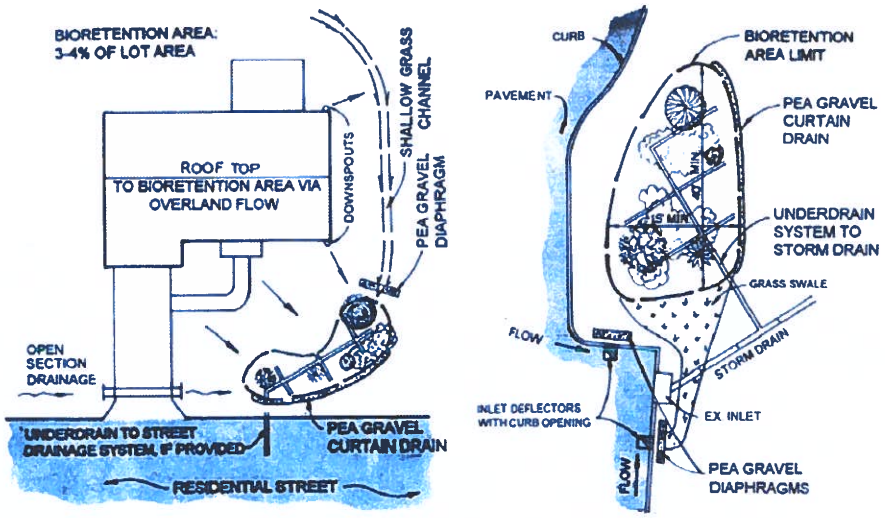
General Description

Bioretention areas (also referred to as *bioretention filters* or *rain gardens*) are structural stormwater controls that capture and temporarily store the water quality volume (WQ_v) using soils and vegetation in shallow basins or landscaped areas to remove pollutants from stormwater runoff.

Bioretention areas are engineered facilities in which runoff is conveyed as sheet flow to the "treatment area," which consists of a grass buffer strip, ponding area, organic or mulch layer, planting soil, and vegetation. An optional sand bed can also be included in the design to provide aeration and drainage of the planting soil. The filtered runoff is typically collected and returned to the conveyance system, though it can also be exfiltrated into the surrounding soil in areas where appropriate.



Bioretention Typical Detail (Source: Georgia SWM Manual)



Application and Site Feasibility Criteria

Bioretention areas are suitable for single-family residential lots of 1 acre or less. Because of its ability to be incorporated in landscaped areas, the use of bioretention is extremely flexible.

The following criteria should be evaluated to ensure the suitability of a bioretention area for meeting stormwater management objectives on a site or development.

Physical Feasibility - Physical Constraints at Project Site

- Site Slope – No more than 6% slope
- Minimum Head – Elevation difference needed at a site from the inflow to the outflow: 5 feet
- Minimum Depth to Water Table – A separation distance of 2 feet recommended between the bottom of the bioretention facility and the elevation of the seasonally high water table.
- Soils – No restrictions; engineered media required

Other Constraints / Considerations

- Aquifer Protection – Do not allow exfiltration of filtered hotspot runoff into groundwater

Planning and Design Criteria

*The following criteria are to be considered **minimum** standards for the design of a bioretention facility **for a single family residential lot**. Consult with the local review authority to determine if there are any variations to these criteria or additional standards that must be followed.*

A. LOCATION AND SITING

- Residential Bioretention areas should have a maximum contributing drainage area of 0.25 acres or less; multiple bioretention areas can be used.

- Bioretention systems are designed for intermittent flow and must be allowed to drain and reaerate between rainfall events. They should not be used on sites with a continuous flow from groundwater, sump pumps, or other sources.

- Bioretention area locations should be integrated into the site planning process, and aesthetic considerations should be taken into account in their siting and design. Elevations must be carefully worked out to ensure that the desired runoff flow enters the facility with no more than the maximum design depth.

B. GENERAL DESIGN - The Standardized bioretention area for a single residential lot consists of:

(1) Grass filter strip (lawn areas) between the contributing drainage area and the pond ing area should where possible be a minimum of 15' in length.
(2) Ponding area containing vegetation with a planting soil bed,
(3) Organic/mulch layer must be four (4') in depth.
(4) Gravel and perforated pipe underdrain system to collect runoff that has filtered through the soil layers (bioretention areas can optionally be designed to infiltrate into the soil).

- A bioretention area design will also include some of the following:

- Optional **sand filter layer** to spread flow, filter runoff, and aid in aeration and drainage of the planting soil.
- **Stone diaphragm** at the beginning of the grass filter strip to reduce runoff velocities and spread flow into the grass filter.

C. PHYSICAL SPECIFICATIONS / GEOMETRY

- The planting soil filter bed is sized using a Darcy's Law equation with a filter bed drain time of 48 hours and a coefficient of permeability (k) of 0.5 ft/day.

- The ponding depth of the bioretention areas is 6 inches.

- The planting soil bed must be at least 4 feet in depth. Planting soils should be sandy loam, loamy sand, or loam texture with a clay content ranging from 10 to 25%. The soil must have an infiltration rate of at least 0.5 inches per hour and a pH between 5.5 and 6.5. In addition, the planting soil should have a 1.5 to 3% organic content and a maximum 500 ppm concentration of soluble salts.

- Water should be directed as sheet flow over lawn area to the bioretention area.

- The mulch layer should consist of 2 to 4 inches of commercially available fine shredded hardwood mulch or shredded hardwood chips.

- The sand bed should be 12 to 18 inches thick. Sand should be clean and have less than 15% silt or clay content.

- Pea gravel for the diaphragm and curtain, where used, should be ASTM D 448 size No. 6 (⅛" to 1/4").

- The underdrain collection system is equipped with a 6-inch perforated PVC pipe (AASHTO M 252) in an 8-inch gravel layer. The pipe should have 3/8-inch perforations, spaced at 6-inch centers, with a minimum of 4 holes per row. The pipe is spaced at a maximum of 10 feet on center and a minimum grade of 0.5% must be maintained. A permeable filter fabric is placed between the gravel layer and the planting soil bed.

D. PRETREATMENT

- Adequate pretreatment is provided when all of the following are provided: (a) water flows over grass filter strip (lawn area) prior to entering the bioretention area.

E. OUTLET STRUCTURES

- Outlet pipe is to be provided from the underdrain system to the facility discharge. Due to the slow rate of filtration, outlet protection is generally unnecessary.

F. EMERGENCY SPILLWAY

- An overflow structure and non-erosive overflow channel must be provided to safely pass flows from the bioretention area that exceed the storage capacity to a stabilized downstream area or watercourse. If the system is located off-line, the overflow should be set above the shallow ponding limit.

G. MAINTENANCE ACCESS

- Adequate access must be provided for all bioretention facilities for inspection, maintenance, and landscaping upkeep, including appropriate equipment and vehicles.

H. SAFETY FEATURES

- Bioretention areas generally do not require any special safety features. Fencing of bioretention facilities is not generally desirable.

I. LANDSCAPING - Landscaping is critical to the performance and function of bioretention areas.

- A dense and vigorous vegetative cover should be established over the contributing pervious drainage areas before runoff can be accepted into the facility.

- The bioretention area should be vegetated to resemble a terrestrial forest ecosystem, with a mature tree canopy, sub-canopy of understory trees, scrub layer, and herbaceous ground cover. Three species each of both trees and scrubs are recommended to be planted.

- The tree-to-shrub ratio should be 2:1 to 3:1. On average, the trees should be spaced 8 feet apart. Plants should be placed at regular intervals to replicate a natural forest. Woody vegetation should not be specified at inflow locations.

- After the trees and shrubs are established, the ground cover and mulch should be established.

- Choose plants based on factors such as whether native or not, resistance to drought and inundation, cost aesthetics, maintenance, etc. Planting recommendations for bioretention facilities are as follows:

    - Native plant species should be specified over non-native species.
    - Vegetation should be selected based on a specified zone of hydric tolerance.
    - A selection of trees with an understory of shrubs and herbaceous materials should be provided.

The following are some native plants suitable for rain gardens for the Northeast Region. They are also attractive to butterflies, birds, and other wildlife. Be sure to choose species appropriate for the degree of sun or shade on the site.

Wildflowers, Ferns, Grasses, and Sedges:

- *Asclepias incarnata,* Swamp milkweed
- *Chelone glabra,* White turtlehead
- *Eupatorium maculatum,* Joe-pye weed
- *Lobelia cardinalis,* Cardinal flower
- *Lobelia syphilitica,* Blue lobelia
- *Monarda didyma,* Oswego tea
- *Vernonia noveboracensis,* Common ironweed
- *Athyrium filix-femina,* Lady fern
- *Osmunda regalis,* Royal fern
- *Osmunda cinnamomea,* Cinnamon fern
- *Carex pendula,* Drooping sedge
- *Carex stipata,* Tussock sedge

Trees and Shrubs:

- *Amelanchier laevis,* Shadbush
- *Asimina triloba,* Pawpaw
- *Betula nigra,* River birch
- *Cephalanthus occidentalis,* Buttonbush
- *Clethra alnifolia,* Sweet pepperbush
- *Cornus amomum,* Silky dogwood
- *Fothergilla gardenii,* Dwarf fothergilla
- *Ilex verticillata,* Winterberry holly
- *Lindera benzoin,* Spicebush
- *Liquidambar styraciflua,* Sweet gum
- *Sambucus canadensis,* American elderberry
- *Viburnum dentatum,* Arrowwood

Design Basis

The required planting soil filter bed area is computed using the following equation (based on Darcy's Law):

$$A_f = (WQv)\,(d_f) / [\,(k)\,(h_f + d_f)\,(t_f)]$$

where:

A_f = surface area of ponding area (ft^2)

WQ_v = water quality volume (or total volume to be captured in CF)

d_f = filter bed depth
(4 feet minimum)

k = coefficient of permeability of filter media (ft/day)
(use 0.5 ft/day for silt-loam)

h_f = average height of water above filter bed (ft)
(typically 3 inches, which is half of the 6-inch ponding depth)

t_f = design filter bed drain time (days)
(2.0 days or 48 hours is recommended maximum)

An overflow must be provided to bypass and/or convey larger flows to the downstream drainage system or stabilized watercourse. Non-erosive velocities need to be ensured at the outlet point.

A landscaping plan for the bioretention area should be prepared to indicate how it will be established with vegetation.

