

ORDINANCE NO: 614

**AN ORDINANCE OF THE TOWNSHIP OF NORTHAMPTON,  
BUCKS COUNTY, PENNSYLVANIA,  
AMENDING CHAPTER 23 (STORMWATER MANAGEMENT AND  
GRADING) OF THE CODE OF THE TOWNSHIP OF NORTHAMPTON  
TO BE CONSISTENT WITH UPDATES TO MS4 GUIDELINES**

**WHEREAS**, the Board of Supervisors of the Township of Northampton is empowered to adopt Ordinances of the Township pursuant to the Pennsylvania First Class Township Code, 53 P.S. § 56502; and

**WHEREAS**, the Board of Supervisors of the Township of Northampton believes amendments to the Provisions contained in Chapter 23 (Stormwater Management and Grading) are necessary to protect the health, safety, morals and general welfare of the residents of the Township.

**NOW, THEREFORE**, the Board of Supervisors of Northampton Township, Bucks County, Pennsylvania does hereby ordain and enact the following:

**SECTION 1.** Chapter 23, Stormwater Management and Grading shall be repealed in its entirety and replaced as follows:

**ARTICLE I  
General Provisions**

**§23-101. Short Title.**

This Ordinance shall be known and may be cited as the "Neshaminy Creek Watershed Stormwater Management Ordinance" (aka Neshaminy/Little Neshaminy Stormwater Management Ordinance).

**§23-102. Statement of Findings.**

The Board of Supervisors of Northampton Township finds that:

- A. Inadequate management of accelerated stormwater runoff resulting from development and redevelopment throughout a watershed increases runoff volumes, flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood-reduction efforts in upstream and downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.

- B. Inadequate planning and management of stormwater runoff resulting from land development and redevelopment throughout a watershed can also harm surface water resources by changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of streambeds and stream banks, thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals, and pathogens.
- C. A comprehensive program of stormwater management (SWM), including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, welfare, and the protection of the people of the municipality and all the people of the Commonwealth, their resources, and the environment.
- D. Stormwater is an important water resource that provides groundwater recharge for water supplies and supports the base flow of streams, which also protects and maintains surface water quality.
- E. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.
- F. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES) program.
- G. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.
- H. Non-stormwater discharges to the Township's separate storm sewer system can contribute to pollution of waters of the Commonwealth by the Township.

**§23-103. Purpose.**

The purpose of this Ordinance is to promote the public health, safety, and welfare within the Township and the Neshaminy Creek watershed by maintaining the natural hydrologic regime and by minimizing the harms and maximizing the benefits described in §23-102 of this Ordinance, through provisions designed to:

- A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Ch. 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.
- B. Minimize increases in stormwater volume and control peak flows.
- C. Minimize impervious surfaces.
- D. Provide review procedures and performance standards for stormwater planning and management.
- E. Preserve the natural drainage systems as much as possible.

- F. Manage stormwater impacts close to the runoff source, requiring a minimum of structures and relying on natural processes.
- G. Focus on infiltration of stormwater to maintain groundwater recharge, to prevent degradation of surface and groundwater quality, and to otherwise protect water resources.
- H. Preserve and restore the flood-carrying capacity of streams.
- I. Prevent scour and erosion of streambanks and stream beds.
- J. Provide standards to meet National Pollution Discharge Elimination System (NPDES) permit requirements.
- K. Address certain requirements of the Municipal Separate Stormwater Sewer System (MS4) NPDES Phase II Stormwater Regulations.
- L. Address the requirements of the Neshaminy Creek Watershed Act 167 Stormwater Management Plan.
- M. Provide for proper operation and maintenance of all stormwater management facilities and best management practices (BMPs) that are implemented in the municipality.

**§23-104. Statutory Authority.**

The municipality is empowered to regulate land use activities that affect runoff, surface, and groundwater quality and quantity by the authority of:

- A. Pennsylvania Municipalities Planning Code, Act 247, as amended.
- B. The Stormwater Management Act 167, as amended.

**§23-105. Applicability; Regulated Activities.**

- A. All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Ordinance.
- B. Regulated activities include, but are not limited to:
  - 1. Land development;
  - 2. Subdivisions;
  - 3. Prohibited or polluted discharges;
  - 4. Alteration of the natural hydrologic regime;
  - 5. Construction or reconstruction of, or addition of new impervious or semi-pervious surfaces (i.e., driveways, parking lots, roads, etc.), except for reconstruction of roads where there is no increase in impervious surface;
  - 6. Construction of new buildings or additions to existing buildings;

7. Redevelopment;
8. Diversion piping or encroachments in any natural or man-made channel; and
9. Nonstructural and structural stormwater management best management practices (BMPs) or appurtenances thereto.

**§23-106. Exemptions.**

- A. Regulated Activities that create impervious surfaces smaller than or equal to 1,000 square feet are exempt from the peak rate control requirements and the SWM Site Plan preparation located in Article IV of this Ordinance unless the activity is found to be a significant contributor of pollution to the waters of this Commonwealth.
- B. Regulated Activities that create impervious surfaces between 1,001 square feet up to and including 5,000 square feet are exempt only from the peak rate control requirements of this Ordinance. (Refer to Appendix I which contains the Small Project SWM Site Plan for small regulated activities creating impervious surface between 1,000 square feet up to and including 5,000 square feet. The Small Project SWM Site Plan provides small regulated activities with the opportunity to submit a SWM site plan without having to hire professional services.)

**Table 23-106-1 Impervious Surface Exemption Thresholds for the Neshaminy Creek Watershed**

| Ordinance Article or Section                        | Type of Project   | Proposed Impervious Surface |                       |                 |
|---|---|-----------------------------|-----------------------|-----------------|
|   |   | 0 – 1,000 sq. ft.           | 1,001 – 5,000 sq. ft. | 5,000 + sq. ft. |
| Article IV SWM Site Plan Requirements               | Development   | Exempt                      | Not Exempt            | Not Exempt      |
| Small Project Site Plan                             | Only Residential Development Applicable   | Exempt                      | Applicable            | N/A             |
| Section 23-303 Volume Control Requirements          | Development   | Not Exempt                  | Not Exempt            | Not Exempt      |
| Section 23-304 Peak Rate Control Requirements       | Development   | Exempt                      | Exempt                | Not Exempt      |
| Erosion and Sediment Pollution Control Requirements | Must comply with Title 25, Chapter 102 of the PA Code and any other applicable state, county, and municipal codes. PADEP requires an engineered post-construction SWM Plan with projects proposing earth disturbance greater than 1 acre. |                             |                       |                 |

- C. Earth disturbance activity of less than 10,000 square feet in area that includes no additional impervious surfaces.
- D. Agricultural activity is exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code 102.
- E. Forest management and timber operations are exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of

25 Pa. Code 102.

- F. Any aspect of BMP maintenance to an existing SWM system made in accordance with plans and specifications approved by the Municipality is exempt.
- G. The use of land for gardening for home consumption is exempt from the requirements of this ordinance.
- H. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in Section 23-301.D through L.
- I. The Township may deny or revoke any exemption pursuant to this Article at any time for any project that the Township believes may pose a threat to public health and safety or the environment.
- J. Exception for Hardship. The Township Engineer, with the concurrence of the Board of Supervisors, may waive or modify any mandatory provision of this Chapter when the literal compliance with a mandatory provision is shown to the satisfaction of the Township Engineer to be unreasonable or cause undue hardship because of peculiar conditions pertaining to the land in question, provided that a modification will not be contrary to the public interest or when an alternative standard can be demonstrated to provide equal or better results.
- K. Additional Exemption Criteria:
  - 1. Exemption Responsibilities – An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect public health, safety, and property.
  - 2. Drainage Problems – Where drainage problems are documented or known to exist downstream of or is expected from the proposed activity, the municipality may deny exemptions.
  - 3. Exemptions are limited to specific portions of this Ordinance.
  - 4. HQ and EV Streams – Northampton Township may deny exemptions in high quality (HQ) or exceptional value (EV) waters and Source Water Protection Areas (SWPA).
  - 5. The exemptions are limited to the increase in impervious coverage amounts listed in Table 23-106-1 for each property as of the adoption of this chapter. Any increase in impervious coverage is cumulative from the date of adoption of this chapter. All cumulative activities that increase the impervious coverage over the amounts stated in Table 23-106.2 will not be exempt from the stated requirements.

**§23-107. Repealer.**

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

**§23-108. Severability.**

Should any section or provision of this Ordinance be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

**§23-109. Compatibility with other ordinance or legal requirements.**

- A. Approvals issued and actions taken pursuant to this Ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance. To the extent that this chapter imposes more rigorous or stringent requirements for stormwater management, the specific requirements contained in this chapter shall be followed.
- B. Nothing in this chapter shall be construed to affect any of the Township requirements regarding stormwater matters which do not conflict with the provisions of this chapter. Conflicting provisions in other Township ordinances or regulations shall be construed to retain the requirements of this chapter by addressing State water quality requirements.

**§23-110. Erroneous Permit.**

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the municipality purporting to validate such a violation.

**§23-111. Waivers**

- A. If the municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 23-111, paragraphs B and C.
- B. Waivers or modifications of the requirements of this Ordinance may be approved by the Township of Northampton if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification.
- C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Township of Northampton unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

**ARTICLE II  
Definitions**

**§23-201. Interpretation.**

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and

the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

- B. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The word "person" includes an individual, firm, association, organization, partnership, trust, company, corporation unit of government or any other similar entity.
- D. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.
- E. The words "used" or "occupied" include the words "intended designed, maintained or arranged to be used, occupied or maintained."

#### **§23-202. Definitions.**

These definitions do not necessarily reflect the definitions contained in pertinent regulations or statutes and are intended for this Ordinance only. As used in this Ordinance, the following terms shall have the meanings indicated:

#### **ACCELERATED EROSION**

The removal of the surface of the land through the combined action of man's activity and the natural processes of a rate greater than would occur because of the natural process alone.

#### **AGRICULTURAL ACTIVITY**

Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops or pasturing and raising of livestock and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

#### **ALTERATION**

As applied to land, a change in topography as a result of the moving of soil and rock from one location or position to another; also the changing of surface conditions by causing the surface to be more or less impervious as the result of changing the land cover including the water, vegetation and bare soil.

#### **APPLICANT**

A landowner, developer, or other person who has filed an application to the municipality for approval to engage in any regulated activity at a project site in the municipality.

#### **AS-BUILT DRAWINGS/PLANS**

Engineering or site drawings maintained by the contractor as he constructs the project and upon which he documents the actual locations of the building components and changes to the original contract documents. These documents, or a copy of same, are turned over to the qualified professional at the completion of the project.

#### **BANKFULL**

The channel at the top-of-bank, or point from where water begins to overflow onto a floodplain.

#### **BASE FLOW**

Portion of stream discharge derived from groundwater; the sustained discharge that does not result from direct runoff or from water diversions, reservoir releases, piped discharges, or other human activities.

#### **BEST MANAGEMENT PRACTICES (BMPs)**

Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural." In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

#### **BIORETENTION**

A stormwater retention area that utilizes woody and herbaceous plants and soils to remove pollutants before infiltration occurs.

#### **BUFFER**

The area of land immediately adjacent to any stream, measured perpendicular to and horizontally from the top-of-bank on both sides of a stream (see "top-of-bank").

#### **CHANNEL**

An open drainage feature through which stormwater flows. Channels include, but shall not be limited to, natural and man-made watercourses, swales, streams, ditches, canals, and pipes that convey continuously or periodically flowing water.

#### **CISTERN**

An underground reservoir or tank for storing rainwater.

#### **CONSERVATION DISTRICT**

The Bucks County Conservation District.

#### **CULVERT**

A structure with its appurtenant works, which carries water under or through an embankment or fill.

#### **CURVE NUMBER**

Value used in the Soil Cover Complex Method. It is a measure of the percentage of precipitation which is expected to run off from the watershed and is a function of the soil, vegetative cover, and tillage method.

#### **CUT**

- (1) An excavation.
- (2) The difference in vertical elevation between a point on the surface of original ground and a designated point of lower elevation on the final grade.



(3) The material removed in excavation.

**DAM**

A man-made barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid. A dam may include a refuse bank, fill or structure for highway, railroad or other purposes which impounds or may impound water or another fluid or semifluid.

**DEPARTMENT**

The Pennsylvania Department of Environmental Protection (PADEP).

**DESIGN PROFESSIONAL (QUALIFIED)**

A Pennsylvania registered professional engineer, registered landscape architect or registered professional land surveyor trained to develop stormwater management plans.

**DESIGN STORM**

The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24 hours), used in the design and evaluation of stormwater management systems. Also see Return Period.

**DESIGNEE**

The agent of the Bucks County, Bucks County Conservation District, and/or agent of the governing body involved with the administration, review, or enforcement of any provisions of this Ordinance by contract or memorandum of understanding.

**DETENTION BASIN**

An impoundment designed to collect and retard stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate. Detention basins are designed to drain completely soon after a rainfall event and become dry until the next rainfall event.

**DETENTION VOLUME**

The volume of runoff that is captured and released into the waters of the Commonwealth at a controlled rate.

**DEP**

The Pennsylvania Department of Environmental Protection.