Inspection and Maintenance Requirements

Typical Maintenance Activities for Bioretention Areas
(Source: EPA, 1999)

Activity	Schedule
Pruning and weeding to maintain appearance. Mulch replacement when erosion is evident. Remove trash and debris.	As needed
Inspect inflow points for clogging (off-line systems). Remove any sediment. Inspect filter strip/grass channel for erosion or gullying. Re-seed or sod as necessary. Trees and shrubs should be inspected to evaluate their health and remove any dead or severely diseased vegetation.	Semi-annually
The planting soils should be tested for pH to establish acidic levels. If the pH is below 5.2, limestone should be applied. If the pH is above 7.0 to 8.0, then iron sulfate plus sulfur can be added to reduce the pH.	Annually
Replace mulch over the entire area. Replace pea gravel diaphragm if warranted.	2 to 3 years

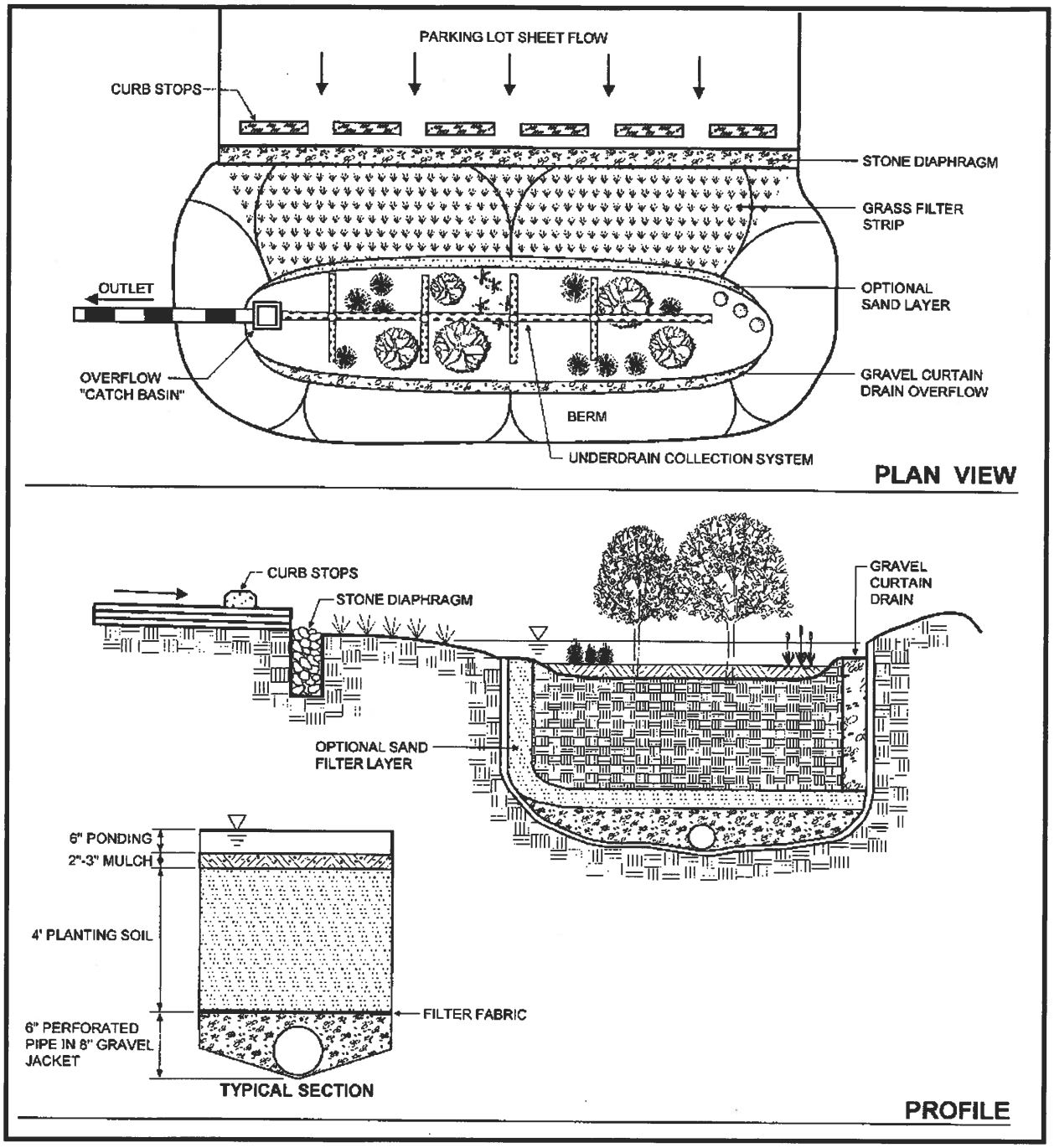
Additional Maintenance Considerations and Requirements

- The surface of the ponding area may become clogged with fine sediment over time. Core

aeration or cultivating of unvegetated areas may be required to ensure adequate filtration.

Regular inspection and maintenance is critical to the effective operation of bioretention facilities as designed. Maintenance responsibility for a bioretention area should be vested with a responsible authority by means of a legally binding and enforceable maintenance agreement that is executed as a condition of plan approval.

Example Schematic



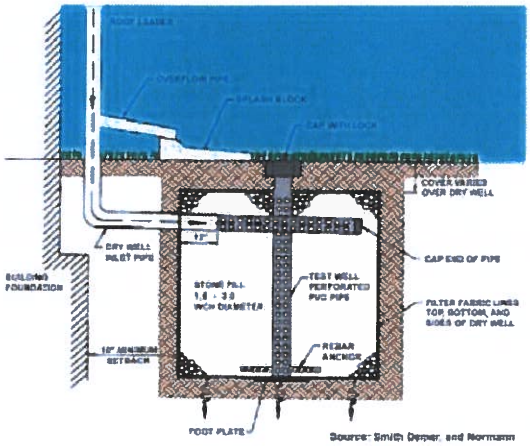
Schematic of a Typical On-line Bioretention Area

(Source: Claytor and Schueler, 1996)

This Guidance document is based upon information adapted from the Georgia Stormwater Manual and the Brooklyn Botanic Garden web site.

Guidance Sheet - Rock Sumps

For Small Projects
Standardized Residential SWM Facility



Description: A Dry Well, or Seepage Pit, is a variation on an Infiltration system that is designed to temporarily store and infiltrate rooftop runoff.

(Source: PA BMP Manual)

KEY CONSIDERATIONS

- Maintain a minimum 2-foot separation to bedrock and seasonally high water table, provide distributed infiltration area (5:1 impervious area to infiltration area - maximum), site on natural, uncompacted soils with acceptable infiltration capacity, and follow other guidelines described in Protocol 2: Infiltration Systems Guidelines
- Maintain minimum distance from building foundation (typically 10 feet)
- Provide adequate overflow outlet for large storms
- Depth of Dry Well aggregate should be between 48 inches
- At least one observation well; clean out is recommended
- Wrap aggregate with nonwoven geotextile
- Maximum drain-down time is 72 hours

STORMWATER MANAGEMENT SUITABILITY

- [x] **Water Quality**
- [ ] **Channel/Flood Protection**

SPECIAL APPLICATIONS

- [ ] **Pretreatment**
- [x] **High Density/Ultra-Urban**
- [x] **Other: Overflow Parking, Driveways & related uses**

Residential Subdivision Use: *Yes*
(in common areas that are maintained)

in certain situations

General Description

A Dry Well, sometimes called a Seepage Pit, is a subsurface storage facility that temporarily stores and infiltrates stormwater runoff from the roofs of structures. Roof leaders connect directly into the Dry Well, which may be either an excavated pit filled with uniformly graded aggregate wrapped in geotextile

or a prefabricated storage chamber or pipe segment. Dry Wells discharge the stored runoff via infiltration into the surrounding soils. In the event that the Dry Well is overwhelmed in an intense storm event, an overflow mechanism (surcharge pipe, connection to larger infiltration area, etc.) will ensure that additional runoff is safely conveyed downstream.

By capturing runoff at the source, Dry Wells can dramatically reduce the increased volume of stormwater generated by the roofs of structures. Though roofs are generally not a significant source of runoff pollution, they are still one of the most important sources of new or increased runoff volume from developed areas. By decreasing the volume of stormwater runoff, Dry Wells can also reduce runoff rate and improve water quality. As with other infiltration practices, Dry Wells may not be appropriate for "hot spots" or other areas where high pollutant or sediment loading is expected without additional design considerations. Dry Wells are not recommended within a specified distance to structures or subsurface sewage disposal systems.

Design Criteria and Specifications

The use of a single stage rock sump is one of several alternatives that may be appropriate for small project area developments. Site parameters which must be considered when determining the suitability of a sump for stormwater control include the following:

- Soil type
- Slope
- Slope Stability
- Discharge location
- Basement elevation
- Offsite stormwater conveyance systems
- Offsite detention systems

Where it is determined that a single stage rock sump is appropriate, the following procedure is designed to provide a fast, simple method to determine the rock volume and orifice size required to provide adequate stormwater control for small projects. In order to develop a practical solution for this type of design problem, several qualifying assumptions are necessary to set the limits for which the procedure is applicable. Those limits were designed to incorporate the type of situation most often encountered. In general, the following conditions must be satisfied in order for the use of single stage rock sumps to be appropriate:

- The project area tributary to the proposed sump is less than 5000 square feet, and consists entirely of impervious (paved or roofed areas) surfaces, i.e., RCN = 98;

- To minimize the sump size, runoff from impervious surfaces may be divided and conveyed to the separate sumps. If runoff from impervious surfaces is not divided, the sump must be designed for the entire area that will be tributary to the facility;

- The pre-development area to be altered must have an existing time of concentration (Tc) of six (6) minutes or less; and

- The single stage rock sump must be designed according to the parameters shown in the attached drawing.

Prior to using the following procedure, the designer must verify that all of the above criteria apply to the subject project. Should any of the conditions not apply, the use of the procedure outlined herein is inappropriate and may result in either the over-design or under-design of the rock sump facility.

DESIGN SIZING

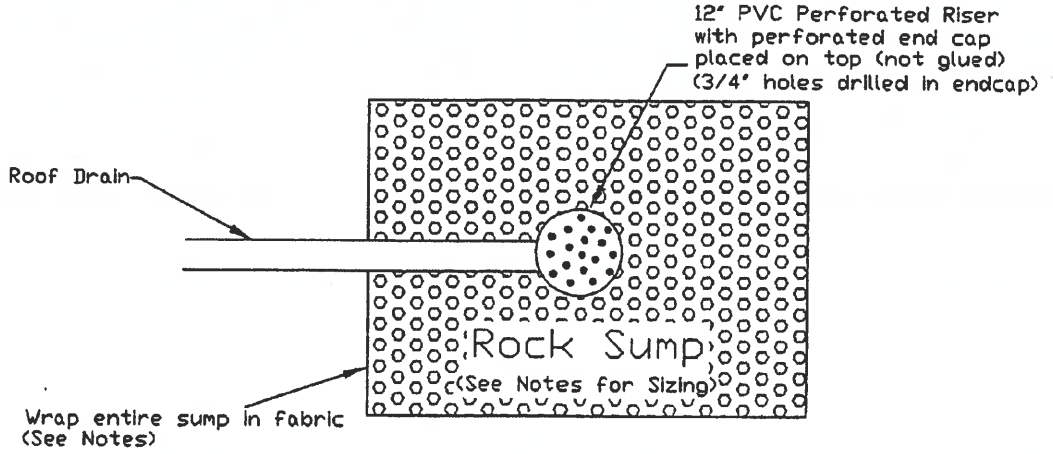
1. Determine the area of the impervious surfaces that will be collected and conveyed to the sump.

2. Enter the sizing table and determine the size of the release orifice and volume of the sump.

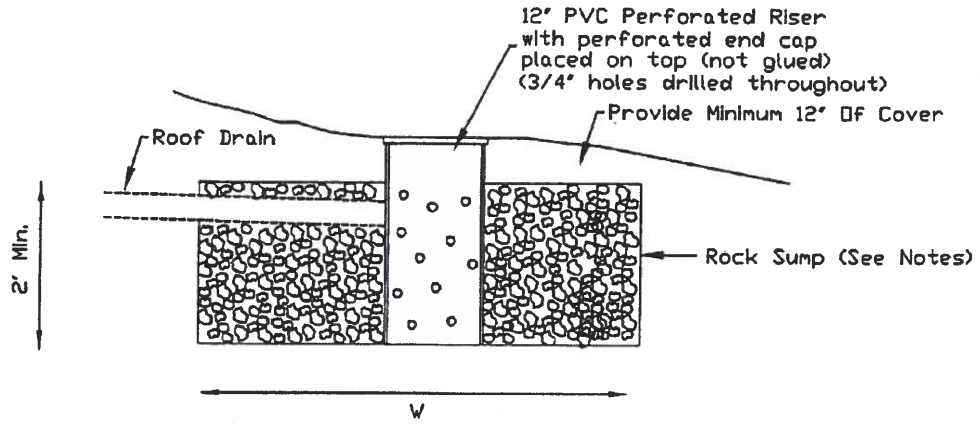
3. Determine the sump dimensions based on the site topography and surface features.

4. Design the sump in accordance with the parameters shown in the attached drawing.

NOTE: If the development will result in an increase in impervious surface of less than 400 square feet, the infiltration sump design (below) should be used. The sump volume should be based on 40 cubic feet of stone for each 100 square feet of impervious surface.



PLAN VIEW



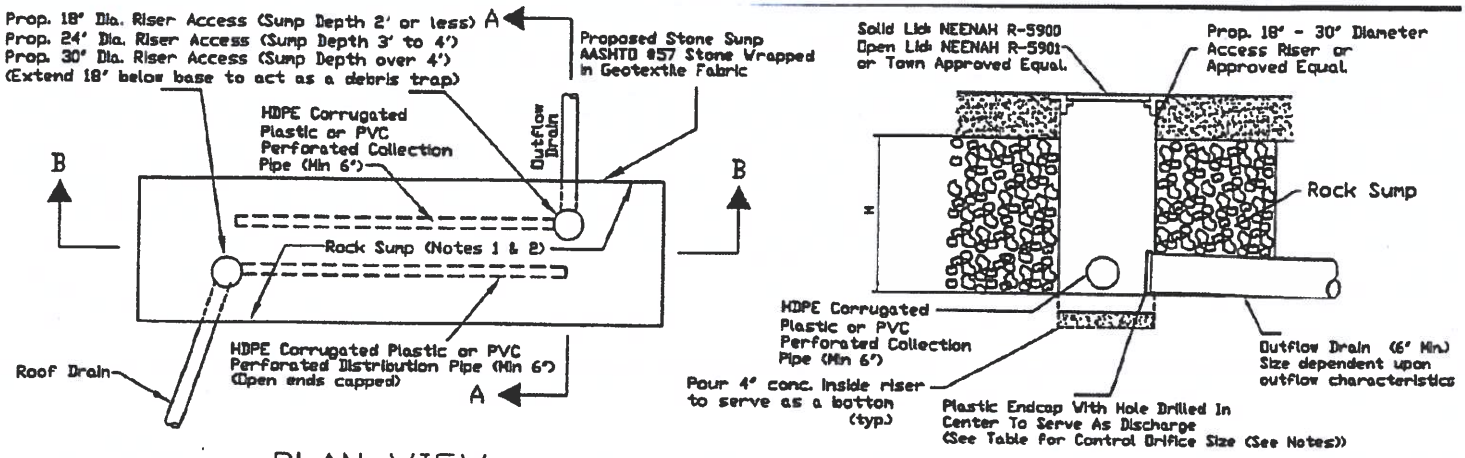
SECTION

Notes:

1. The Rock Sump shall be designed as follows:
   40 c.f. of Rock per 100 s.f. of impervious area
2. Rock Sump shall be constructed of AASHTO #57 Limestone or 2B Gravel.
3. Wrap sump on all sides with PennDOT Class 2, Type B Non-woven Geotextile Material.
4. Dimensions and ratios shall vary as per design volume required.
5. Dry sumps in fill areas not permitted.
6. Cleanouts shall be located just before any horizontal bends.
7. When feasible, the Rock Sump should be located such that the top elevation of the riser pipe is below the basement floor elevation.

THIS DETAIL MAY BE UTILIZED FOR TOTAL IMPERVIOUS AREAS < 400 S.F.

Figure S1 - Rock Sump Detail (< 400 SF of impervious area)
(Detailed from Town of McCandless / Partridge Venture Engineering)



Notes:

1. Design Parameters (volume and outlet control works) shall be based upon the Table of values as shown on Detail SW-5, (400 S.F. < Impervious Area < 5000 s.f.)
2. Rock Sump shall be constructed of AASHTO #57 Limestone or 2B Gravel.
3. Wrap sump on all sides with PennDOT Type B Non-woven Geotextile Material.
4. Dimensions and ratios of L (Length), W (Width) and H (Height) shall vary as per design volume required.
5. Minimum ratio L to W is 3:1; (ie. L = 3W).
6. Dry sumps in fill areas not permitted.
7. Dimensions L (Length) shall be oriented to be parallel to the grade contour alignment.
8. No 90° elbows permitted on cleanout installations.
9. Cleanouts shall be located just before any horizontal bends.
10. All pipe and fittings shall be ASTM D2729.
11. When feasible, the Rock Sump should be located such that the outflow elevation is below the basement floor elevation.

THIS DETAIL MAY BE UTILIZED FOR TOTAL IMPERVIOUS AREAS > 400 S.F. & < 5,000 S.F.

Figure S2 - Rock Sump Detail (> 400 SF & < 5000 SF of impervious area)

(Detailed from Town of McCandless / Partridge Venture Engineering)