**DEVELOPER**

A person that seeks to undertake a land development or subdivision.

**DEVELOPMENT**

Any human-induced change to improved or unimproved real estate, whether public or private, including but not limited to land development, construction, installation, or expansion of a building or other structure, land division, street construction, drilling, and site alteration such as embankments, dredging, grubbing, grading, paving, parking or storage facilities, excavation, filling, stockpiling, or clearing. As used in this Ordinance, "development" encompasses both new development and redevelopment.

**DEVELOPMENT SITE (SITE)**

The specific tract or parcel of land where any regulated activity in the municipality is planned,

conducted, or maintained.

**DIFFUSED DRAINAGE DISCHARGE**

Drainage discharge that is not confined to a single point location or channel, including sheet flow or shallow concentrated flow.

**DISCHARGE**

A. Verb: To release water from a project, site, aquifer, drainage basin or other point of interest.

B. Noun: The rate and volume of flow of water such as in a stream, generally expressed in cubic feet per second. See also "peak discharge."

**DISCHARGE POINT**

The point of discharge for a stormwater facility.

**DISCONNECTED IMPERVIOUS AREA (DIA)**

An impervious or impermeable surface that is disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area, which allows for infiltration, filtration, and increased time of concentration as specified in Appendix F, Disconnected Impervious Area.

**DISTURBED AREA**

Unstabilized land area where an earth disturbance activity is occurring or has occurred.

**DITCH**

A man-made waterway constructed for irrigation or stormwater conveyance purposes.

**DRAINAGE CONVEYANCE FACILITY**

A stormwater management facility designed to transport stormwater runoff that includes channels, swales, pipes, conduits, culverts, and storm sewers.

**DRAINAGE EASEMENT**

A right granted by a landowner to a grantee, allowing the use of private land for stormwater management purposes.

**DRAINAGE PERMIT**

A permit issued by the municipality after the SWM Site Plan has been approved.

**EARTH DISTURBANCE ACTIVITY**

A construction or other human activity that disturbs the surface of land, including but not limited to: clearing and grubbing, grading, excavations, embankments, land development, agricultural plowing or tilling, timber harvesting activities, road maintenance activities, building construction, mineral extraction, and the moving, depositing, stockpiling, or storing of soil, rock or earth materials.

**EMERGENCY SPILLWAY**

A conveyance area that is used to pass peak discharge greater than the maximum design storm controlled by the stormwater facility.

**ENCROACHMENT**

A structure or activity that changes, expands or diminishes the course, current or cross section of a

watercourse, floodway or body of water.

**EROSION**

The process by which the surface of the land, including water/stream channels, is worn away by water, wind, or chemical action.

**EROSION AND SEDIMENT CONTROL PLAN**

A site-specific plan identifying BMPs to minimize accelerated erosion and sedimentation. For agricultural plowing or tilling activities, the Erosion and Sediment Control Plan is that portion of a conservation plan identifying BMPs to minimize accelerated erosion and sedimentation.

**EXCEPTIONAL VALUE WATERS**

Surface waters of high quality which satisfy Pennsylvania Code Title 25 Environmental Protection, Chapter 93, Water Quality Standards, § 93.4b(b) (relating to antidegradation).

**EXISTING CONDITIONS**

The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

**EXISTING RECHARGE AREA**

Undisturbed surface area or depression where stormwater collects and a portion of which infiltrates and replenishes the groundwater.

**EXISTING RESOURCES AND SITE ANALYSIS MAP**

A base map which identifies fundamental environmental site information including floodplains, wetlands, topography, vegetative site features, natural areas, prime agricultural land and areas supportive of endangered species.

**FILL**

Any act by which earth, sand, gravel, rock or any other material is placed, pushed, dumped, pulled, transported or moved to a new location above the natural surface of the ground or on top of the stripped surface, including the conditions resulting there from; the difference in elevation between a point on the original ground and a designated point of higher elevation on the final grade; or the material used to make a fill.

**FINISHED GRADE**

The final vertical elevation of the ground after development.

**FEMA**

Federal Emergency Management Agency.

**FLOOD**

A temporary condition of partial or complete inundation of land areas from the overflow of streams, rivers, and other waters of the Commonwealth.

**FLOODPLAIN**

Any land area susceptible to inundation by water from any natural source or as delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement

Officers (as amended or replaced from time to time by DEP).

### **FLOODPLAIN SOIL**

Soil in a current floodplain that has a flooding occurrence greater than none. Floodplain soils shall be the following soils so classified by the Soil Survey of Bucks County, Pennsylvania, United States Department of Agriculture, Natural Resources Conservation Service; in cooperation with the Pennsylvania State University, College of Agricultural Sciences; the Pennsylvania Department of Environmental Protection; the Pennsylvania Department of Agriculture; and the Bucks County Conservation District, dated September 2002:

- (1) Bowmansville-Knauers silt loam (Bo).
- (2) Delaware loam (DaA, DaB).
- (3) Fluvaquents (Fl).
- (4) Hatboro Silt Loam (Ha).
- (5) Holly silt loam (Ho).
- (6) Linden loam (U).
- (7) Nanticoke-Hatboro silt loam (Na).
- (8) Psamments (Ps).
- (9) Rowland silt loam (Ro).
- (10) Urban land, Occasionally flooded (Ufw).
- (11) Urban land, Delaware complex (UIB).

### **FLOODWAY**

The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the 100-year flood without cumulatively increasing the water surface elevation more than one foot. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed--absent evidence to the contrary--that the floodway extends from the watercourse to 50 feet from the top of the bank of the watercourse.

### **FOREST MANAGEMENT/TIMBER OPERATIONS**

Planning and associated activities necessary for the management of forestland. These include timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

### **FREEBOARD**

A vertical distance between the elevation of the design high water and the top of a dam, levee, tank, basin, swale, or diversion berm. The space is required as a safety margin in a pond or basin.

### **GOVERNING BODY**

The Township Board of Supervisors of the Township of Northampton.

### **GRADE**

A. Noun: A slope, usually of a road, channel or natural ground specified in percent and shown on plans as specified herein.

B. Verb: To finish the surface of a roadbed, the top of an embankment, or the bottom of excavation.

#### **GREEN INFRASTRUCTURE**

Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

#### **GROUND COVER**

Low-growing plant materials planted and growing in such a manner so as to conceal the earth surface.

#### **GROUNDWATER**

Water beneath the earth's surface that supplies wells and springs, and is often between saturated soil and rock.

#### **GROUNDWATER RECHARGE**

The replenishment of existing natural underground water supplies from rain or overland flow.

#### **HEC-HMS**

The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) — Hydrologic Modeling System (HMS). This model was used to model the Neshaminy Creek watershed during the Act 167 Plan development and was the basis for the standards and criteria of this Ordinance.

#### **HIGH-QUALITY WATERS**

Surface waters having quality which exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water by satisfying Pennsylvania Code Title 25, Environmental Protection, Chapter 93, Water Quality Standards, § 93.4b(a).

#### **HOT SPOT**

An area where land use or activity generates highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater. Typical pollutant loadings in stormwater may be found in Chapter 8, Section 6, of the Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) No. 363-0300-002 (2006). More information concerning hot spots may be found in §23-306.

#### **HYDROGRAPH**

A graph representing the discharge of water versus time for a selected point in the drainage system.

#### **HYDROLOGIC REGIME**

The hydrologic cycle or balance that sustains quality and quantity of stormwater, baseflow, storage, and groundwater supplies under natural conditions.

#### **HYDROLOGIC SOIL GROUP (HSG)**

A classification of soils by the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, into four runoff potential groups. The groups range from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff. The soils in the area of the development site may be identified from a soil survey report that can be obtained from the local NRCS offices or conservation district office.

**IMPERVIOUS SURFACE (IMPERVIOUS AREA)**

A surface that does not absorb water or prevents the infiltration of water into the ground. All buildings, roofs, parking areas, driveways, roads, sidewalks, and any areas in concrete, asphalt, and packed stone shall be considered impervious surfaces. In addition, other areas determined by the Municipal Engineer to be impervious within the meaning of this definition will also be impervious surfaces.

**IMPOUNDMENT**

A retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

**INFILL DEVELOPMENT**

Development that occurs on smaller parcels that remain undeveloped but are within or very close proximity to urban or densely developed areas. Infill development usually relies on existing infrastructure and does not require an extension of water, sewer or other public utilities.

**INFILTRATION**

Movement of surface water into the soil, where it is absorbed by plant roots, evaporated into the atmosphere, or percolated downward to recharge groundwater.

**INFILTRATION STRUCTURES**

A structure designed to direct runoff into the underground water (e.g., French drains, seepage pits, or seepage trenches).

**INITIAL ABSTRACTION (IA)**

The value used to calculate the volume or peak rate of runoff in the Soil Cover Complex Method. It represents the depth of rain retained on vegetation plus the depth of rain stored on the soil surface plus the depth of rain infiltrated prior to the start of runoff.

**INLET**

The upstream end of any structure through which water may flow.

**INTERMITTENT STREAM**

A stream that flows only part of the time. Flow generally occurs for several weeks or months in response to seasonal precipitation or groundwater discharge.

**KARST**

A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

**LAND DEVELOPMENT**

Any of the following activities:

- A. The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving:
  - (1) A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots, regardless of the number of occupants or tenure; or

- (2) The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features.

B. A subdivision of land;

C. Development in accordance with Section 503(1.1) of the Pa. Municipalities Planning Code.

**LOT**

A designated parcel, tract or area of land established by a plat or otherwise as permitted by law and to be used, developed or built upon as a unit.

**LOW-IMPACT DEVELOPMENT (LID) PRACTICES**

Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site.

**MAIN STEM (MAIN CHANNEL)**

Any stream segment or other runoff conveyance used as a reach in the Neshaminy Creek hydrologic model.

**MANNING EQUATION (MANNING FORMULA)**

A method for calculation of velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.

**MUNICIPAL ENGINEER**

A professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed as the engineer for a municipality, planning agency or joint planning commission.

**MUNICIPALITY**

Northampton Township, Bucks County, Pennsylvania.

**NATURAL HYDROLOGIC REGIME**

See "hydrologic regime."

**NONPOINT SOURCE POLLUTION**

Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

**NONSTORMWATER DISCHARGES**

Water flowing in stormwater collection facilities, such as pipes or swales, which is not the result of a rainfall event or snowmelt.

**NONSTRUCTURAL BEST MANAGEMENT PRACTICE (BMP)**

Methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area and grading reduction, protection of natural depression area, temporary ponding

onsite and other techniques.

**NPDES**

National Pollutant Discharge Elimination System, the federal government's system for issuance of permits under the Clean Water Act, which is delegated to PADEP in Pennsylvania.

**NRCS**

USDA Natural Resource Conservation Service (previously Soil Conservation Service).

**OUTFALL**

"Point source" as described in 40 CFR 122.2 at the point where the municipality's storm sewer system discharges to surface waters of the Commonwealth.

**OUTLET**

Points of water disposal to a stream, river, lake, tidewater or artificial drain.

**PARENT TRACT**

The parcel of land from which a land development or subdivision originates, determined from the date of municipal adoption of this Ordinance.

**PEAK DISCHARGE**

The maximum rate of stormwater runoff from a specific storm event.

**PENN STATE RUNOFF MODEL (PSRM)**

The computer-based hydrologic model developed at the Pennsylvania State University.

**PERENNIAL STREAM**

A stream which contains water at all times except during extreme drought.

**PERVIOUS SURFACE/AREA**

Any area not defined as impervious.

**PIPE**

A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

**PLANNING COMMISSION**

The Planning Commission of Northampton Township.

**POINT SOURCE**

Any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged, as defined in state regulations at 25 Pa. Code § 92.1.

**POSTCONSTRUCTION**

Period after construction during which disturbed areas are stabilized, stormwater controls are in place and functioning and all proposed improvements in the approved land development plan are completed.

**PREDEVELOPMENT**

See "existing condition."



**PRETREATMENT**

Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily designed to meet the volume requirements of §23-303.

**PROJECT SITE**

The specific tract or parcel of land where any regulated activity in the municipality is planned, conducted, or maintained.

**QUALIFIED PROFESSIONAL**

Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Ordinance.

**RATIONAL METHOD**

A rainfall-runoff relation used to estimate peak flow.

**RECHARGE**

The replenishment of groundwater through the infiltration of rainfall, other surface waters, or land application of water or treated wastewater.

**RECORD DRAWINGS**

Original documents revised to suit the as-built conditions and subsequently provided by the engineer to the client. The engineer reviews the contractor's as-built drawings against his/her own records for completeness, then either turns these over to the client or transfers the information to a set of reproducibles, in both cases for the client's permanent records. Record drawings are not the same as record plans submitted for recording with the county in accordance with the Pa. Municipalities Planning Code (Act 247).

**REDEVELOPMENT**

Any development that requires demolition or removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as top-layer grinding and repaving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment. Utility trenches in streets are not considered redevelopment unless more than 50% of the street width including shoulders is removed and repaved.

**REGULATED ACTIVITIES**

Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

**REGULATED EARTH DISTURBANCE ACTIVITY**

Activity involving earth disturbance subject to regulation under 25 Pa. Code Ch. 92, 25 Pa. Code Ch. 102, or the Clean Streams Law.