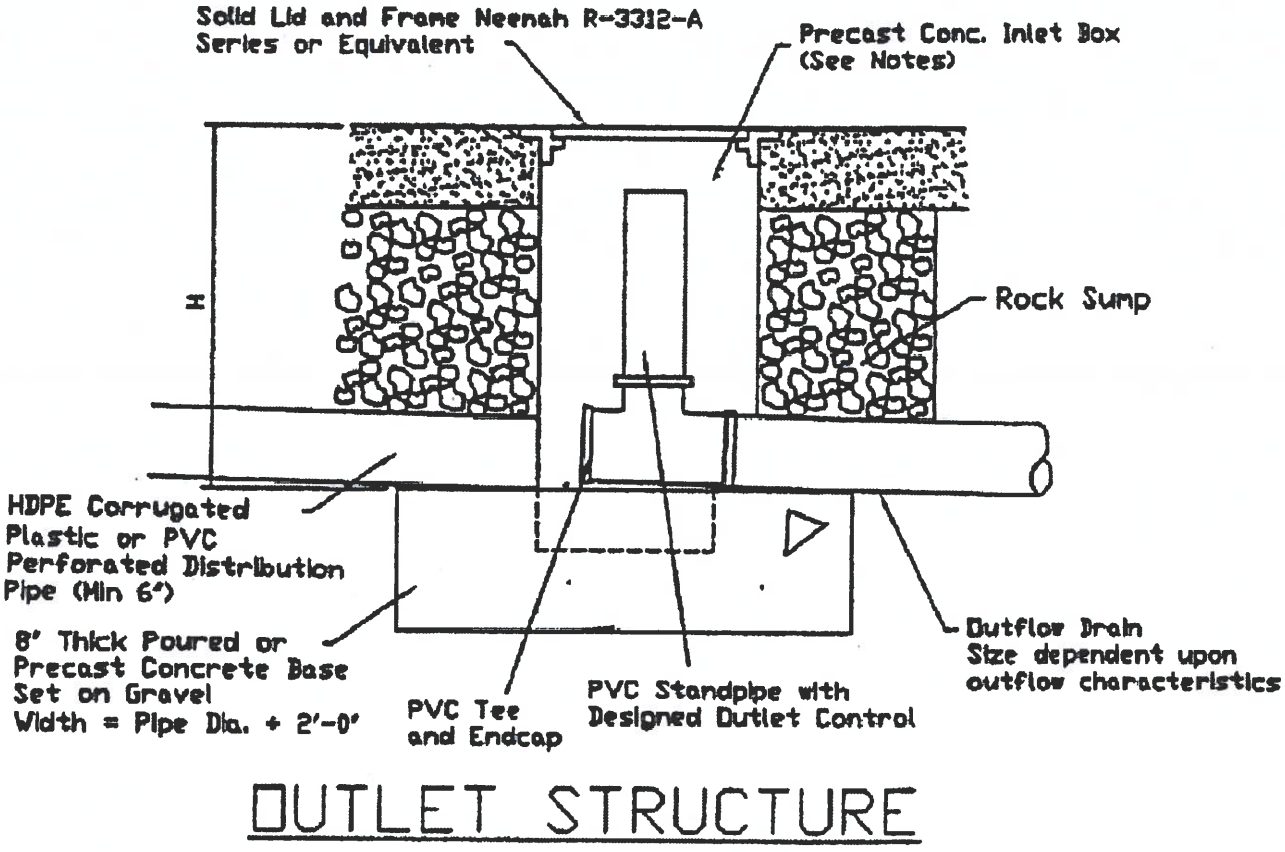
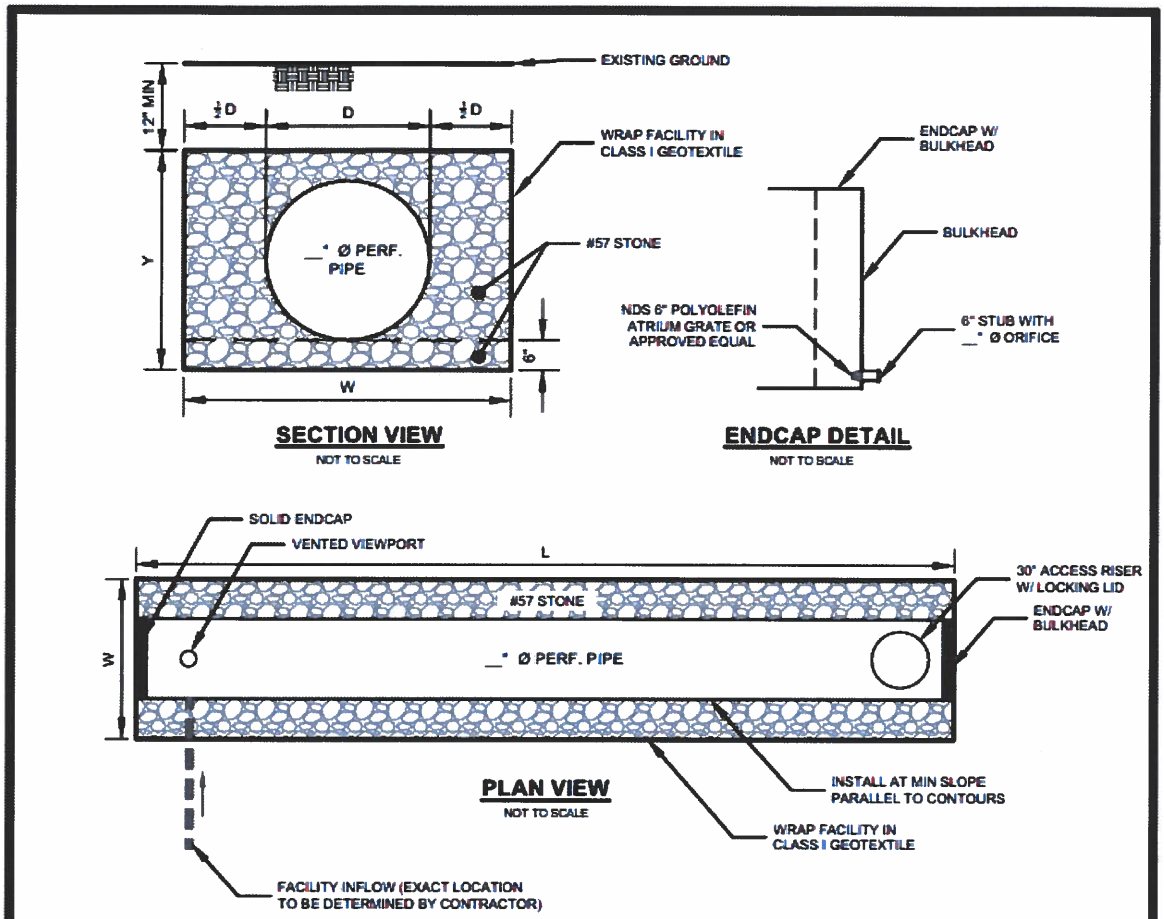


Figure S3 – Sump Outlet Structure
(Information from Town of McCandless / Partridge Venture Engineering)



NOTES:

1. USE TABLE S2 TO SIZE PIPE & STONE ENVELOPE. USE TABLE S1 TO SIZE CONTROL ORIFICE. BOTH TABLES ARE BASED ON IMPERVIOUS AREA.
2. INSTALL VENTED ACCESS ON DOWNSTREAM SIDE OF FACILITY.
3. INSTALL VENTED VIEWPORT ON UPSTREAM END.
4. CAP BOTH ENDS OF FACILITY.
5. DRILL XX" ORIFICE IN ENDCAP OF 6" OUTFALL PIPE (AT CENTER OF CAP).
6. RISER HEIGHT WILL VARY DEPENDING ON DEPTH OF FACILITY.
7. WHEN FEASIBLE, SYSTEM SHOULD BE LOCATED SUCH THAT OUTFLOW ELEVATION IS BELOW THE BASEMENT FLOOR ELEVATION.

ALTERNATE SWM FACILITY

HAMPTON TOWNSHIP, ALLEGHENY COUNTY

PVE
Waterfront Corporate Park III, Suite 101
2000 Georgetowne Drive
Sewickley, PA 15143
P: 724-444-1100
F: 724-444-1104
www.pve-llc.com
Civil Engineering | Land Development | Planning
Landscape Architecture | Structures | Environmental

N

DATE:	09-2018
SCALE:	NTS
PROJECT NUMBER:	150008

FIGURE S4

DESIGN PARAMETERS
RESIDENTIAL ON-LOT SUMP
(TOTAL IMPERVIOUS AREA < 5,000 S.F.)

IMPERVIOUS AREA (SQ. FT.)	DEPTH OF SUMP (FT.)					SUMP VOLUME REQUIRED (CU. FT.)	
	1	2	3	4	5		
	DIAMETER OF OUTLET ORIFICE (IN)					NET	ROCK
400	11/16	9/16	1/2	1/2	1/2	68	170
600	13/16	11/16	5/8	9/16	9/16	102	255
800	15/16	13/16	11/16	5/8	5/8	136	340
1000	1-1/16	7/8	13/16	3/4	11/16	170	425
1200	1-3/16	1-0	7/8	13/16	3/4	204	510
1400	1-1/4	1-1/16	15/16	7/8	13/16	238	595
1600	1-3/8	1-1/8	1-0	15/16	7/8	272	680
1800	1-7/16	1-3/16	1-1/16	1-0	15/16	306	765
2000	1-1/2	1-1/4	1-1/8	1-1/16	1-0	340	850
2200	1-9/16	1-5/16	1-3/16	1-1/8	1-1/16	374	935
2400	1-5/8	1-3/8	1-1/4	1-3/16	1-1/8	408	1020
2600	1-11/16	1-7/16	1-5/16	1-1/4	1-1/8	442	1105
2800	1-3/4	1-1/2	1-3/8	1-1/4	1-3/16	476	1190
3000	1-13/16	1-9/16	1-3/8	1-5/16	1-1/4	510	1275
3200	1-7/8	1-5/8	1-7/16	1-3/8	1-1/4	544	1360
3400	1-15/16	1-5/8	1-1/2	1-3/8	1-5/16	578	1445
3600	2-0	1-11/16	1-9/16	1-7/16	1-3/8	612	1530
3800	2-1/16	1-3/4	1-9/16	1-7/16	1-3/8	646	1615
4000	2-1/8	1-13/16	1-5/8	1-1/2	1-7/16	680	1700
4200	2-3/16	1-13/16	1-11/16	1-9/16	1-7/16	714	1785
4400	2-1/4	1-7/8	1-11/16	1-9/16	1-1/2	748	1870
4600	2-5/16	1-15/16	1-3/4	1-5/8	1-9/16	782	1955
4800	2-5/16	1-15/16	1-3/4	1-5/8	1-9/16	816	2040
5000	2-3/8	2-0	1-13/16	1-11/16	1-5/8	850	2125

Table S1
(Information from Town of McCandless / Partridge Venture Engineering)

DESIGN VOLUME PARAMETERS
RESIDENTIAL ALTERNATE SWM FACILITY

TOTAL IMPERVIOUS AREA < 5,000 SQUARE FEET

8" PIPE & STONE VOLUME PROVIDED (cubic feet)

PIPE LENGTH (L)	DEPTH OF SUMP (Y) (feet)				
(feet)	1	2	3	4	5
10					
20					
30				74.5	90.5
40			78.0	99.3	120.6
50		70.8	97.4	124.1	150.8
60		84.9	116.9	148.9	180.9
70		99.1	136.4	173.8	211.1
80	70.6	113.2	155.9	198.6	241.2
90	79.4	127.4	175.4	223.4	271.4
100	88.2	141.6	194.9	248.2	301.6

Width (W) of Facility 1.33 feet

12" PIPE & STONE VOLUME PROVIDED (cubic feet)

PIPE LENGTH (L)	DEPTH OF SUMP (Y) (feet)				
(feet)	1	2	3	4	5
10					
20				79.7	95.7
30		71.6	95.6	119.6	143.6
40		95.4	127.4	159.4	191.4
50		119.3	159.3	199.3	239.3
60		143.1	191.1	239.1	287.1
70		167.0	223.0	279.0	335.0
80		190.8	254.8	318.8	382.8
90		214.7	286.7	358.7	430.7
100		238.5	318.5	398.5	478.5

Width (W) of Facility 3.00 feet

15" PIPE & STONE VOLUME PROVIDED (cubic feet)

PIPE LENGTH (L)	DEPTH OF SUMP (Y) (feet)				
(feet)	1	2	3	4	5
10					
20			84.5	104.5	124.5
30		96.8	126.8	156.8	186.8
40		129.1	169.1	209.1	249.1
50		161.3	211.3	261.3	311.3
60		193.6	253.6	313.6	373.6
70		225.9	295.9	365.9	435.9
80		258.1	338.1	418.1	498.1
90		290.4	380.4	470.4	560.4
100		322.7	422.7	522.7	622.7

Width (W) of Facility 2.00 feet

18" PIPE & STONE VOLUME PROVIDED (cubic feet)

PIPE LENGTH (L)	DEPTH OF SUMP (Y) (feet)				
(feet)	1	2	3	4	5
10					77.7
20		83.3	107.3	131.3	155.3
30		125.0	161.0	197.0	233.0
40		166.7	214.7	262.7	310.7
50		208.3	268.3	328.3	388.3
60		250.0	322.0	394.0	466.0
70		291.6	375.6	459.6	543.6
80		333.3	429.3	525.3	621.3
90		375.0	483.0	591.0	699.0
100		416.6	536.6	656.6	776.6

Width (W) of Facility 4.00 feet

24" PIPE & STONE VOLUME PROVIDED (cubic feet)

PIPE LENGTH (L)	DEPTH OF SUMP (Y) (feet)				
(feet)	1	2	3	4	5
10			79.4	95.4	111.4
20			158.8	190.8	222.8
30			238.2	286.2	334.2
40			317.6	381.6	445.6
50			397.0	477.0	557.0
60			476.4	572.4	668.4
70			555.8	667.8	779.8
80			635.2	763.2	891.2
90			714.6	858.6	1002.6
100			794.0	954.0	1114.0

Width (W) of Facility 2.50 feet

NOTES:

Use Table S1 for size of circular orifice to drill into endcap as per Figure S4 Detail.

TABLE S2

(INFORMATION FROM PVE, LLC)

Design Basis

The sump design and alternate SWM facility are based upon calculations, documents, and detail sheets provided by PVE, LLC.

Determine the square footage for the Standardized Rock Sump Foot Print from the "Determination of SWM Facility Sizing" table (Disturbed Area Table).

Note that the square footage of the "sump foot print" for the Standardized Design provided in the Disturbed Area Table is based upon an assumed sump rock depth of 4'.

Different sump rock depths may be used. These may be determined by multiplying the "sump foot print" by the assumed rock depth of four (4') feet, to determine the cubic feet of rock required for the sump. Then use Table S1 to select determine the "diameter of the outlet orifice" need for the actual depth proposed.

To determine the sump foot print needed for the actual depth proposed, multiply the cubic feet of rock required by the actual depth of the sump proposed.

The same procedure to determine the Net volume required for the Alternate SWM Facility should be followed based on the amount of impervious surface to be added. The Net volume can then be compared to the provided volume shown on Table S2 to determine what combination of pipe and stone SWM storage works for each individual property. Size the control orifice based on the depth of the Facility chosen.

The footprint for the Alternate Facility will only vary by depth and length of pipe needed to obtain the required net SWM Volume. The Alternate SWM Facility will provide a reduction in stone needed for the sump volume.

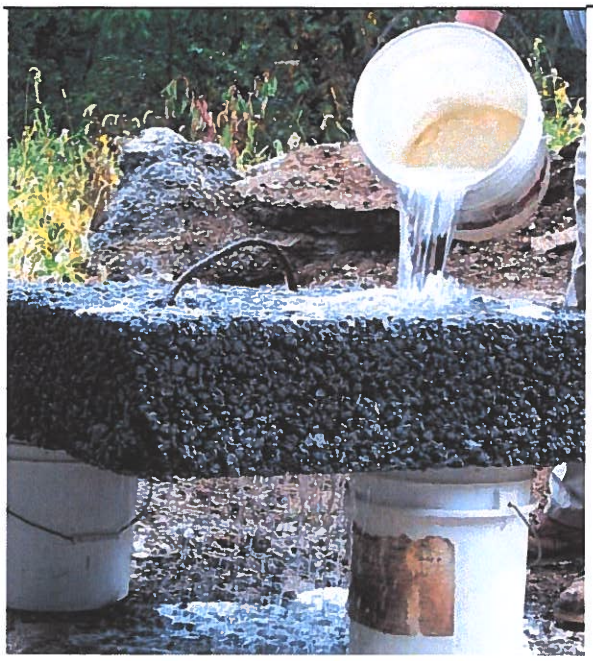
Inspection and Maintenance Requirements

As with all infiltration practices, Dry Wells require regular and effective maintenance to ensure prolonged functioning. The following represent minimum maintenance requirements for Dry Wells:

Activity	Schedule
Initial inspection	By Building Inspector to Insure Proper Sizing
Ensure that sediment is not directed to the sump	As needed
Regularly clean out gutters and ensure proper connections to facilitate the effectiveness of the dry well.	As needed, based on inspection
Evaluate the drain-down time of the Dry Well to ensure the maximum time of 72 hours is not being exceeded. If drain-down times are exceeding the maximum, drain the Dry Well via pumping and clean out perforated piping, if included. If slow drainage persists, the system may need replacing.	As needed, based on inspection
Reconstruct sump if its no longer functioning as originally designed	As needed, based on inspection
Replace filter screen that intercepts roof runoff as necessary. If an intermediate sump box exists, clean it out at least once per year.	Annually

This Guidance document is based upon information abstracted from the Georgia Stormwater Manual, the PA SW BMP Manual and the Town of McCandless. .

Guidance Sheet - Porous Pavements



Description: Porous concrete is the term for a mixture of coarse aggregate, Portland cement and water that allow for rapid infiltration of water and overlays a stone aggregate reservoir. This reservoir provides temporary storage as runoff infiltrates into underlying permeable soils and/or out through an underdrain system.
(Photograph Source: Pittsburgh Mobile Concrete)

KEY CONSIDERATIONS

- Soil infiltration rate of 0.5 in/hr or greater required
- Pour the concrete using a volumetric (mobile) mixer
- Excavated area filled with stone media; gravel and sand filter layers with observation well
- Pre-treat runoff if sediment present
- Provides reduction in runoff volume
- Somewhat higher cost when compared to conventional pavements
- Potential for high failure rate if poorly designed, poorly constructed, not adequately maintained or used in unstabilized areas
- Potential for groundwater contamination

STORMWATER MANAGEMENT SUITABILITY

- [x] **Water Quality**
- [ ] **Channel/Flood Protection**

SPECIAL APPLICATIONS

- [ ] **Pretreatment**
- [x] **High Density/Ultra-Urban**
- [x] **Other: Overflow Parking, Driveways & related uses**

Residential Subdivision Use: *Yes*
(in common areas that are maintained)

in certain situations

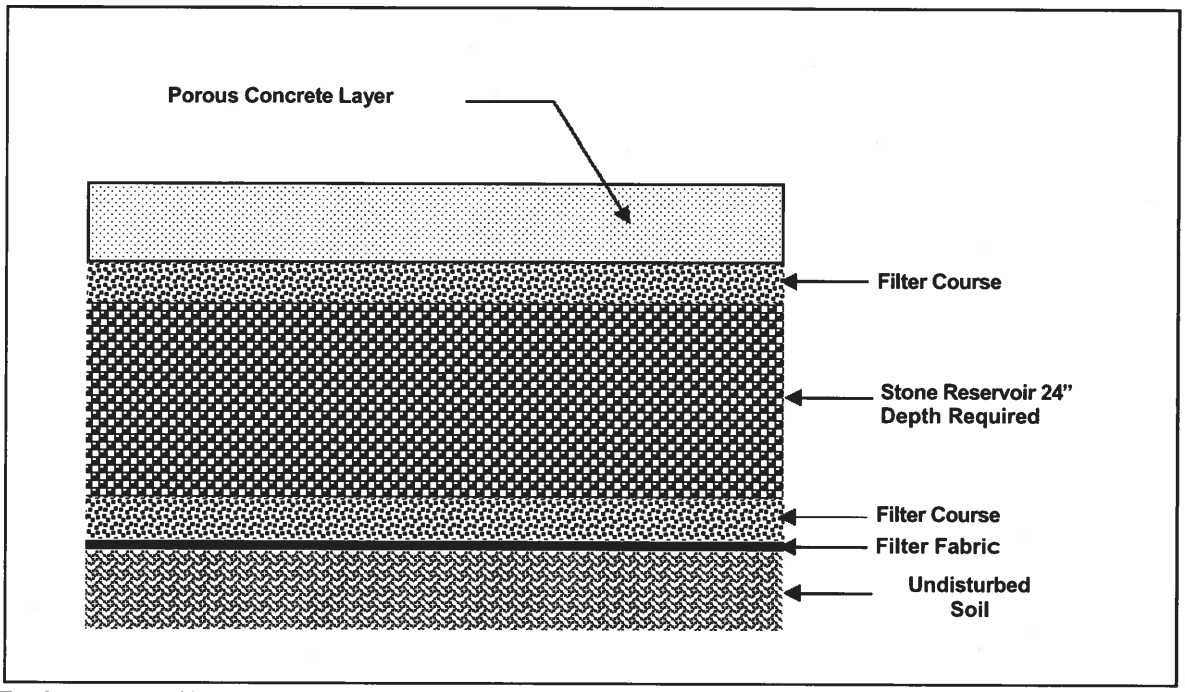
General Description – Porous Concrete

Porous concrete (also referred to as *enhanced porosity concrete*, *porous concrete*, *portland cement pervious pavement* and *pervious pavement*) is a subset of a broader family of pervious pavements including porous asphalt, and various kinds of grids and paver systems. Porous concrete is thought to have a greater ability than porous asphalt to maintain its porosity in hot weather and thus is provided as

a limited application control. Although, porous concrete has seen growing use, there is still very limited practical experience with this measure.

Porous concrete consists of a specially formulated mixture of Portland cement, uniform, open graded course aggregate, and water. The concrete layer has a high permeability often many times that of the underlying permeable soil layer, and allows rapid percolation of rainwater through the surface and into the layers beneath. The void space in porous concrete is in the 15% to 22% range compared to three to five percent for conventional pavements. The permeable surface is placed over a layer of open-graded gravel and crushed stone. The void spaces in the stone act as a storage reservoir for runoff.

Porous concrete is designed primarily for stormwater quality, i.e. the removal of stormwater pollutants. However, they can provide limited runoff quantity control, particularly for smaller storm events. For some smaller sites, trenches can be designed to capture and infiltrate the channel protection volume (Cp_v) in addition to WQ_v. Porous concrete will need to be used in conjunction with another structural control to provide overbank and extreme flood protection, if required.