**RELEASE RATE**

The percentage of existing conditions peak rate of runoff from a site or subarea to which the proposed conditions peak rate of runoff must be reduced to protect downstream areas.

**REPAVING**

Replacement of the impervious surface that does not involve reconstruction of an existing paved (impervious) surface.

**REPLACEMENT PAVING**

Reconstruction of and full replacement of an existing paved (impervious) surface.

**RETENTION BASIN**

A structure in which stormwater is stored and not released during the storm event. Retention basins are designed for infiltration purposes, and do not have an outlet. The retention basin must infiltrate stored water in four days or less.

**RETENTION VOLUME/REMOVED RUNOFF**

The volume of runoff that is captured and not released directly into the surface waters of the Commonwealth during or after a storm event.

**RETURN PERIOD**

The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the 25-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e., a 4% chance).

**RIPARIAN BUFFER**

Any area with qualifying vegetation in the 100-year floodplain and a minimum of 35' from the streambank.

**ROAD MAINTENANCE**

Earth disturbance activities within the existing road cross-section, such as grading and repairing existing unpaved road surfaces, cutting road banks, cleaning or clearing drainage ditches and other similar activities.

**ROOF DRAINS**

A drainage conduit or pipe that collects water runoff from a roof and leads it away from the structure.

**RUNOFF**

Any part of precipitation that flows over the land surface.

**RUNOFF COEFFICIENT**

Value used in the Rational Method. It is a measure of the portion of precipitation which is expected to run off from the watershed and is a function of the soil and vegetative cover.

**SALDO**

Subdivision and Land Development Ordinance.

**SEDIMENT**

Soils or other materials transported by surface water as a product of erosion.

**SEDIMENT BASIN**

A barrier, dam, retention or detention basin located and designed to retain rock, sand, gravel, silt, or other material transported by water.

**SEDIMENT POLLUTION**

The placement, discharge or any other introduction of sediment into the waters of the Commonwealth.

**SEDIMENTATION**

The process by which mineral or organic matter is accumulated or deposited by the movement of water or air.

**SEEPAGE PIT/SEEPAGE TRENCH**

An area of excavated earth filled with loose stone or similar coarse material, into which surface water is directed for infiltration into the underground water. More information on seepage pits may be found in the PA BMP Manual, December 2006, Chapter 6, Section 4, or the latest edition, chapter, and section.

**SEPARATE STORM SEWER SYSTEM**

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) primarily used for collecting and conveying stormwater runoff.

**SHALLOW CONCENTRATED FLOW**

Stormwater runoff flowing in shallow, defined ruts prior to entering a defined channel or waterway.

**SHEET FLOW**

A flow process associated with broad, shallow water movement on sloping ground surfaces that is not channelized or concentrated.

**SOIL COVER COMPLEX METHOD**

A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called "curve number" (CN).

**SOURCE WATER PROTECTION AREAS (SWPA)**

The zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

**SPECIAL PROTECTION SUBWATERSHEDS**

Watersheds that have been designated in Pennsylvania Code Title 25, Environmental Protection, Chapter 93, Water Quality Standards, as exceptional value (EV) or high-quality (HQ) waters.

**SPILLWAY**

A conveyance that is used to pass the peak discharge of the maximum design storm that is controlled by the stormwater facility.

**STATE WATER QUALITY REQUIREMENTS**

The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

**STORM FREQUENCY**

The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years. See "return period."

**STORM SEWER**

A system of pipes and/or open channels that convey intercepted runoff and stormwater from other sources, but excludes domestic sewage and industrial wastes.

#### **STORMWATER**

Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

#### **STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES**

"BMPs" or "SWM BMPs" throughout this Ordinance.

#### **STORMWATER MANAGEMENT FACILITY**

Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff quality, rate or quantity. Typical stormwater management facilities include, but are not limited to detention and retention basins, open channels, storm sewers, pipes, and infiltration structures.

#### **STORMWATER MANAGEMENT PLAN**

The watershed plan, known as the "Neshaminy Creek Watershed Act 167 Stormwater Management Plan," for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the Neshaminy Creek watershed adopted by Bucks and Montgomery Counties as required by the Act of October 4, 1978, P.L. 864 (Act 167).

#### **STORMWATER MANAGEMENT SITE PLAN (SWM SITE PLAN)**

The plan prepared by the applicant or his representative indicating how stormwater runoff will be managed at the particular site of interest according to this Ordinance.

#### **STREAM**

A flow of water in a natural channel or bed, as a brook, rivulet, or a small river.

#### **STREAM BUFFER**

The land area adjacent to each side of a stream, essential to maintaining water quality. (See "buffer.")

#### **STREAM ENCLOSURE**

A bridge, culvert, or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of the Commonwealth.

#### **STREAM BANK EROSION**

The widening, deepening, or headward cutting of channels and waterways, caused by stormwater runoff or bankfull flows.

#### **SUBAREA (SUBWATERSHED)**

The smallest drainage unit of a watershed for which stormwater management criteria have been established in the stormwater management plan.

#### **SUBDIVISION**

The division or redivision of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels, or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development, provided the subdivision by lease of land for agricultural purposes into parcels of more than 10 acres, not involving any new street or easement of access or any residential dwelling, shall be exempted.

**SURFACE WATERS OF THE (THIS) COMMONWEALTH**

Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface waters, or parts thereof, whether natural or artificial, within or on the boundaries of the Commonwealth.

**SWALE**

A low-lying stretch of land that gathers or carries surface water runoff.

**SWM SITE PLAN**

The documentation of the stormwater management system to be used for a given development site, the contents of which are established in §23-402.

**TIMBER OPERATIONS**

See "forest management."

**TIME-OF-CONCENTRATION (TC)**

The time required for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

**TOP-OF-BANK**

Highest point of elevation in a stream channel cross-section at which a rising water level just begins to flow out of the channel and over the floodplain.

**TREE DRIP LINE**

A boundary line marking the outer edges of the branches of a tree.

**TREE PROTECTION ZONE**

An area 15 feet radially from the trunk of the tree to be retained, or the distance from the trunk to the tree dripline, whichever is greater, in which no construction activity shall occur. Where there is a group of trees or woodlands, the tree protection zone shall be the aggregate of the protection zones for the individual trees.

**USDA**

United States Department of Agriculture.

**VEGETATED SWALE**

A natural or man-made waterway, usually broad and shallow, covered with erosion-resistant grasses, used to convey surface water.

**VERNAL POOL**

Seasonal depressional wetlands that are covered by shallow water for variable periods from winter to spring, but may be completely dry for most of the summer and fall.

**WATERCOURSE**

A channel or conveyance of surface water having a defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

## **WATERS OF THE (THIS) COMMONWEALTH**

Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of the Commonwealth.

## **WATERSHED**

Region or area drained by a river, watercourse, or other surface water of the Commonwealth, whether natural or artificial.

## **WET BASIN**

Pond for urban runoff management that is designed to detain urban runoff and always contains water.

## **WETLAND**

Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, fens, and similar areas.

## **ARTICLE III** **Stormwater Management Standards**

### **§23-301. General requirements.**

- A. Applicants proposing regulated activities in the Neshaminy Creek watershed that do not fall under the exemption criteria shown in §23-106 shall submit a stormwater management (SWM) Site Plan consistent with the Neshaminy Creek Watershed SWM Plan to the Township for review. The SWM criteria of this Ordinance shall apply to the total proposed development even if development is to take place in stages. Preparation and implementation of an approved SWM Site Plan is required. No regulated activities shall commence until the Township issues written approval of a SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.
- B. SWM Site Plans approved by the municipality, in accordance with Article IV, shall be on-site throughout the duration of the regulated activity.
- C. The Township may, after consultation with the DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.
- D. For all regulated earth disturbance activities, erosion and sediment (E&S) control best management practices (BMPs) shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* No. 363-2134-008, as amended and updated.
- E. Impervious areas:

1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.
  2. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.
  3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance.
- F. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification of the adjacent property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.
- G. All regulated activities shall include such measures as necessary to:
1. Protect health, safety, and property;
  2. Meet the water quality goals of this Ordinance by implementing measures to:
    - a. Minimize disturbance to floodplains, wetlands, and wooded areas.
    - b. Create, maintain, repair or extend riparian buffers.
    - c. Avoid erosive flow conditions in natural flow pathways.
    - d. Minimize thermal impacts to waters of this Commonwealth.
    - e. Disconnect impervious surfaces (i.e., disconnected impervious areas/DIAs) by directing runoff to pervious areas, wherever possible. See Appendix F for detail on DIAs.
  3. Incorporate the techniques for low impact development practices (e.g., protecting existing trees, reducing area of impervious surface, cluster development, and protecting open space) described in the *Pennsylvania Stormwater Best Management Practices Manual (PA BMP Manual) No. 363-0300-002(2006)*, as amended and updated. See Appendix E for a summary description.
- H. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize the use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.
- I. The design of all facilities over karst shall include an evaluation of measures to minimize the risk of adverse effects.
- J. Storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.
- K. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, Version 3.0, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service Hydrometeorological Design Studies Center, Silver Spring, Maryland, using data from the Doylestown station (36-2221), seen in Table 23-B-1 in Appendix 23-B. The SCS Type II

rainfall curve from NOAA is found on Figure 23-B-1 in Appendix B. NOAA's Atlas 14 can be accessed at [http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html).

- L. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Stormwater Management Act.
- M. Various BMPs and their design standards are listed in the Pennsylvania Stormwater Best Management Practices Manual (PA BMP Manual).

#### **§23-302. Permit Requirements by Other Governmental Entities.**

Approvals issued and actions taken under this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance.

#### **§23-303. Erosion and Sedimentation Control During Regulated Activities.**

- A. No regulated earth disturbance activities within Northampton Township shall commence until Northampton Township approves an erosion and sediment control plan for construction activities.
- B. DEP has regulations that require an erosion and sediment control plan for any earth disturbance activity of 5,000 square feet or more, under Title 25, Pa. Code. The Bucks County Conservation District requires their approval of an erosion and sedimentation control plan for any earth disturbance activity of 1,000 square feet or more.
- C. In addition, under 25 Pa. Code, Chapter 102.5, a DEP "NPDES permit for stormwater discharges associated with construction activities" permit is required for any earth disturbance activity that involves equal to or greater than one acre of earth disturbance prior to commencing the earth disturbance activity, this includes earth disturbance on any portion, part or during any stage of a larger common plan of development or sale.
- D. Detailed construction schedules shall be included in all erosion and sedimentation plans and stormwater management plan reviews by the Bucks County Conservation District.
- E. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office or the Bucks County Conservation District must be provided to Northampton Township. The issuance of an NPDES permit for stormwater discharges associated with construction activities or permit under the Statewide general permit (PAG-2) satisfies the requirements of Subsection 1.
- F. A copy of the erosion and sediment control plan and any required permit, as required by DEP regulations, shall be available on the project site at all times.
- G. Additional erosion and sediment control design standards and criteria are recommended to be applied where infiltration BMPs are proposed. They shall include the following:
  - 1. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity. Barriers such as construction fencing should be used to protect and keep construction traffic out of the area where



infiltration BMPs are proposed. Inlet or pipes that are installed to these systems should be completely sealed or protected and monitored until the drainage areas are completely stabilized.

2. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has achieved final stabilization, or as approved by the engineer.

**§23-304. Volume control.**

Volume controls will mitigate increased runoff impacts, protect stream channel morphology, maintain groundwater recharge, and contribute to water quality improvements. Stormwater runoff volume control methods are based on the net change in runoff volume for the two-year storm event.

The green infrastructure and low impact development practices provided in the PA BMP Manual shall be utilized for all regulated activities wherever possible. Runoff volume controls shall be implemented using the *Design Storm Method* in subsection A or the *Simplified Method* in subsection B below. For Regulated Activities equal to or less than one (1) acre that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the basis of economic considerations, the intrinsic limitations of the procedures associated with each methodology, and other factors. All regulated activities greater than one (1) acre and those that require hydrologic routing to design the stormwater facilities must use the *Design Storm Method*.

A. The *Design Storm Method* (CG-1 in the PA BMP Manual) is applicable to any size of regulated activity. This method requires detailed modeling based on site conditions. For modeling assumptions, refer to §23-306.A.

1. Post-development total runoff cannot be increased from pre-development total runoff for all storms equal to or less than the 2-year 24-hour duration precipitation.
2. The following applies in order to estimate the increased volume of runoff for the 2-year 24-hour duration precipitation event:

To calculate the runoff volume (cubic feet) for existing site conditions (pre-development) and for the proposed developed site conditions (post-development), it is recommended to use the Soil Cover Complex method as shown below. The calculated volume shall be either reused, evapotranspired, or infiltrated through structural or nonstructural means. Runoff volume must be calculated for each land use type and soil. The use of a weighted CN value for volume calculations is not acceptable. Table 23-B-3 in Appendix B is available to guide a qualified professional and/or an applicant to calculate the stormwater runoff volume.