Typical Detail (Source: Georgia SWM Manual)

Modifications or additions to the standard design have been used to pass flows and volumes in excess of the water quality volume, or to increase storage capacity or treatment. These include:

- Placing a perforated pipe near the top of the crushed stone reservoir to pass excess flows after the reservoir is filled
- Providing surface detention storage in a parking lot, adjacent swale, or detention pond with suitable overflow conveyance
- Connecting the stone reservoir layer to a stone filled trench
- Adding a sand layer and perforated pipe beneath the stone layer for filtration of the water quality volume
- Placing an underground detention tank or vault system beneath the layers

The infiltration rate of the soils in the subgrade should be adequate to support drawdown of the entire runoff capture volume within 24 to 48 hours. Special care must be taken during construction to avoid undue compaction of the underlying soils which could affect the soils' infiltration capability.

Slopes should be flat or gentle to facilitate infiltration versus runoff and the seasonally high water table or bedrock should be a minimum of two feet below the bottom of the gravel layer if infiltration is to be relied on to remove the stored volume.

Porous concrete has the positive characteristics of volume reduction due to infiltration, groundwater recharge, and an ability to blend into the normal urban landscape relatively unnoticed. It also allows a

reduction in the cost of other stormwater infrastructure, a fact that may offset the greater placement cost somewhat.

A drawback is the cost and complexity of porous concrete systems compared to conventional pavements. Porous concrete systems require a very high level of construction workmanship to ensure that they function as designed. They experience a high failure rate if they are not designed, constructed and maintained properly.

Design Criteria and Specifications

- Porous concrete systems can be used where the underlying in-situ subsoils have an infiltration rate greater than 0.5 inches per hour. Therefore, porous concrete systems are not suitable on sites with hydrologic group D and many group C soils, or soils with a high (>30%) clay content. In areas where poor infiltration is expected the gravel bed should be properly graded and an overflow provided to drain the bed so that water will not be trapped in the pervious concrete. During construction and preparation of the subgrade, special care must be taken to avoid compaction of the soils.

- Pour the concrete using volumetric (mobile) mixer.

- Porous concrete systems should typically be used in applications where the pavement receives tributary runoff only from impervious areas. Actual pervious surface area sizing will depend on achieving a 24 hour minimum and 48 hour maximum draw down time for the design storm volume.

- If runoff is coming from adjacent pervious areas, it is important that those areas be fully stabilized to reduce sediment loads and prevent clogging of the porous paver surface. Pretreatment using filter strips or vegetated swales for removal of course sediments is recommended. (see sections 3.3.1 and 3.3.2)

- Porous concrete systems should not be used on slopes greater than 5% with slopes of no greater than 2% recommended. For slopes greater than 1% barriers perpendicular to the direction of drainage should be installed in sub-grade material to keep it from washing away, or filter fabric should be placed at the bottom and sides of the aggregate to keep soil from migrating into the aggregate and reducing porosity.

- A minimum of four feet of clearance is recommended (may be reduced to two feet in coastal areas) between the bottom of the gravel base course and underlying bedrock or the seasonally high groundwater table.

- Porous concrete systems should be sited at least 10 feet down-gradient from buildings and 100 feet away from drinking water wells.

- To protect groundwater from potential contamination, runoff from designated hotspot land uses or activities must not be infiltrated. Porous concrete should not be used for manufacturing and industrial sites, where there is a potential for high concentrations of soluble pollutants and heavy metals. In addition, porous concrete should not be considered for areas with a high pesticide concentration. Porous concrete is also not suitable in areas with karst geology without adequate geotechnical testing by qualified individuals and in accordance with local requirements.
- Porous concrete system designs must use some method to convey larger storm event flows to the conveyance system. One option is to use storm drain inlets set slightly above the elevation of the pavement. This would allow for some ponding above the surface, but would accept bypass flows that are too large to be infiltrated by the porous concrete system, or if the surface clogs.

- For the purpose of sizing downstream conveyance and structural control system, porous concrete surface areas can be assumed to 35% impervious. In addition, credit can be taken for the runoff volume infiltrated from other impervious areas using the methodology in Section 3.1.

- For treatment control, the design volume should be, at a minimum, equal to the water quality volume. The water quality storage volume is contained in the surface layer, the aggregate reservoir, and the sub-grade above the seasonal high water table – if the sub-grade is sandy. The

storm duration (fill time) is normally short compared to the infiltration rate of the sub-grade, a duration of two hours can be used for design purposes. The total storage volume in a layer is equal to the percent of voids times the volume of the layer. Alternately storage may be created on the surface through temporary ponding, though this would tend to accelerate clogging if course sediment or mud settles out on the surface.

- The cross-section typically consists of four layers, as shown on the Typical Detail. The aggregate reservoir can sometimes be avoided or minimized if the sub-grade is sandy and there is adequate time to infiltrate the necessary runoff volume into the sandy soil without by-passing the water quality volume. Descriptions of each of the layers is presented below:

  Porous Concrete Layer – The porous concrete layer consists of an open-graded concrete mixture usually ranging from depths of 2 to 4 inches depending on required bearing strength and pavement design requirements. Porous concrete can be assumed to contain 18 percent voids (porosity = 0.18) for design purposes. The omission of the fine aggregate provides the porosity of the porous pavement. To provide a smooth riding surface and to enhance handling and placement a coarse aggregate of 3/8 inch maximum size is normally used. Use No. 89 coarse aggregate (3/8 to No. 50) per ASTM D 448.

  Top Filter Layer – Consists of a 0.5 inch diameter crushed stone to a depth of 1 to 2 inches. This layer serves to stabilize the porous asphalt layer. Can be combined with reservoir layer using suitable stone.

  Reservoir Layer – The reservoir gravel base course consists of washed, bank-run gravel, 1.5 to 2.5 inches in diameter with a void space of about 40% (Clean Washed No. 2B Stone). **The depth of this layer shall be two (2') feet.** A porosity value (void space/total volume) of 0.32 was assumed. .

  Bottom Filter Layer – The surface of the subgrade should be an 6 inch layer of sand (ASTM C-33 concrete sand) or a 2 inch thick layer of 0.5 inch crushed stone, and be completely flat to promote infiltration across the entire surface. This layer serves to stabilize the reservoir layer, to protect the underlying soil from compaction, and act as the interface between the reservoir layer and the filter fabric covering the underlying soil.

  Filter Fabric – It is very important to line the entire trench area, including the sides, with filter fabric prior to placement of the aggregate. The filter fabric serves a very important function by inhibiting soil from migrating into the reservoir layer and reducing storage capacity. Fabric should be MIRFI # 14 N or equivalent.

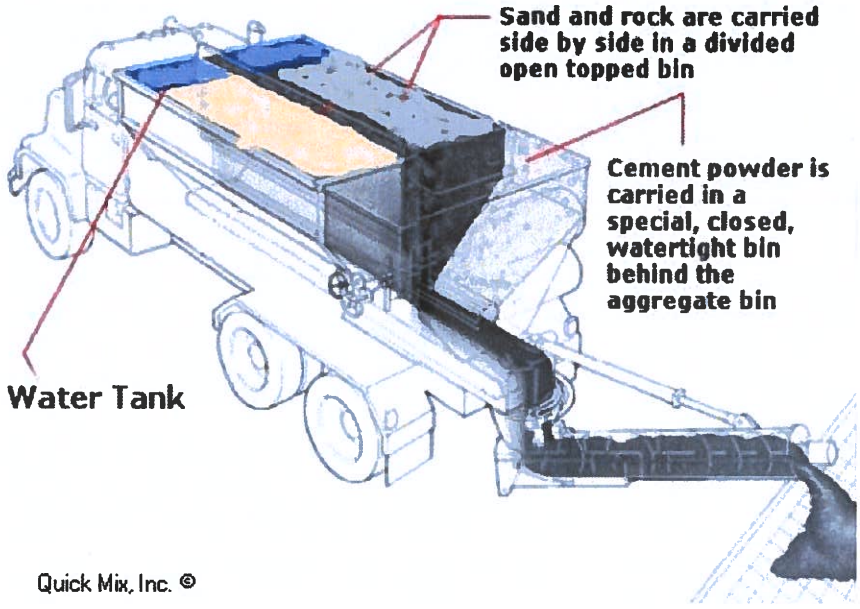
  Underlying Soil – The underlying soil should have an infiltration capacity of at least 0.5 in/hr, but preferably greater than 0.50 in/hr.

- The pit excavation should be limited to the width and depth specified in the design. Excavated material should be placed away from the open trench as not to jeopardize the stability of the trench sidewalls. The bottom of the excavated trench should not be loaded so as to cause compaction, and should be scarified prior to placement of sand. The sides of the trench shall be trimmed of all large roots. The sidewalls shall be uniform with no voids and scarified prior to backfilling. All infiltration trench facilities should be protected during site construction, and should be constructed after upstream areas have been stabilized.

- An observation well consisting of perforated PVC pipe 4 to 6 inches in diameter may be placed at the downstream end of the facility and protected. The well should be used to determine actual infiltration rates.

Volumetric (Mobile) Concrete Mixers

The Mobile Concrete Mixer is a combination materials transporter and mobile concrete mixing plant, mounted on a transport vehicle, usually a truck or trailer, which carries sufficient unmixed material, sand, cement, coarse aggregates, water (and any other chemicals that may be used for special mix designs) to the job to produce fresh concrete, mixed to design specifications.



(Source: Quick Mix, Inc.)

Sand and stone are accurately proportioned by adjusting gates to the correct height. The settings are based on actual calibration of the gate settings done with the specific aggregates being used.

(Source: Pittsburgh Mobile Concrete)

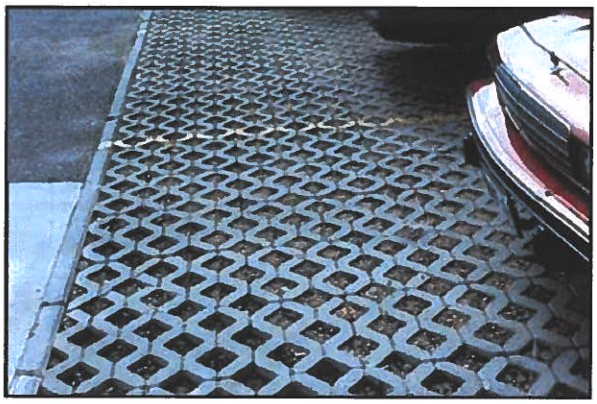
The three basic dry ingredients (sand, stone, and cement powder) simultaneously drop off the main conveyor into the charging end of the mixer at the rear of the unit. At this point, a predetermined metered flow of water also enters the mixer. Action of the combined auger and paddle mixer rapidly, thoroughly, and continuously mixes the ingredients and water to produce a continuous discharge of uniform quality concrete.