***Soil Cover Complex Method:***

**Step 1: Runoff (in) =  $Q = (P - 0.2S)^2 / (P + 0.8S)$**

Where:

P = Two-year rainfall (inches)

$$S = (1,000/CN) - 10; \text{ the potential maximum retention (including initial abstraction, } I_a)$$

Step 2: Runoff Volume (cubic feet) = Q x Area x 1/12

Where:

$$\begin{aligned} Q &= \text{Runoff (inches)} \\ \text{Area} &= \text{Stormwater management area (square feet)} \end{aligned}$$

B. The *Simplified Method* (CG-2 in the PA BMP Manual) is independent of site conditions and should be used if the *Design Storm Method* is not followed. This method is not applicable to regulated activities greater than one acre or for projects that require design of stormwater storage facilities. For new impervious surfaces:

1. Stormwater facilities shall capture the runoff volume from at least the first two inches (2") of runoff from all new impervious surfaces.

$$\text{Volume (cubic feet)} = (2 \text{ inches runoff} / 12 \text{ inches}) * \text{impervious surface (square feet)}$$

2. At least the first one inch (1") of runoff volume from new impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. The calculated volume shall be removed through reuse, evapotranspiration, or infiltration through structural or nonstructural means.

$$\text{Volume (cubic feet)} = (1 \text{ inch runoff} / 12 \text{ inches}) * \text{impervious surface (square feet)}$$

3. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases where soils are suitable for infiltration based on the criteria of §23-304.C.(5) and §23-304.C.(6), at least the first 1/2 inch (0.5") of the permanently removed runoff should be infiltrated.
  4. No more than one inch (1") of runoff volume from impervious surfaces shall be released from the site. The release time must be over 24 to 72 hours.
- C. Stormwater control measures. The applicant must demonstrate how the required volume is controlled through Stormwater Best Management Practices (BMPs) which shall provide the means necessary to capture, reuse, evaporate, transpire or infiltrate the total runoff volume.

1. If natural resources exist on the site, the applicant who is required to submit a SWM Site Plan shall determine the total acreage of protected area where no disturbance is proposed. The acreage of the protected area should be subtracted from the total site area and not included in the stormwater management site area acreage used in determining the volume controls.

$$\text{Stormwater Management Site Area} = \text{Total Site Area (for both pre and post development conditions)} \textit{ minus} \text{ Protected Area}$$

Natural resource areas should be calculated based upon the Township's own natural resource protection ordinance requirements in the Zoning Ordinance. See Table B-2 in Appendix B for

**Stormwater Management Site Area =  
Total Site Area (for both pre and post development conditions) *minus* Protected Area**

guidance to assess the total protected area. For additional reference, see Chapter 5 Section 5.4.1 of the PA BMP manual.

2. Calculate the volume controls provided through nonstructural BMPs. Table B-5 in Appendix B is recommended as guidance.
3. Volume controls provided through nonstructural BMPs should be subtracted from the required volume to determine the necessary structural BMPs.

$$\begin{array}{ccccccc} \text{Required} & & \text{Nonstructural} & & \text{Structural Volume} \\ \text{Volume Control (feet}^3\text{)} & \textit{minus} & \text{Volume Control (feet}^3\text{)} & = & \text{Requirement (feet}^3\text{)} \end{array}$$

4. Calculate the volume controls provided through structural BMPs. Table B-6 in Appendix B is recommended as guidance. See PA BMP Manual Chapter 6 for description of the BMPs.
5. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on the suitability of soils and site conditions (see Table B-6 in Appendix B for a list of Infiltration BMPs). Infiltration BMPs shall be constructed on soils that have the following characteristics:
  - a. A minimum soil depth of 24 inches between the bottom of the infiltration BMPs and the top of bedrock, seasonally high water table, or other limiting zone.
  - b. An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests. A minimum of 0.2 inches/hour should be utilized and for acceptable rates a safety factor of 50% should be applied for design purposes (e.g., for soil which measured 0.4 inch/hour, the BMP design should use 0.2 inch/hour to ensure safe infiltration rates after construction).
  - c. All open-air infiltration facilities shall be designed to completely infiltrate runoff volume within three days (72 hours) from the start of the design storm.
6. Soils. A soils evaluation of the project site shall be required to determine the suitability of infiltration facilities. All regulated activities are required to perform a detailed soils evaluation by a qualified design professional which at minimum address soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be:
  - a. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of subgrade stability; infiltration may not be ruled out without conducting these tests.
  - b. Provide field tests such as double-ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.
  - c. Design the infiltration structure based on field-determined capacity at the level of the proposed

infiltration surface and based on the safety factor of 50%.

- d. If on-lot infiltration structures are proposed, it must be demonstrated to the Township that the soils are conducive to infiltrate on the lots identified.
- e. An impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Township.

**§23-305. Stormwater peak rate control and management districts.**

Peak rate controls for large storms, up to the 100-year event, is essential in order to protect against immediate downstream erosion and flooding. The following peak rate controls have been determined through hydrologic modeling of the Neshaminy Creek Watershed.

- A. Standards for managing runoff from each subarea in the Neshaminy Creek Watershed for the 2-, 5-, 10-, 25-, 50-, and 100-year design storms are shown in Table 23-305-1. Development sites located in each of the management districts must control proposed development conditions runoff rates to existing conditions runoff rates for the design storms in accordance with Table 23-303-1 below:

**Table 23-305-1  
Peak Rate Runoff Control Standards by Stormwater Management Districts  
in the Neshaminy Creek Watershed  
(includes Little Neshaminy Creek)**

| District | Design Storm<br>Post-development<br>(Proposed Conditions) | Design Storm<br>Pre-development<br>(Existing Conditions) |
|----------|---|--|
| A        | 2-year  | 1-year   |
|          | 5-year  | 5-year   |
|          | 10-year   | 10-year  |
|          | 25-year   | 25-year  |
|          | 50-year   | 50-year  |
|          | 100-year  | 100-year   |
| B        | 2-year  | 1-year   |
|          | 5-year  | 2-year   |
|          | 10-year   | 5-year   |
|          | 25-year   | 10-year  |
|          | 50-year   | 25-year  |
|          | 100-year  | 50-year  |
| C        | 2-year  | 2-year   |
|          | 5-year  | 5-year   |
|          | 10-year   | 10-year  |
|          | 25-year   | 25-year  |

**Table 23-305-1**  
**Peak Rate Runoff Control Standards by Stormwater Management Districts**  
**in the Neshaminy Creek Watershed**  
**(includes Little Neshaminy Creek)**

| District | Design Storm<br>Post-development<br>(Proposed Conditions) | Design Storm<br>Pre-development<br>(Existing Conditions) |
|----------|---|--|
|          | 50-year   | 50-year  |
|          | 100-year  | 100-year   |

- B. General. Proposed conditions rates of runoff from any regulated activity shall not exceed the peak release rates of runoff from existing conditions for the design storms specified on the Stormwater Management District Watershed Map (Appendix D) and in this section.
- C. District boundaries. The boundaries of the Stormwater Management Districts are shown on official maps and are available for inspection at the Township office and county planning offices. A copy of the map at a reduced scale, and four other maps with zoomed-in extents, are included in Appendix D. The exact location of the Stormwater Management District boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours (or most accurate data required) provided as part of the SWM site plan.
- D. Sites located in more than one district. For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall meet the management district criteria for the district in which the discharge is located.
- E. Off-site areas. When calculating the allowable peak runoff rates, developers do not have to account for runoff draining into the subject development site from an off-site area. On-site drainage facilities shall be designed to safely convey off-site flows through the development site.
- F. Site areas. The stormwater management site area is the only area subject to the management district criteria. Non-impacted areas or nonregulated activities bypassing the stormwater management facilities would not be subject to the management district criteria. On-site drainage facilities shall be designed to safely convey flows from an undisturbed area of the property through the developed portion of the site.
- G. Alternate criteria for redevelopment sites. For redevelopment sites, one of the following minimum design parameters shall be accomplished, whichever is most appropriate for the given site conditions as determined by the Township.
  - 1. Meet the full requirements specified by Table 23-305-1 and §23-305.A through E; or
  - 2. Reduce the total impervious surface on the site by at least 20% based upon a comparison of existing impervious surface to proposed impervious surface.

**§23-306. Calculation methodology.**

- A. The following criteria shall be used for runoff calculations:
  - 1. For development sites not considered redevelopment, the ground cover used to determine the

existing conditions runoff volume and flow rate shall be as follows:

- a. Wooded sites shall use a ground cover of "woods in good condition." A site is classified as wooded if a continuous canopy of trees exists over a 1/4 acre.
  - b. The undeveloped portion of the site including agriculture, bare earth, and fallow ground, shall be considered as "meadow in good condition," unless the natural ground cover generates a lower curve number (CN) or Rational "c" value (i.e. woods) as listed in Tables 23-B-4 or 23-B-7 in Appendix B of this Ordinance.
2. For redevelopment sites, the ground cover used to determine the existing conditions runoff volume and flow rate for the developed portion of the site shall be based upon actual land cover conditions, except that 20% of the existing impervious surface area shall be considered meadow in good condition in the model for existing conditions.
- B. Stormwater runoff peak discharges from all development sites with a drainage area equal to or greater than one acre shall be calculated using a generally accepted calculation technique that is based on the NRCS Soil Cover Complex Method. Table 23-306-1 summarizes acceptable computation methods. The method selected by the design professional shall be based on the individual limitations and suitability of each method for a particular site. The municipality may allow the use of the Rational Method ( $Q=CIA$ ) to estimate peak discharges from drainage areas that contain less than one acre.

Where:

- Q = Peak flow rate, cubic feet per second (CFS)
- C = Runoff coefficient, dependent on land use/cover
- I = Design rainfall intensity, inches per hour
- A = Drainage area, acres

- C. All calculations consistent with this Ordinance using the Soil Cover Complex Method shall use the appropriate design rainfall depths for the various return period storms according to the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rain data corresponding to the Doylestown rain gage, seen in Table 23-B-1 in Appendix 23-B. The SCS Type II rainfall curve from NOAA is found on Figure 23-B-1 in Appendix 23-B. This data may also be directly retrieved from the NOAA Atlas 14 website: [hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html). If a hydrologic computer model such as PSRM or HEC-1/HEC-HMS is used for stormwater runoff calculations, then the duration of rainfall shall be 24 hours.

**Table 23-306-1**  
**Acceptable Computation Methodologies for Stormwater Management Plans**

| Method  | Method Developed By          | Applicability  |
|---|------------------------------|--|
| TR-20 (or commercial computer package based on TR-20) | USDA NRCS                    | Applicable where use of full hydrology computer model is desirable or necessary  |
| TR-55 (or commercial computer package based on TR-55) | USDA NRCS                    | Applicable for land development plans within limitations described in TR-55      |
| HEC-1/HEC-HMS   | U.S. Army Corps of Engineers | Applicable where use of full hydrologic computer model is desirable or necessary |

**Table 23-306-1**  
**Acceptable Computation Methodologies for Stormwater Management Plans**

| Method  | Method Developed By   | Applicability  |
|---|-----------------------|--|
| PSRM  | Penn State University | Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1 |
| Rational Method (or commercial computer package based on Rational Method) | Emil Kuichling (1889) | For sites less than 1 acre, or as approved by the Township and/or Township Engineer                        |
| Other methods   | Varies                | Other computation methodologies approved by the Township and/or Township Engineer                          |

- D. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration for overland flow and return periods from NOAA Atlas 14, Volume 2, Version 3 corresponding to the Doylestown rain gage, seen in Table 23-B-1 in Appendix 23-B. This data may also be directly retrieved from the NOAA Atlas 14 website: [hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html). Times of concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of Urban Hydrology for Small Watersheds, NRCS TR-55 (as amended or replaced from time to time by NRCS). Times of concentration for channel and pipe flow shall be computed using Manning's equation.
- E. Runoff curve numbers (CN) for both existing and proposed conditions to be used in the Soil Cover Complex Method shall be based on Table 23-B-4 in Appendix 23-B.
- F. Runoff coefficients (C) for both existing and proposed conditions for use in the Rational Method shall be consistent with Table 23-B-7 in Appendix 23-B.
- G. Runoff from proposed sites graded to the subsoil will not have the same runoff conditions as the site under existing conditions because of soil compaction, even after topsoiling or seeding. The proposed condition "CN" or "C" shall increase by 5% to better reflect proposed soil conditions.
- H. The Manning equation is preferred for one-dimensional, gradually varied, open channel flow. In other cases, appropriate applicable methods should be applied; however, early coordination with the Township is necessary.
- I. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Ordinance using the generally accepted hydraulic analysis technique or method of the municipality.
- J. The design of any stormwater detention facilities intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. For drainage areas greater than 200 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The municipality may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

**ARTICLE IV**  
**Stormwater Management (SWM) Site Plan Requirements**

**§23-401. General requirements.**

For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, the commencement of any earth disturbance, or activity may not proceed until the property owner or applicant or his/her agent has received written approval of a SWM Site Plan from Northampton Township and an approval of an adequate Erosion and Sediment (E&S) Control Plan review from Northampton Township and Bucks County Conservation District, as applicable.