The materials blending action is continuous, and may proceed until the ingredient bins are empty. On the other hand, mixing and delivery may be stopped at any time and then started again at the will of the

operator. This permits production to be balanced to the demands of the placing and finishing crews and other job requirements

General Description Modular Paver Systems

Modular porous pavers are structural units, such as concrete blocks, bricks, or reinforced plastic mats, with regularly interdispersed void areas used to create a load-bearing pavement surface. The void areas are filled with pervious materials (gravel, sand, or grass turf) to create a system that allows for the infiltration of stormwater runoff. Porous paver systems provide water quality benefits in addition to groundwater recharge and a reduction in stormwater volume. The use of porous paver systems results in a reduction of the effective impervious area on a site.



There are many different types of modular porous pavers available from different manufacturers, including both pre-cast and mold in-place concrete blocks, concrete grids, interlocking bricks, and plastic mats with hollow rings or hexagonal cells

Modular porous pavers are typically placed on a gravel (stone aggregate) base course. Runoff infiltrates through the porous paver surface into the gravel base course, which acts as a storage reservoir as it exfiltrates to the underlying soil. The infiltration rate of the soils in the subgrade must be adequate to support drawdown of the entire runoff capture volume within 24 to 48 hours. Special care must be taken during construction to avoid undue compaction of the underlying soils, which could affect the soils' infiltration capability.

A drawback is the cost and complexity of modular porous paver systems compared to conventional pavements. Porous paver systems require a higher level of construction workmanship to ensure that they function as designed. In addition, there is the difficulty and cost of rehabilitating the surfaces should they become clogged.

The system must be installed based upon the manufactures recommendations. **The gravel layer required for the Standardized Single Lot Residential Facility is a minimum of two (2') feet in depth.**

Design Basis

For the Standardized BMP for a single residential lot, the minimum surface area of the porous pavement was determined from the following equation:

$$A = WQ_v/(n_g d_g + kT/12)$$

Where:

A = Surface Area Porous Pavement (SF)
WQv = Water Quality Volume in CF
n_g = 0.32 = porosity of the gravel
d_g = 2' = depth or gravel layer (feet)
k = percolation = 0.5 inches/hour assumed
T= Fill Time = 2 hours (time for the practice to fill with water), in hours

Inspection and Maintenance Requirements

Typical Maintenance Activities for Porous Concrete Systems

Activity	Schedule
Initial inspection	Monthly for three months after installation
Ensure that the porous paver surface is free of sediment	Monthly
Ensure that the contributing and adjacent area is stabilized and mowed, with clippings removed	As needed, based on inspection
Vacuum sweep porous concrete surface followed by high pressure hosing to keep pores free of sediment	Four times a year
Inspect the surface for deterioration or spalling Check to make sure that the system dewaters between storms	Annually
Spot clogging can be handled by drilling half-inch holes through the pavement every few feet Rehabilitation of the porous concrete system, including the top and base course as needed	Upon failure

To ensure proper maintenance of porous pavement, a carefully worded maintenance agreement is essential. It should include specific the specific requirements and establish the responsibilities of the property owner and provide for enforcement.

This Guidance document is based upon information abstracted from the Georgia Stormwater Manual and the Quick Mix, Inc. web site.

General

Erosion and Sedimentation from individual residential lots can most often be controlled by silt fence along the lower perimeter of all disturbed areas and the installation of a rock construction entrance where construction traffic will enter and exit the site. Standard Construction Detail, Sheet ES-1, shows the typical erosion controls that should be placed on high and low side lots. If the scope of the work requires additional measures on the site, an individual plan must be submitted and approved by the Township. In all cases, the Contractor is responsible for complying with the provisions of PA DEP Chapter 102.

Temporary Erosion Controls

Silt fence must be installed along the lower perimeter of all disturbed areas and will function as the primary control for the site. A stone construction entrance must be installed at the driveway entrance to the site to help prevent mud from being tracked out onto the roadway. When at all possible, construction vehicles should be restricted to paved surfaces.

All uncompleted disturbed areas on which activity will cease for more than twenty (20) days should be seeded and stabilized. After construction is complete and all areas are stabilized, all temporary control measures may be removed and all monitoring will cease. Stabilization is defined as the establishment of a uniform 70% perennial vegetal cover.

Staging Schedule

In general, the following staging schedule should be followed for small projects"

1. Install the silt fence in accordance with the standard detail shown on Detail Sheet ES-2 along the lower perimeter of all disturbed areas.

2. Install the rock construction entrance in accordance with the standard detail shown on Detail Sheet ES-2 at the entrance to the site. The stone base for the driveway should also be installed as soon as it is graded in order to prevent erosion.

3. Grub the construction area and remove the topsoil, stockpiling it at the area designated on the plans.

4. Construct the site improvements.

5. Seed and mulch all disturbed areas.

6. Remove all E & S Controls once the site is stabilized. An area will not be considered stabilized until a uniform 70% perennial vegetal cover is established over the disturbed area.

Maintenance Schedule

It shall be the sole responsibility of the contractor to execute the control of inspection, maintenance, and repair of various sediment control facilities according to the guidelines prescribed below.

All control measures must be inspected on a weekly basis, and in all cases immediately following each runoff event. All necessary repairs should be carried out immediately after their identification. Materials cleaned from the BMP's shall be disposed of by spreading them in the topsoil stockpile area.

Silt Fence

Maintenance checks shall include inspecting silt fence for undercutting, tears, collapse offence, and depths of sediment accumulation. All repairs of damaged fence must be performed immediately to ensure that the fence meets design specifications. Sediment should be removed periodically, and in all cases

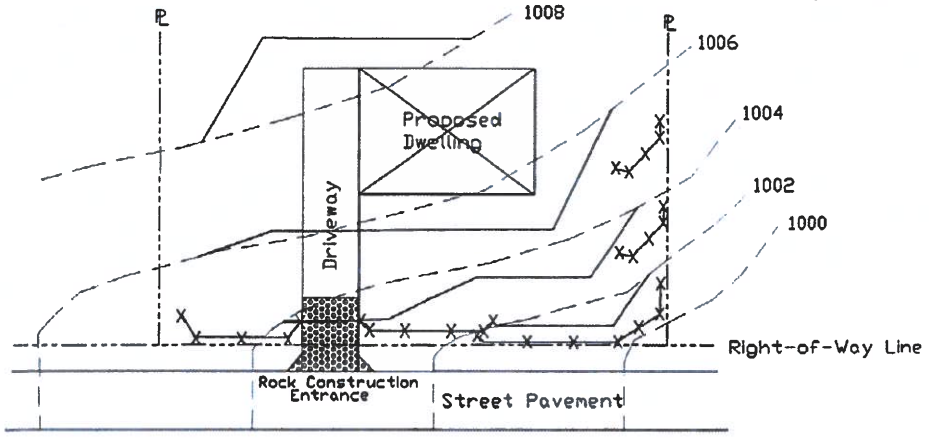
should accumulation attain depths equal to half the height of fence. Sediment deposits removed from the silt fence must be disposed of by spreading the material within the topsoil stockpile area. Undercutting of the toe shall be immediately repaired by installing a rock filter outlet.

Construction Entrance

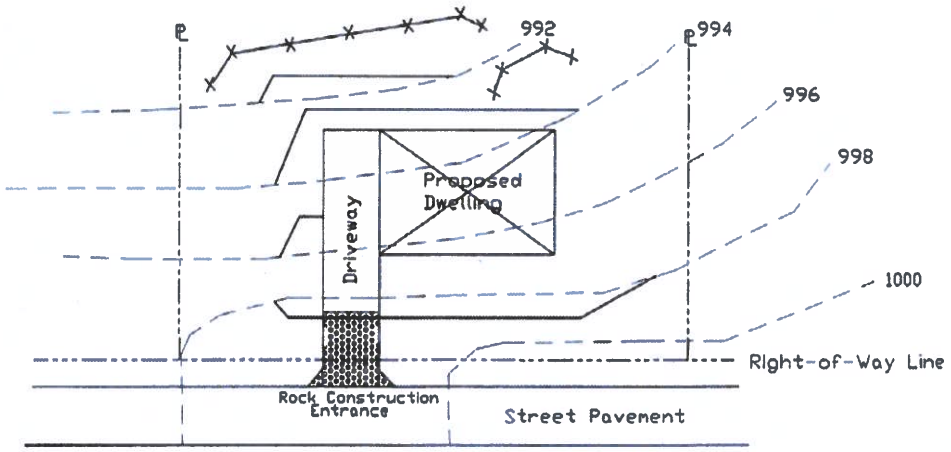
The stabilized construction entrance should be maintained so as to ensure a constant rock thickness. This will be achieved by the placement of additional rock to the specified dimension as required. A stockpile of rock must be maintained on-site for this purpose. At the completion of each work day, all sediment deposited on the public roadways must be removed and returned to the construction site. Washing of the roadway with water will be unacceptable.

Vegetation

All areas to be stabilized by vegetation should be inspected for rills and gullies, bare soil patches or accumulation of sediment at the toe of slopes. Eroded areas shall be regraded, and substandard vegetated areas shall be re-seeded and mulched as specified in the plans.



TYPICAL HIGH-SIDE ON-LOT CONTROL



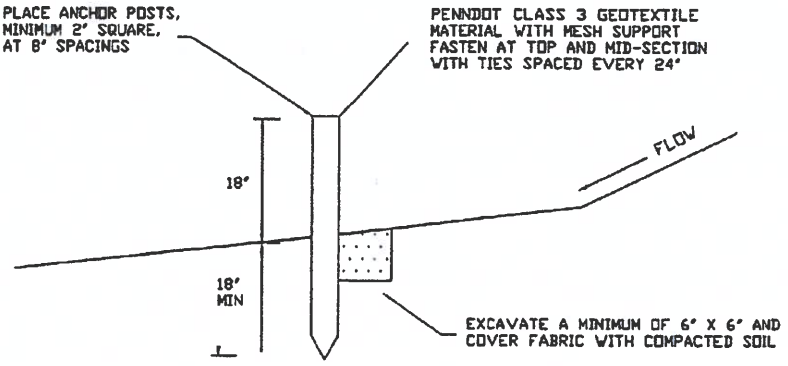
TYPICAL LOW-SIDE ON-LOT CONTROL

LEGEND

Finished Grade
Existing Grade
Silt Fence

Detail ES-1

(Detail from Town of McCandless / Partridge Venture Engineering)



INSTALLATION:

A TRENCH WILL BE PLOWED OR OTHERWISE EXCAVATED TO THE REQUIRED DEPTH WITH LITTLE, IF ANY, DISTURBANCE TO THE DOWNSLOPE SIDE OF THE TRENCH. THE BOTTOM OF THE TRENCH AND THE FENCE TOP WILL BE PLACED ON A LEVEL GRADE. WHEN IT IS NECESSARY TO CROSS SMALL DEPRESSIONS, THE TRENCH BOTTOM AND FENCE TOP EDGE MAY DEVIATE SLIGHTLY FROM LEVEL GRADE. GRADES IN SUCH SECTIONS WILL NOT EXCEED 1% NOR WILL THE DEVIATION EXTEND FOR MORE THAN 25 FEET.