**§23-402. SWM Site Plan requirements.**

The SWM Site Plan shall consist of a general description of the project, including calculations, maps, and plans. A note on the maps shall refer to the associated computations and E&S Control Plan by title and date. The cover sheet of the computations and E&S Control Plan shall refer to the associated maps by title and date. All SWM Site Plan materials shall be submitted to the municipality in a format that is clear, concise, legible, neat and well organized; otherwise, the SWM Site Plan shall not be accepted for review and shall be returned to the Applicant. The following items shall be included in the SWM Site Plan:

**A. General.**

1. General description of the project including plan contents described in Subsection B of this section.
2. General description of proposed SWM techniques to be used for SWM facilities.
3. Complete hydrologic and hydraulic computations for all SWM facilities.
4. All reviews and letters of adequacy from the Bucks County Conservation District for the erosion and sedimentation plan as required by the municipal, county, and state regulations.
5. A general description of proposed nonpoint source pollution controls.
6. The SWM Site Plan application and completed fee schedule form and associated fee(s) for all regulated activities not already paid pursuant to the SALDO regulations.
7. The SWM Site Plan Checklist (Appendix 23-C).
8. Appropriate sections from this Ordinance, Subdivision and Land Development Ordinance [Chapter 22], and other applicable local ordinances shall be followed in preparing the SWM Site Plan.

**B. Plans. SWM Site Plan shall provide the following information:**

1. The overall stormwater management concept for the project.
2. A determination of natural site conditions and stormwater management needs in accordance with



the PA BMP Manual. This shall include, but not be limited to:

1. Site features:

- a. The location of the project relative to highways, municipal boundaries or other identifiable landmarks.
- b. The locations of all existing and proposed utilities, sanitary sewers, and water lines on site and to within 50 feet of property lines.
- c. Proposed structures, roads, paved areas, and buildings.
- d. The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
- e. Plan and profile drawings of all SWM BMPs, including drainage structures, pipes, open channels, and swales. At a minimum this should include pre- and post-drainage area maps, an overall post-construction stormwater management plan, stormwater details sheets, and landscape plans (if proposing landscaped SWM BMPs, including bioretention facilities, low-impact development, bioretention, and vegetative basins).
- f. The locations and minimum setback distances of existing and proposed on-lot wastewater facilities and water supply wells.
- g. The location of all erosion and sediment control facilities.
- h. The location of proposed septic tank infiltration areas and wells in cases where groundwater recharge measures such as seepage pits, beds or trenches are proposed.

2. Natural site conditions:

- a. An Existing Resource and Site Analysis Map (ERSAM) showing environmentally sensitive areas including, but not limited to: steep slopes; ponds; lakes; streams; wetlands; hydric soils; hydrologic soil groups A and B; vernal pools; stream buffers; open channels; existing recharge areas; floodplains; prominent land forms; underlying geologic formations and sinkholes; and woodlands and natural vegetation areas. The area of each of these sensitive areas shall be calculated and should be consistent with the runoff volume calculation required pursuant to §23-304 of this Ordinance.
- b. A detailed site evaluation for projects proposed in areas of frequent flooding, carbonate geology or karst topography, and other environmentally sensitive areas, such as brownfields and source water protection areas.
- c. Existing and proposed contour lines at intervals of two feet, or one foot as appropriate.
- d. The total extent of the drainage area upstream from the site and all downgradient receiving channels, swales and waters to which stormwater runoff or drainage will be discharged.

3. Stormwater runoff design computations and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that the maximum practicable measures have been taken

to meet the requirements of this Ordinance, including the recommendations and general requirements in §23-301.

4. The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.
3. The format of the plan shall include the following:
    - a. The expected project time schedule.
    - b. The name of the development, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
    - c. The tax map parcel number and the address of the site.
    - d. The date of submission.
    - e. A graphic and written scale of one inch equals no more than 50 feet (a larger scale may be required as determined by the Municipal Engineer).
    - f. A north arrow.
    - g. The size of the plan shall be 11 inches by 17 inches only for plans that are not part of a subdivision or land development submission, 24 inches by 36 inches or 30 inches by 42 inches.
    - h. An access easement around all stormwater management facilities is required that would provide ingress to and egress from a public right-of-way. The size of the easement shall be commensurate with the maintenance and access requirements determined in the design of the BMP and as necessary to implement the Operation and Maintenance (O&M) Plan.
    - i. A location map showing the relation of the project site to adjoining properties, streets, Township boundaries or other identifiable landmarks.
    - j. A key map showing all existing man-made features beyond the property boundary that would be affected by the project.
    - k. All proposed landscape and vegetative BMP measures, including a planting schedule indicating the locations, species and sizes of plantings and seeding as may be required, including seeding mixes and rates.
    - l. A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities. All facilities shall meet the performance standards and design criteria specified in this Ordinance.
    - m. The name and address of the individual or firm preparing the plan and if required, the name, address and seal of the registered, professional engineer responsible for the preparation of the plan.
    - n. The following signature block for the design engineer: "I, (Design Engineer), on this date (date

of signature), hereby certify that the SWM Site Plan meets all design standards and criteria of the Northampton Township Stormwater Management Ordinance or Plan."

- o. A statement, signed by the applicant or site owner, acknowledging that any revision to the approved SWM site plan must be approved by the Township and that a revised E&S plan may be required to be submitted to the Conservation District. The statement should also include a note acknowledging that the stormwater BMPs are fixtures that cannot be altered or removed unless approved by the Township.
  - p. A detailed plan of all required off-site improvements.
- 4. A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.
  - 5. The SWM Site Plan shall include an Operations and Maintenance (O&M) Plan for all existing and proposed physical stormwater management facilities. This plan shall address long-term ownership and responsibilities for O&M as well as schedules and costs for O&M activities.
- C. Calculations. The following information should be included in the stormwater report and calculations:
- 1. A general description of the proposed development.
  - 2. A general description of temporary and permanent accelerated erosion control.
  - 3. A general description of temporary and permanent sediment control.
  - 4. A general description of stormwater management both during and after development.
  - 5. A study of the watershed including plans in which the site is located to assess the impact the proposal will have on downstream conditions.
  - 6. Computations of the stormwater runoff for all points of runoff concentration before and after development, including:
    - a. The design computations for the stormwater drainage systems, including storm drain pipes and inlets, runoff control measures, volume control measures, BMPs and culverts and drainage channels.
    - b. Computations of the stormwater runoff before, during and after construction, including all supporting material.
    - c. The flood routing and/or storage requirement calculations.
    - d. A stage-storage curve for the detention/retention/wet basin.
  - 7. The estimated development schedule for the site, including:
    - a. Stripping and/or clearing.
    - b. Rough grading and installation of erosion and sediment control facilities and practices.
    - c. Installation of improvements, including streets, underground utilities, buildings, driveways, parking areas, stormwater BMPs and other structures and facilities.

- d. Final grading and vegetative establishment, including program of operations for conversion of erosion and sediment controls to permanent stormwater management facilities.
8. A statement describing temporary control measures and facilities to be used during earthmoving.
  9. A permanent stormwater management program.
    - a. A statement regarding conformance with requirements of this chapter, including BMPs.
    - b. Types, locations, dimensional details and specifications of stormwater management facilities and BMPs, including detailed plans of all required off-site improvements.
    - c. Design considerations and calculations supporting the stormwater management program.
    - d. Establishment of permanent vegetation or other soil stabilization measures, including:
      - (1) All landscape and vegetative BMP measures.
      - (2) Seeding mixes and rates.
      - (3) Mowing rates, if applicable.
    - e. The location and legal descriptions of rights-of-way, easements or land offered for dedication related to the management of stormwater.
  10. Maintenance procedures and ownership arrangements for temporary and permanent stormwater management facilities, including BMPs.
  11. For detention basins, the following information shall be submitted:
    - a. General description of proposed facilities and the operation of the runoff control measures.
    - b. A sketch of the berm embankment and outlet structure, indicating the embankment top elevation, embankment side slopes, top width of embankment, slope of basin floor, emergency spillway elevation, outlet structure dimensions and elevations, outlet pipe size and length, cut-off trench location and dimensions, dimensions and spacing of anti-seep collars and if required, temporary riser location and dimensions.
    - c. Design computations of the outlet pipe and outlet structure.
    - d. A plot of the stage/storage (acre-feet versus elevation) and all supporting computations.
    - e. Flood routing computations and hydrographs for all required storms.
    - f. Time of concentration and curve number computations.
    - g. A detailed plan of the trash rack and anti-vortex device, if required.

**§23-403. Plan submission.**

The municipality requires submission of a complete SWM Site Plan, as specified in this Ordinance.

- A. Proof of application or documentation of required permit(s) or approvals for the programs listed below shall be part of the plan:

1. NPDES permit for stormwater discharges from construction activities.
  2. Any other permit under applicable state or federal regulations.
- B. The plan shall be coordinated with the State and Federal permit process and the Northampton Township SALDO review process. For regulated activities requiring permits from Pennsylvania DEP or the U.S. Army Corps of Engineers, the applicant shall make all submittals directly to the agency with all required submittal documents and fees. Proof of application or documentation of required permit(s) and approvals must be submitted as part of the plan.
  - C. For regulated activities the stormwater management site plan shall be submitted by the developer to the Zoning/Code Enforcement Officer either as part of the preliminary plan submission for the subdivision or land development or as a SWM site plan application for any other regulated activity.
  - D. Six (6) copies of the SWM Site Plan shall be submitted by the Applicant to the following agencies:
    1. Two (2) copies to the Township accompanied by the requisite municipal review fee, as specified in this Ordinance.
    2. Two (2) copies to the Bucks County Conservation District, if required.
    3. One (1) copy to the Township Engineer (where applicable).
    4. One (1) copy to the Bucks County Planning Commission if the regulated activity is also required to submit a subdivision and/or land development plan to the County Planning Commission in accordance with the Pennsylvania Municipal Planning Code.
  - E. Any submissions to the agencies listed above that are found to be incomplete shall not be accepted for review and shall be returned to the applicant with a notification in writing of the specific manner in which the submission is incomplete.
  - F. Additional copies shall be submitted as requested by the Township or PADEP.

**§23-404. Stormwater management (SWM) Site Plan Review.**

- A. The SWM Site Plan shall be reviewed by a qualified professional on behalf of the Township for consistency with the provisions of this Ordinance. After review, the qualified professional shall provide a written recommendation for the Township to approve or disapprove the SWM Site Plan. If it is recommended to disapprove the SWM Site Plan, the qualified professional shall state the reasons for the disapproval in writing. The qualified professional also may recommend approval of the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing. The SWM Site Plan review and recommendations shall be completed within the time allowed by the Municipalities Planning Code for reviewing subdivision plans.
- B. The Township will notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved. If the SWM Site Plan involves a subdivision and land development plan,

the notification period is 90 days or as waived by the applicant. If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the municipality. If the municipality disapproves the SWM Site Plan, the municipality shall cite the reasons for disapproval in writing.

- C. The Municipality shall not approve any SWM Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, the Municipality may either disapprove the submission, require a resubmission, or accept the SWM Site Plan with conditions.
- D. No building permits for any regulated activity specified in §23-105 of this Chapter shall be approved by Northampton Township if the stormwater management site plan has been found to be inconsistent, as determined by the Township Engineer and Bucks County Conservation District, or without considering the comments of the Township Engineer and Conservation District. All required permits from DEP must be obtained prior to issuance of a building permit.
- E. Northampton Township's approval of a stormwater management site plan shall be valid for a period not to exceed 5 years commencing on the date that Northampton Township approves the stormwater management site plan. Northampton Township may specify a term of validity shorter than 5 years for the approval for any specific stormwater management site plan. If stormwater management facilities included in the approved stormwater management site plan have not been constructed, or if constructed, and as-built drawings of these facilities, if required, have not been approved within this 5-year time period, then Northampton Township may consider the stormwater management site plan inconsistent or noncompliant and may revoke any and all permits. Stormwater management site plans that are determined to be inconsistent or noncompliant by Northampton Township shall be resubmitted in accordance with §23-405 of this Chapter.

**§23-405. Modification of plans.**

- A. A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Township shall require a resubmission of the modified SWM Site Plan in accordance with this article.
- B. A modification to an already approved stormwater management site plan shall be submitted to Northampton Township, accompanied by the applicable Township review and inspection fee and escrow. A modification to a stormwater management site plan for which a formal action has not been taken by Northampton Township shall be submitted to the Township, accompanied by the applicable Township review and inspection fee and escrow.

**§23-406. Resubmission of disapproved SWM Site Plans.**

An inconsistent, noncompliant or disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Township's concerns documented in writing and addressed to the Township Zoning / Code Enforcement Officer in accordance with this article. The applicable review fee must accompany a resubmission of an inconsistent, noncompliant or disapproved SWM Site Plan.

## ARTICLE V Design Criteria and Requirements

### §23-501. Design Criteria.

#### A. General.

1. All land areas shall be graded to secure proper drainage away from buildings and to prevent the collection of stormwater pools. Drainage provisions shall be of such design as to carry surface waters to the nearest practical adequate street, storm drain or natural watercourse. The developer shall construct and/or install such drainage structures and/or pipes as are determined by the Township Engineer to prevent erosion, damage and siltation and to satisfactorily carry off surface waters.
2. Stormwater discharge shall be carried by conduit to prevent excessive surface flow on or across streets, sidewalks, drives, parking areas and any other paved surface or traveled way, where infiltration practices would not be feasible. Culverts or bridges shall be required at all stream crossings of any street or roadway, using design criteria for a 100-year peak flow rate. Natural swales or open drains of any type may be used only where there is no danger to structures or abutting property.
3. Identified natural watercourses (streams or creeks) which have continuous flow shall remain open and shall not be piped or covered unless required by the Township and as approved by the Township Engineer and if required by PADEP.
4. The SWM site plan for each regulated activity shall take into account and provide for upstream areas within the entire watershed in computing discharge quantities, sizing of pipes, inlets and other structures. The runoff from any proposed development shall be subject to evaluation which includes the anticipated runoff from other existing or proposed developments within the same watershed. Stormwater management facilities designed to serve more than one property, or development in the same watershed are encouraged, in which case consultation with the Township is required prior to design.
5. The Board of Supervisors may require, based upon the advice of the Township Engineer, stormwater retention or detention devices, basins, subsurface recharge facilities or other delayed-release devices or designs to contain the excess storm discharge and prevent downstream flow increases and/or encourage groundwater recharge.
6. Storm Drainage Required. Overland or sheet flow is encouraged over concentrated flow. A storm sewer system and all appurtenances shall be required to be constructed by the applicant in any area from which the surface or subsurface drainage could impair public safety or cause physical damage to adjacent lands or public property. The system shall be designed to collect water at any point where three to five cubic feet per second is accumulated, at the bottom of all vertical grades and immediately upgrade from all street intersections. The system shall discharge to the nearest practical natural drainage channel or storm system.

7. Off-site Improvements. Any increase in runoff may require necessary corrective measures, including deeds of easement, deemed appropriate by the Township to alleviate any off-site drainage problem affected by the regulated activity. The costs for such measures will be borne entirely by the developer or subdivider.
8. Total Watershed Evaluation. The future use of undeveloped areas upstream, as shown on the approved Township Comprehensive Plan, shall be taken into account in the design of all storm sewer systems. The capacity and maximum anticipated present flow of the body or system receiving the proposed system(s) discharge shall be calculated to verify its capability of receiving any additional flow caused by the development or subdivision. The runoff from any proposed development shall be subject to an evaluation which includes the anticipated runoff from other existing or proposed developments within the same watershed. Stormwater management facilities designed to serve more than one property or development in the same watershed are encouraged. Consultation with the Township is required prior to the design of such facilities.
9. In addition to any other requirement of this chapter, the developer may be required to participate in off-site storm drainage improvements in the drainage basin within which the proposed development is located. The specific off-site drainage improvements required shall be those specified by the Township Board of Supervisors.
10. General Note for All Stormwater Management Systems. The following note shall be placed on all plans which propose a stormwater BMP: "The stormwater facilities shown on these plans are a basic and perpetual part of the stormwater management system of the proposed site located in Northampton Township, Bucks County, Commonwealth of Pennsylvania, and as such are to be protected and preserved in accordance with the approved final plans by the owners, their successors and assigns of these lands. Northampton Township and/or its agents reserve the right and privilege to enter upon these lands from time to time for the inspection of said facilities in order to determine that proper operation and maintenance and that the structural and design integrity is being maintained by the owner."

B. Storm Sewer and Inlets.

1. Storm sewer within all road rights-of-way and all Township-owned easements (pipes or other structures) shall be reinforced concrete pipe. All storm sewer (pipes or other structures) shall have a minimum grade of 1/2% and a minimum inside diameter of 18 inches or a cross-sectional area of 254 square inches, except that pipes under a fill of 25 feet or greater shall not be less than 24 inches in diameter (inside) or have a cross-sectional area of less than 453 square inches.
2. Roof drains or yard drains shall not connect to any sanitary sewer and shall not discharge water directly over any sidewalk. Storm drainage facilities should be located within the paved areas of roadways. Where storm sewers discharge into existing drainage channels at an angle greater than 30° from parallel to the downstream channel flow, the far side bank shall be stabilized by the use of riprap, masonry, or concrete walls. The stabilization shall be designed to prevent erosion and frost heave under and behind the stabilizing media.
3. Storm sewer systems shall be constructed in accordance with Township specifications, which are



approved by resolution of the Board of Supervisors. If a particular design or device is not specifically approved within the Township specifications, the Township Engineer must review the particular design or device for conformance with the objectives of this section.

4. All pipe and inlets shall meet material capacity and construction specifications as outlined in the latest revisions of the PennDOT Form 408 and the PennDOT Design Manual or as outlined in the Township specification as approved by resolution of the Board of Supervisors.
5. Design Flow Rate. The storm drain system shall be designed to convey a 100-year peak flow rate without surcharging inlets. The design 100-year peak flow rate into each inlet shall be indicated on the stormwater drainage plan. The 100-year flow rate shall be determined by the rational formula as follows:

$$Q = ciA$$

Where:

- Q = Peak runoff rate in cubic feet per second (cfs)
- c = Runoff coefficient equal to the ratio of the peak runoff rate to the average rate of rainfall over a time period equal to the time of concentration.
- i = Average rainfall intensity in inches per hour for a time equal to the time of concentration.
- A = Drainage area in acres.

NOTE: Appropriate values for the runoff coefficient and rainfall intensity can be found in Table 23-B-7 and Table 23-B-1, respectively, in Appendix 23-B .

6. Overflow System. An overflow system shall be provided to carry flow to the detention basin when the capacity of the storm drain pipe system is exceeded.
7. Inlet Capacity. All inlets must be designed to accommodate the 100-year peak flow rate. The capacity of all C-type, M-type or S-type inlets shall be determined from the Commonwealth of Pennsylvania Department of Transportation Design Manual, Part 2, Highway Design.
8. Straight Pipe Sections. Wherever possible, all storm drain pipes shall be designed to follow straight courses. No angular deflections of storm sewer pipe sections in excess of 5 degrees shall be permitted. A manhole or inlet shall be provided at all horizontal deflections in the storm pipe system exceeding 5°. No vertical curves shall be permitted in the storm drain pipe system.
9. Pipe Capacity. The capacity of all pipe culverts shall, as a minimum, provide the required carrying capacity as determined by, this chapter or if approved by the Township, the following sources:

US Department of Transportation

Federal Highway Administration

Hydraulic Design Series No. 5

Hydraulic Design of Highway Culverts, Second Edition

10. Pipe Arches. Where headroom is restricted, equivalent pipe arches may be used in lieu of circular pipe.
11. Allowable Headwater Depth. At all inlets or manholes, the maximum allowable headwater depth shall be one half foot below the top of the inlet grate or the manhole cover.
12. Minimum and Maximum Cover. A minimum of two feet of cover shall be maintained over all reinforced concrete pipe. All other storm pipes shall have a minimum of three feet of cover. The top of storm drain pipes shall be at least 1/2-foot below subgrade elevation. The maximum cover over storm drain pipes shall be 10 feet unless special structural design calculations are submitted or approved.

Minimum and Maximum Cover. For AASTHO H-20/HS-20 loading, a minimum of eighteen (18) inches of cover, or 6 inches (1/2-foot) below subgrade elevation, whichever is greater, shall be maintained over HDPE pipe, Class IV and Class V reinforced concrete pipe, and ductile iron pipe. A minimum of thirty (30) inches of cover, or 6 inches (1/2-foot) below subgrade elevation, whichever is greater, shall be maintained over Class III and lower reinforced concrete pipe and all other storm pipes. The minimum cover may be reduced by 6 inches for non-traffic loading. The maximum cover over storm drain pipes shall be 10 feet unless special structural design calculations are submitted or approved. In all cases that manufacturer's guidelines and recommendations are more stringent, manufacturer's guidelines and recommendations shall be followed.

13. Match Crowns. The crowns of all pipes tying into an inlet or manhole shall be set at equal elevations.
  14. Diversions of Runoff. All storm drain pipes shall be designed to carry the runoff into a detention basin or similar facility utilized to control the rate of runoff.
  15. Structural Backfill. All storm drainage structures shall be backfilled in twelve-inch layers with 2A stone to a dimension at the base of the structure 12 inches outside of all faces of the structure tapering to a width of 24 inches outside all faces of the structure at the top of the structure.
- C. Erosion and Sedimentation Control. Prior to the commencement of any regulated earth disturbance activity, the following criteria shall be met:
1. No changes shall be made in the contour of the land and no grading, excavating, removal or destruction of the topsoil, trees or other vegetative cover of the land shall be commenced until such time as a plan for minimizing soil erosion and sedimentation has been submitted and approved.
  2. Measures used to control erosion and reduce sedimentation shall, as a minimum, meet the standards and specifications of the Bucks County Conservation District and the PADEP. The Township Engineer shall ensure compliance with the appropriate specifications, copies of which are available from the district.
  3. Plans shall preserve salient natural features, keep cut/fill operations to a minimum and ensure conformity with natural topography so as to create the least erosion potential and adequately handle the volume and velocity of surface water runoff. Whenever feasible, natural vegetation

shall be retained, protected and supplemented. The disturbed area and the duration of exposure shall be kept to a practical minimum. Disturbed soils shall be stabilized as quickly as practicable. Temporary vegetation and/or mulching shall be used to protect critical areas during development.

4. The permanent (final) vegetation, erosion control and drainage shall be installed as soon as practical in the development. Provisions shall be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development. Sediment in all runoff water shall be trapped by the use of filters, sediment basins, silt traps or similar measures until the disturbed area is fully stabilized. Such devices shall be periodically cleaned of all silt and debris to ensure proper operation.
5. During grading operations, necessary measures for dust control must be exercised.
6. Grading equipment will not be allowed to cross-flowing streams. Provision shall be made for the installation of temporary culverts or bridges which are subject to PADEP approval.
7. Permanent retention or detention basins shall be provided when required by the Board. The location of such basins shall be approved by the Board upon advice from the Township Engineer and when required, by the PADEP.
8. No person, corporation or other entity shall block, impede the flow of, alter, construct any structure or deposit any material or thing or commit any act which will affect normal or flood flow in any swale, stream or watercourse without having obtained prior approval from the Township and/or the Pennsylvania Department of Environmental Protection, whichever is applicable. It is the responsibility of any person, corporation or other entity doing any act on or across a stream, watercourse or swale or upon the floodplain or right-of-way during the period of the activity to return it to its original or equal condition after such activity is completed.
9. Whenever sedimentation is caused by stripping vegetation, regrading or other development, it shall be the responsibility of the person, corporation or other entity causing such sedimentation to remove it from all adjoining surfaces; drainage systems and watercourses and to repair any damage at their expense as quickly as possible.
10. Maintenance of all drainage facilities and watercourses, both existing and proposed, within the proposed site shall be the responsibility of the developer until such time as one of the following is accomplished:
  - a. A right-of-way for these facilities is offered for dedication by the developer and is accepted by the Township, at which time it shall then be the responsibility of the Township.
  - b. An easement acceptable to the Township is established. In the case of a subdivision, the maintenance shall then be the responsibility of the individual lot owners over whose property the easement passes. For land developments, the maintenance shall thereafter be the responsibility of the owner.
  - c. A homeowner's association, approved by the Township, assumes responsibility for the maintenance of the development, including the maintenance of the watercourses and/or drainage facilities, provided that the Township Engineer approves the assumption of

maintenance of such facilities.

11. The installation and design of the required erosion and sediment control measures, listed below, shall be in accordance with standards and specifications found in PADEP's Erosion and Sediment Pollution Control Program Manual dated April 15, 2000, or latest edition, or the Pennsylvania Handbook of Best Management Practices for Developing Areas.
12. Detailed designs for all the appurtenances related to temporary basins and all stormwater and erosion and sedimentation control facilities must be supplied.
13. Criteria contained in this chapter shall not remove or alter the requirement for the developer to submit plans and specifications to the Pennsylvania Department of Environmental Protection under the Clean Streams Act of 1972, 35 P.S. § 691.1 et seq., where Department of Environmental Protection's permits are required.
14. Three days prior to the commencement of any operation in the construction or installation of any drainage facilities or erosion and sedimentation control facility, the applicant shall notify the Township Engineer, who shall inspect the work, materials, construction and installation for compliance with Township requirements. The Township Engineer shall be authorized to have such tests of materials made as are provided in the Northampton Township specification and design standards in order to have proper control of materials. Such fees for tests of materials as provided above shall be in accordance with the fee schedule as established by resolution of the Board of Supervisors.
15. Sediment basins, retention basins, wet basins and detention basins shall neither be located within nor discharge into a tree protection zone where no established water course exists.

D. Underdrains.

1. All building foundations, grade slabs and cellar floors located in soils that have a community development limitation degree of moderate to severe seasonal high water table, as defined by an on-site soils test witnessed by the Township Engineer, shall be provided with an underdrain system. This system shall provide for drainage of the enclosed volume above the slab and relief of subsurface water to a depth of not less than six inches below the slab or foundation bottom. The system shall consist of a perforated pipe field of the herringbone or gridiron configuration in coarse, gravel-filled trenches that are in direct contact with the slab or foundation subbase. The excavation shall provide a minimum of 0.05-foot/foot slope to the gravel-filled trenches.
2. All proposed roadways shall be constructed with an underdrain system consisting of six-inch perforated pipe wrapped in a Class 1 geotextile material. The underdrain shall be bedded with a minimum of six inches of 2B stone. The bedding material shall extend to the bottom of the base course. The underdrain shall discharge into an inlet, manhole or other approved stormwater device.