SUPPORT STAKES WILL BE DRIVEN TO THE REQUIRED DEPTH BELOW THE EXISTING GROUND SURFACE AT SPECIFIED INTERVALS AS ILLUSTRATED.

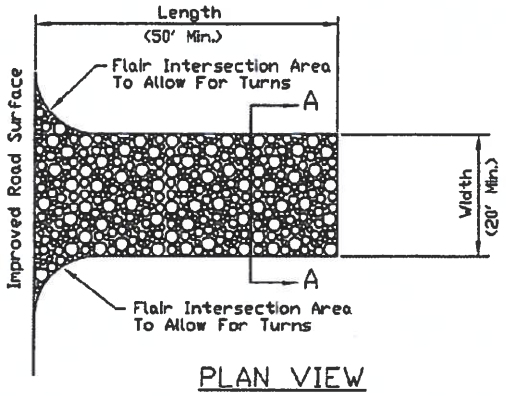
STRETCH AND FASTEN FABRIC TO THE UPSLOPE SIDE OF THE SUPPORT STAKES.

WHERE ENDS OF FABRIC COME TOGETHER, THEY WILL BE OVERLAPPED, FOLDED, AND STAPLED TO PREVENT SEDIMENT BYPASS. AT THE ENDS OF EACH LINE OF SILT FENCE, OR EVERY 100 FEET, WHICHEVER IS S SHORTER, EXTEND THE FENCE UPSLOPE AT A 90 DEGREE ANGLE FOR 4 FEET TO PREVENT ENDFLOW.

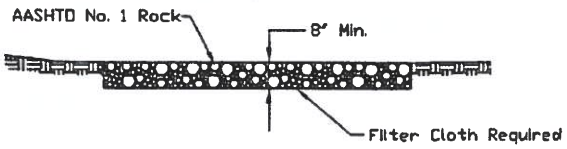
THE TOE ANCHOR WILL BE BACKFILLED AND COMPACTED TO A DENSITY EQUAL TO SURROUNDING SOILS.

SILT FENCE

NO SCALE



PLAN VIEW



SECTION A-A

MAINTENANCE: The structure's thickness will be constantly maintained to the specified dimensions by adding rock. A stockpile of rock material will be maintained on the site for this purpose. At the end of each construction day, all sediment deposited on public roadways will be removed and returned to the

ROCK CONSTRUCTION ENTRANCE DETAIL

NO SCALE

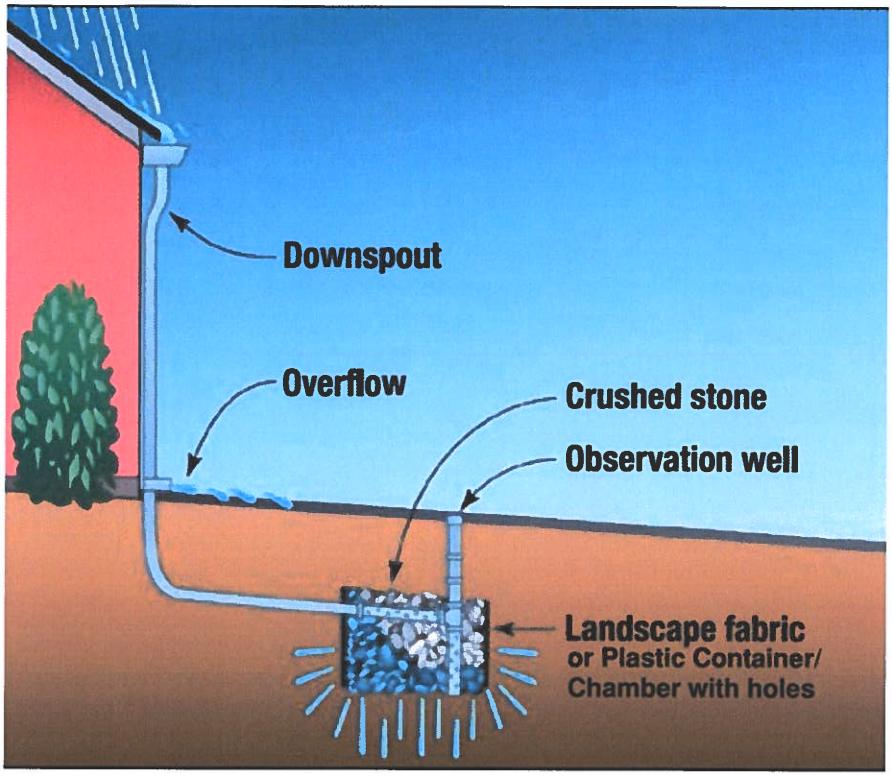
Detail ES-2

(Detail from Town of McCandless / Partridge Venture Engineering)

Exhibit No. 2

Illustrations of Single Family Individual BMPs

Rock Sump

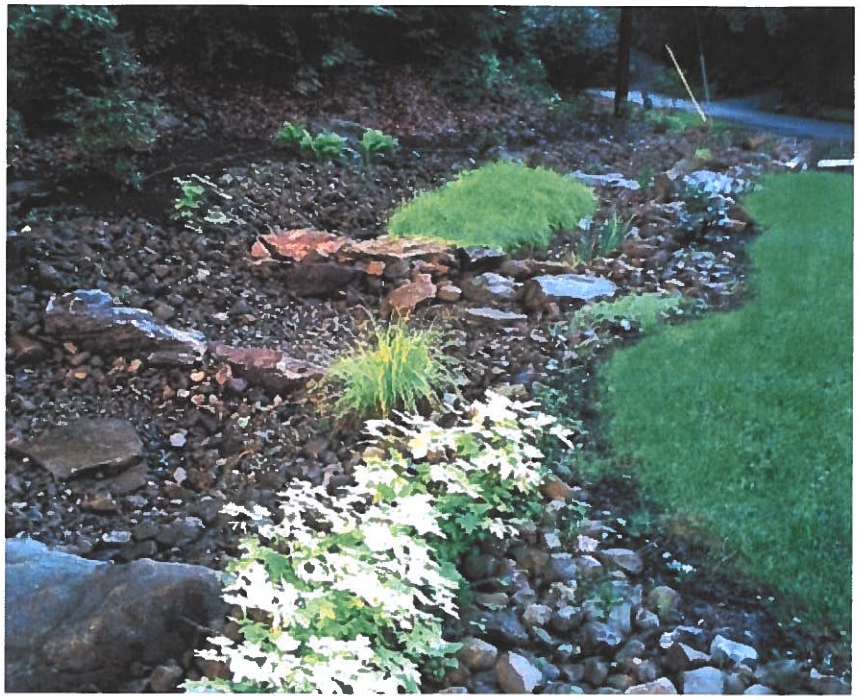


Rain Gardens

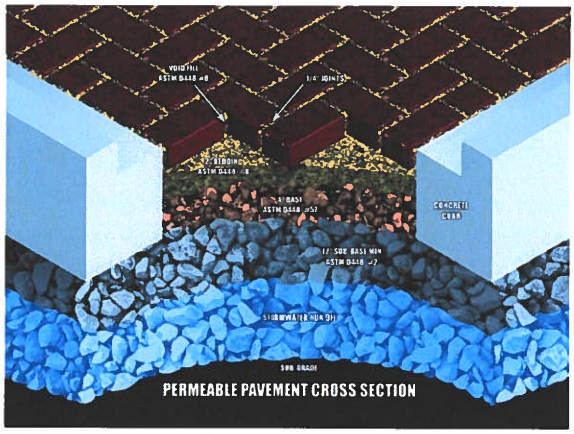
Individual Detention/Retention Ponds

Green Roof

Stormwater Treatment Channel / Swale

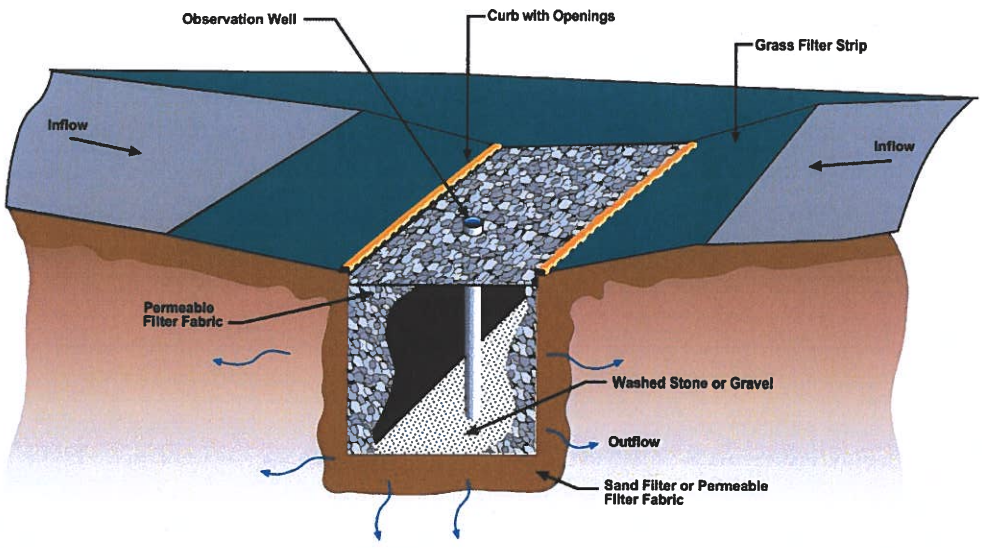


Permeable Pavement



Underground Detention

Infiltration Trench



Infiltration Basin