E. Detention Basins/Stormwater Rate Management Facilities.

1. Basin Design Criteria. The following design criteria shall be used in the design of all detention basins and/or other stormwater management facilities in the Township. The basins shall be designed to detain the quantity of water resulting from a 100-year, twenty-four-hour storm under

full development conditions. This criteria shall be met for all frequency storms and must be analyzed of the one-, two-, five-, ten-, twenty-five-, fifty- and 100-year storms. All flows in excess of the above-mentioned standard shall flow over an emergency spillway.

2. Maximum Depth of Detention Basins. The maximum depth of water in a detention basin shall not exceed five feet.
3. Emergency Spillway. Whenever possible, the emergency spillway for detention basins shall be constructed on undisturbed ground. Emergency spillways shall be constructed of reinforced concrete, vegetated earth, or other approved material. All emergency spillways shall be constructed so that the detention basin berm is protected against erosion. The minimum capacity of all emergency spillways shall be equal to the peak inflow rate from the postdevelopment 100-year design storm. Emergency spillways shall extend along the upstream and downstream berm embankment slopes. The upstream edge of the emergency spillway shall be a minimum of three feet below the spillway crest elevation. The downstream slope of the spillway shall, as a minimum, extend to the top of the berm embankment. The emergency spillway shall not discharge over earthen fill and/or easily erodible material.
4. Anti-seep Collars. Anti-seep collars shall be poured-in-place concrete and installed around the principal pipe barrel within the normal saturation zone of the detention basin berms. The collars shall be poured against the pipe bell. The antiseep collars and their connections to the pipe barrel shall be watertight. The antiseep collars shall extend a minimum of two feet beyond the outside of the principal pipe barrel. The spacing between collars shall be 16 feet. The use of an O-ring pipe would be required for all detention discharge pipes.
5. Freeboard. Basin freeboard is the difference between the design flow elevation through the emergency spillway when the facility functions for the 100-year post-development inflow and the top of the settled detention basin embankment. The minimum freeboard shall be one foot.
6. Slope of Detention Basin Embankment. The maximum slope of earthen detention basin embankments shall be three to one. The top or toe of any slope shall be located a minimum of five feet from any property line. Whenever possible, the side slopes and basin shape shall be amenable to the natural topography. Straight side slopes and rectangular basins shall be avoided whenever possible.
7. Width of Berm. The minimum top width of detention basin berms shall be 10 feet.
8. Slope of Basin Bottom. In order to ensure proper drainage of the detention basin, a minimum grade of 2% shall be maintained for all sheet flow. This requirement may be waived for infiltration basins and rain gardens which the Township deems to have sufficient infiltration capacity to drain, or for basins with approved soil media and underdrain systems.
9. Energy Dissipaters. Energy dissipating devices (riprap, end sills, etc.) shall be placed at all basin inlets and outlets, sized for the design storm of the pipe and/or basin. Forebays or split flow controls are encouraged at the inlet to all basins. When a forebay or split flow control is not used, an energy-dissipating device shall be used and extend to the bottom of the basin.
10. Key Trench. All basin berms in fill areas are to have a key trench. The minimum depth shall be

one foot and increased to a depth of three feet at the maximum point of fill. The minimum width of the key trench shall be eight feet.

11. The distance from the highest free water surface of any above-ground or partially above-ground detention basin or drainage facility to a dwelling unit shall be a minimum of 100 feet.
12. All detention basin outlet structures with invert orifices of 12 inches or less shall be protected with a trash rack. The surface area of the trash rack shall be three times the area of the opening. The trash rack shall be welded aluminum with stainless steel anchors.
13. A sketch of the berm embankment and outlet structure, indicating the embankment top elevation, embankment side slopes, top width of embankment, emergency spillway elevation, perforated riser dimensions, pipe barrel dimensions and dimensions and spacing of anti-seep collars shall be provided.

#### F. Culverts and Drainage Channels.

1. Design Flow Standard. All culverts and drainage channels shall be designed to carry a flow rate equal to a 100-year, twenty-four-hour storm (Soil Conservation Service, Technical Release No. 55).
2. Erosion Prevention. All drainage channels shall be designed to prevent the erosion of the bed and bank areas. The flow velocity in all vegetated drainage channels shall not exceed the maximum permissible velocity to prevent erosion from a 25-year storm with a minimum of six (6) inches of freeboard. Suitable bank stabilization shall be provided where required to prevent erosion of the drainage channels. The stabilization shall be designed to prevent erosion and frost heave under and behind the stabilizing media.
3. Maximum Side Slope. Any vegetated drainage channel requiring mowing of the vegetation shall have a maximum grade of three horizontal to one vertical.
4. Design Standard. Because of the critical nature of vegetated drainage channels, the design of all vegetated channels shall, as a minimum, conform to the design procedures outlined in the Erosion and Sediment Pollution Control Program Manual. Several acceptable sources outline procedures for nonvegetated drainage channels, including the following:

US Department of Transportation

Federal Highway Administration

Hydraulic Design Series No. 5

Hydraulic Design of Highway Culverts, Second Edition.

#### G. Subsurface Recharge System.

1. In selecting the appropriate subsurface recharge BMPs, the applicant shall consider the following:
  - a. Permeability and infiltration rate of the site soils.
  - b. Slope and depth to bedrock.

- c. Seasonal high water table.
  - d. Proximity to building foundations and well heads.
  - e. Erodibility of soils.
  - f. Land availability and topography.
2. Soil Investigation. In designing a subsurface stormwater system, a key element is an analysis of the soil. The Township Engineer shall require and witness the soil testing which shall include the following:
    - a. The locations and results of all testing bores, test pits or auger holes, in order to determine the type of soil.
    - b. The seasonal high water table.
    - c. The slope and depth to bedrock.
  3. Infiltration Capacity. Infiltration rates may be determined from permeability testing using a double ring infiltrometer or hydraulic conductivity testing.
  4. Infiltration Rate. Permeability tests shall be accepted as a means of determining the infiltration rate of a soil. The tests must be completed at the location and depth of the proposed infiltration area.
  5. Soil Characteristics.
    - a. Infiltration BMPs are particular appropriate in hydrologic soil groups A and B.
    - b. Low erodibility factors ("k" factors) are preferred for the construction of basins.
    - c. There, must be a minimum depth of 24 inches between the bottom of any subsurface recharge BMP and the seasonal high water table and/or bedrock (limiting zones).
    - d. There must be an infiltration and or permeability rate sufficient to accept the additional storm water load, and to drain completely as determined by field tests.
    - e. Infiltration BMPs shall be located a minimum of 10 feet away from the building foundation wall.
    - f. The infiltration system shall provide positive overflow controls to prevent storage within one foot of the finished surface or grade.
    - g. Infiltration rates shall not be used in computing the storage volume or when routing the respective design storm through the infiltration system.
    - h. Sediment and Debris. Various measures shall be taken to guarantee that the subsurface recharge system does not become filled with sediment during and after construction and that the system is kept free of debris (leaves, twigs, etc.) to prevent clogging. These measures include, but are not limited to, temporary siltation berms and other erosion controls and gutter screens for direct piping from roofs to the system. Surface inflows shall be designed to prevent direct discharge of sediment into the infiltration system.

6. During the period of land disturbance, runoff shall be controlled prior to entering any proposed infiltration area, areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase, so as to maintain their maximum infiltration capacity.
7. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMPs has received final stabilization.
8. Aggregate/Filter Material. Aggregate fill shall be clean stone between two inches and four inches in diameter. Larger stone shall be placed near the bottom of the system and smaller stone near the top. An appropriate geotextile fabric shall line the bottom, top and sides, with sufficient excess material left at the top to fold over the aggregate fill when placed, prior to the placement of the topsoil layer.  
  
Aggregate/Filter Material. Aggregate fill shall be clean stone and clean stone mixes with top stone sizes between one and a half (1 ½) inches and four inches in diameter. Stone mixes should have no stone passing the #8 sieve (<3/16"). Stone should be uniformly blended or larger stone shall be placed near the bottom of the system and smaller stone near the top. An appropriate geotextile fabric shall line the bottom, top and sides, with sufficient excess material left at the top to fold over the aggregate fill when placed, prior to the placement of the topsoil layer.
9. Prefabricated Systems. When prefabricated systems are proposed, the applicant shall adhere to all recommended manufacturer's specifications, in addition to the requirements of this section.
10. Emergency Overflow. Each subsurface recharge system shall be designed with an emergency overflow/surcharge system to protect the system in the event of a storm of higher intensity. Overflow structures shall be placed at or below the downstream surface point of the recharge system footprint where feasible.

**§23-502. Grading and Landscaping.**

- A. Grassed Areas or Grass/Ground Cover Combinations. All such areas specified on proposed or approved plans shall be prepared, installed and maintained in accordance with the Pennsylvania Department of Transportation Form 408 Specifications, as amended.
- B. Drainage Channels and Retention Areas. All storm drainage channels, detention and retention areas, whether existing or proposed, shall be graded and planted to effectively naturalize area(s) so as to become an integral and harmonious part of the landscape by contour and type of plant materials used.
- C. All detention basins side slopes and bottom shall be seeded with an appropriate seed mixture specifically suited to the levels or periodic inundation for which the system is designed. No-mow basins shall only be allowed as approved by the Township.
- D. A suitable naturalized, native plant screening shall be provided around all detention basins. Fences may be required at the discretion of the Board of Supervisors. Native plants acceptable for use are listed as part of the Recommended Native Plants for Landscaping in Pennsylvania, as issued by the PA Department of Conservation and Natural Resources. The uses of native plants and grasses and wetland tolerant plants, acceptable for use is highly encouraged.



- E. Trees and shrubs shall be placed so as to provide a suitable visual barrier at the time of planting. Trees shall not be placed on the top of the detention basin. Trees may be placed in the basin bottom, subject to the approval of the Township Engineer. Whatever materials are used, they shall be placed sufficiently far back from the cut or fill slope so as to allow ease in mowing.
- F. Native deciduous trees shall be a minimum of 2 1/2 inches in caliper, native shrubs shall be a minimum of 24 inches to 36 inches in height, and native evergreen trees shall be a minimum of six feet to eight feet in height at the time of installation. Trees and shrubs shall be spaced in accordance with the characteristic spread of each specific species at maturity.
- G. The screening requirement shall be waived only with the expressed consent of the Board of Supervisors.
- H. Topsoil. A minimum of six inches of topsoil material shall be placed on all areas affected by the basin construction (bottom of basin, side slopes, top of berm, etc.). The material must meet the requirements of the Pennsylvania Department of Transportation, Form 408 specifications, as amended.
- I. Subsurface Recharge System. In order to preserve the integrity of the system, at no time shall any trees be planted in or around a subsurface recharge system. As a general rule, the dripline of a mature tree should not be located within five feet of a subsurface recharge system.
- J. Grading Design Criteria.
  - 1. Cuts. No excavation shall be made with a cut face steeper than three to one, horizontal to vertical, except under the condition in which the material in which the excavation is made is sufficiently stable to sustain a slope of steeper than three horizontal to one vertical. A written statement to that effect is required from a licensed civil engineer having experience in soils engineering and shall be submitted to the Township Engineer and approved by him. The statement shall affirm that the site has been inspected and that the deviation from the slope will not result in injury to persons or damage to property. Retaining walls will be required if a stable slope cannot be maintained. Any retaining walls design must be approved by the Township Engineer. The toe of the slope or headwall of any cut must be located a minimum of five feet from property lines. No excavation shall endanger adjoining properties.
  - 2. Fills. No fills shall be made which creates any exposed surface steeper in slope than three horizontal to one vertical, except where the fill is located so that settlement, sliding or erosion will not result in property damage or be a hazard to adjoining property, streets or buildings. A written statement from a licensed civil engineer licensed by the commonwealth of Pennsylvania and having experience in soils engineering, certifying that he has inspected the site and that any proposed deviation from the slope specified above will not endanger any property or result in property damage, must be submitted to and approved by the Township Engineer.
    - a. A concrete or stone masonry wall constructed in accordance with Township specifications may be required to support the face of the fill where above slopes are exceeded.
    - b. The top of any fill or toe of the slope of any fill shall be located five feet from any property line.

- c. Fill Placement and Compaction. All fill shall be placed mechanically and shall be free of any debris or organic material, roots and stumps. Fill shall be placed in consecutive, maximum eight-inch layers: and compressed or compacted mechanically with equipment weighing not less than 10 tons or with similar sheeps-foot roller or compactors having equivalent compression capability. The Township shall require, at the owner's expense, a test certifying the adequate compaction of fill materials as required above or in accordance with the requirements of the Township Engineer. All detention basin fill shall be compacted to 95% Modified Proctor Density (ASTM 1557).
3. Retaining Walls. All plans that require retaining walls shall provide shop drawings and design calculations, sealed by a professional engineer registered in the State of Pennsylvania, to be submitted to the Township Engineer for review and approval prior to construction. Top and bottom of wall elevations must be shown on the grading plans to the satisfaction of the Township Engineer.

K. Tree Protection Standards.

1. General requirements shall be as follows:

- a. Grade changes and excavation on any locations within the site shall not:
  - (1) Encroach upon a tree protection zone.
  - (2) Result in an alteration to soil or drainage conditions which would adversely affect existing vegetation to be retained following site disturbance, unless adequate provisions are made to protect such vegetation and its root systems.
- b. No toxic materials shall be stored within 100 feet of a tree protection zone including petroleum-based and/or derived products.
- c. The area within a tree protection zone shall not be built upon or covered by impervious materials, either temporarily or permanently.
- d. The-storage of equipment, materials, debris or fill and the parking of vehicles shall be prohibited within a tree protection zone.

2. Tree protection zone construction requirements shall be as follows:

- a. Prior to construction, any tree protection zone shall be identified on the site in conformance with the approved subdivision or land development plan and in the following manner:
  - (1) All trees scheduled to remain shall be clearly marked. Only trees on the outer edge of tree groups or forests are required to be marked.
  - (2) A four-foot high wooden snow fence mounted on steel posts located eight feet on center, or similar fencing materials or barrier approved by the Township Arborist, shall be placed along the boundary of the tree protection zone. Immediately following the installation of said fencing, the Township shall inspect and approve the same prior to the commencement of any development activity on the site. The fencing shall be properly maintained until all development activity has ceased, and damaged fencing shall be repaired or replaced before any development may recommence.

- (3) In addition to such fencing, trees outside the tree protection zone may be temporarily retained to the limits of grading and utilized as an additional buffer area during construction. Such trees shall be removed prior to the completion of development.
- b. The operation of heavy equipment shall not occur within a tree protection zone.
- c. Trees being removed shall not be felled, pushed or pulled into a tree protection zone or into any other trees which are required to be retained.
- d. Any tree stumps located within 10 feet of a tree protection zone shall be removed by means of a stump grinder to minimize their effect on surrounding root systems.
- e. Tree roots which must be severed shall be:
  - (1) Cut by a backhoe or similar equipment, aligned radially to the tree, in such a manner so as to reduce the lateral movement of roots during excavation.
  - (2) Trimmed cleanly so that their edges are smooth and are cut back to a lateral root, if exposed.
  - (3) Covered temporarily with peat moss, moist burlap or other moist biodegradable material within four hours of any severance in order to avoid their drying out.
- f. Damaged areas shall be treated promptly, and as may be required by the Township Arborist.
  - (1) Damaged bark shall be cut back to a point where the bark is intact and tight to the tree.
  - (2) Exposed roots shall be cleaned up and covered with topsoil.
  - (3) Tree limbs shall be cut back in proportion to root area loss.
  - (4) Liquid or dry fertilizer shall be applied to trees with disturbed root zones to compensate for any loss of roots.
  - (5) All pruning shall be undertaken in accordance with the standards of the National Arborist Association as noted in the National Arborist Association Book of Standards, as amended.
  - (6) Trees shall not be used for roping, cables, signs, fencing or lighting. Nails and spikes shall not be driven into trees.
- g. Fertilization.
  - (1) All trees which have been disturbed or have tree roots which have been damaged as a result of development shall be fertilized.
  - (2) Such trees shall be fertilized during the months of September through October or April through May.
  - (3) Fertilizer having approximately three parts nitrogen to one part phosphorus and one part potassium (three to one to one ratio) shall be broadcast over the soil surface in an area twice the size of the tree protection zone at a rate equivalent to one pound nitrogen per 1,000 square feet. A minimum of 1,000 square feet per tree shall receive fertilization.

h. Retaining Walls.

- (1) Any re-grading which causes a change in the original grade at the tree protection zone line shall require the installation of a retaining wall outside of the tree protection zone, designed to comply with Township standards.
- (2) The top of such retaining wall shall be four inches above the finished grade line.
- (3) The retaining wall shall be constructed of large stones, brick, building tile, concrete blocks or treated wood beams not less than six inches by six inches.
- (4) A means for drainage through the wall shall be provided, as approved by the Township Engineer.
- (5) A layer of clean stone, sized 3/4 to one inch shall be placed one foot out from the retaining wall to aid in drainage.

i. Trenching and Tunneling.

- (1) Utility lines shall be located outside tree protection zones.
- (2) Tunneling shall be used for the installation of any utility line approved by the Board of Supervisors for location within a tree protection zone. Trenching may only be used where, in the opinion of the Township, the survival of a tree or trees would not be affected.
- (3) Upon the completion of the installation of any utility line, the trench shall be filled immediately and tamped lightly to avoid air spaces.

**§23-503. Township Stormwater BMP Operation and Maintenance Fund.**

- A. If stormwater facilities and BMPS are accepted by the Township for dedication, the Township may require persons installing stormwater BMPS to pay a specified amount to the Township stormwater BMP operation and maintenance fund, to help defray costs of operations and maintenance activities. The amount may be determined as follows:
1. If the stormwater facility or BMP is to be owned and maintained by the Township, the amount shall cover the estimated costs for operations and maintenance for 10 years as determined by the Township.
  2. The amount shall then be converted to present worth of the annual series values.
- B. If a BMP is proposed that also serves as a recreation facility (e.g., ball field, lake), the Township may adjust the amount accordingly.
- C. The off-site stormwater drainage contribution shall be in addition to the obligation of the developer to construct and install at its sole expense the on-site and off-site drainage improvements required as a condition to subdivision or land development approval.
- D. When, in the discretion of the Board of Supervisors, circumstances surrounding the development of a site warrant special consideration, these contributions may be reduced or waived.

**ARTICLE VI**  
**Inspections and Right of Entry**

**§23-601. Inspections.**

- A. The Township or its designee shall inspect all phases of the installation of the best management practices (BMPs) and/or stormwater management (SWM) facilities as deemed appropriate by the Township.
- B. During any stage of the work, if the Township or its designee determines that the BMPs and/or stormwater management facilities are not being installed in accordance with the approved SWM Site Plan, the Township shall revoke any existing permits or other approvals and issue a cease-and-desist order until a revised SWM Site Plan is submitted and approved, as specified in this Ordinance and until the deficiencies are corrected.
- C. An inspection of all BMPs and/or stormwater management facilities may be conducted by the municipality to confirm compliance with the approved SWM Site Plan prior to the issuance of any Occupancy Permit.
- D. The landowner or the owner's designee (including the Township for dedicated and owned facilities) shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:
  - 1. Annually for the first five years;
  - 2. Once every three years thereafter;
  - 3. During or immediately after the cessation of a ten-year or greater storm; and/or;
  - 4. As specified in the operations and maintenance (O&M) agreement.

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Township within 30 days following completion of the inspection.

**§23-602. Right of Entry**

- A. Upon presentation of proper credentials, duly authorized representatives of the Township may enter at reasonable times upon any property within the Township to inspect the implementation, condition, or operation and maintenance of the stormwater facilities or best management practices (BMPs) in regard to any aspect governed by this Chapter.
- B. Landowners, with stormwater facilities and BMPs on their property, shall allow persons working on behalf of the Township ready access to all parts of the premises for the purposes of determining

compliance with this Chapter.

- C. Persons working: on behalf of the Township shall have the right to temporarily locate on any stormwater facility or BMP in the Township such devices as are necessary to conduct monitoring and/or sampling of the discharges from such stormwater facilities or BMP.
- D. Unreasonable delays in allowing the Township access to a stormwater management facility or BMP is a violation of this Chapter.

## **ARTICLE VII Fees and Expenses**

### **§23-701. Stormwater Management (SWM) Site Plan Review and Inspection Fee.**

Fees shall be established by the Township to cover plan review and construction inspection costs incurred by the Township. All fees shall be paid by the applicant at the time of SWM Site Plan submission. A review and inspection fee schedule shall be established by resolution of the Board of Supervisors based on the size of the regulated activity and based on the Township's costs for reviewing SWM Site Plans, conducting inspections pursuant to §23-601, and reviewing as-built plans pursuant to §23-803. The Township shall periodically update the review and inspection fee schedule to ensure that review costs are adequately reimbursed. No permit to begin work on the project shall be issued until the requested fees have been paid.

### **§23-702. Expenses Covered by Fees.**

The fees required by this Chapter shall, at a minimum, cover:

- A. Administrative costs and clerical processing.
- B. The review of the stormwater (SWM) site plan and as-built plan by the Township and the Township Engineer. Review shall mean all technical reviews, meetings and discussions relative to the plans.
- C. The site inspections including, but not limited, to pre-construction meetings, inspections during construction of stormwater facilities and BMP's and final inspection upon completion of the stormwater facilities and BMP's.
- D. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.
- E. Stormwater permit issuance.

## **ARTICLE VIII Operation and Maintenance Responsibilities**

### **§23-801. Performance guarantee.**

- A. For subdivisions and land developments, the applicant shall provide a financial guarantee to Northampton Township for the timely installation and proper construction of all stormwater

management (SWM) facilities as:

1. Required by the approved SWM Site Plan equal to or greater than the full construction cost of the required controls in accordance with the provisions of Sections 509, 510, and 511 of the Pennsylvania Municipalities Planning Code.
  2. The amount and method of payment provided for in Subdivision and Land Development Ordinance [Chapter 22].
- B. For other regulated activities, Northampton Township may require a financial guarantee from the applicant.
- C. Unless and until the permitted earth disturbance activity and stormwater management facilities have been completed and are accepted by the Township or other legal entity approved by the Township, the maintenance of said stormwater management facilities shall be the responsibility of the applicant.
- D. Whenever sedimentation is caused by an earth disturbance activity, it shall be the responsibility of the person causing such sedimentation to remove it from all affected surfaces, drainage systems and watercourses on and off site and to repair any damage at his or her expense as quickly as possible following a storm event.
- E. Persons doing any earth disturbance on or across a watercourse, swale, floodplain or right-of-way shall return such areas to their original or equal condition after such activity is completed.
- F. Upon the issuance of an approved earth disturbance permit, unless maintenance responsibilities lie with the Township or a legal entity approved by the Township, the owner of any property on which an excavation or fill has been made shall maintain in good condition and repair all retaining walls, cribbing, drainage structures, fences, landscaping and any other protective devices.

**§23-802. Responsibilities for Operations and Maintenance (O&M) of Stormwater Facilities and BMPs.**

- A. No regulated activities within Northampton Township shall commence until approval by Northampton Township of a SWM site plan that describes how the permanent stormwater controls and BMPs will be properly operated and maintained.
- B. The owner of any land upon which stormwater facilities and BMPs will be placed, constructed, or implemented, as described in the stormwater facility and BMP O&M plan, shall record the following documents in the Office of the Recorder of Deeds for Bucks County, within 90 days of approval of the SWM and BMP O&M Plan by the Township:
1. The O&M agreements.
  2. Easements.
- C. The Township may suspend or revoke any approvals granted for the project site upon discovery of failure on the part of the owner to comply with this section.
- D. The stormwater management site plan for the project site shall establish responsibilities for the continuing O&M of all stormwater facilities and BMPs, as follows:

1. If a plan includes structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the Township, stormwater facilities and BMPs may also be offered for dedication to and maintained by the Township. If the Township does not accept dedication of the BMP's, the owner, homeowners association, or private management entity shall be responsible for the continued operation and maintenance of the BMP's.
- E. The Township shall make the final determination on the continuing O&M responsibilities. The Township reserves the right to accept or reject the O&M responsibility for any or all of the stormwater facilities and BMPs.
- F. Facilities, areas, or structures used as BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.
- G. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land.
- H. The Township may take enforcement actions against an owner for any failure to satisfy the provisions of this article and this Ordinance. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.
- I. The O&M agreement shall be transferred with transfer of ownership. The agreement shall be substantially the same as the agreement in Appendix 23-A.
- J. Other items may be included in the O&M agreement where determined necessary to guarantee the satisfactory O&M of all stormwater controls and BMPs. The O&M agreement shall be subject to the review and approval of the Township.
- K. The owner is responsible for the O&M of the SWM BMPs. If the owner fails to adhere to the O&M agreement, the Township may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.
- L. The owner shall convey to the Township easements to assure access for periodic inspections by the Municipality and maintenance, as necessary.
- M. The owner shall keep on file with the Municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Municipality within ten (10) working days of the change.

**§23-803. As-Built Plans, Completion Certificate, and Final Inspection.**

- A. The applicant and/or developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to Northampton Township. The as-built plans shall be submitted in paper and digital (.dwg) formats.
- B. The as-built submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. If any licensed qualified professionals contributed to the construction plans, they must sign and seal the completion certificate.



- C. The applicant and/or developer shall be responsible for providing the latitude and longitude coordinates for all permanent SWM BMPs, at the central location of each BMP.
- D. After receipt of the completion certification by the Township, the Township may conduct a final inspection.

**§23-804. Stormwater management easements.**

- A. Where stormwater or surface water will be gathered, discharged, or drained over lands within or beyond the boundaries of the subdivision or land development, or within a proposed regulated activity site, the applicant or owner shall reserve or obtain easements over all lands affected thereby, provided that no easement or right-of-way for drainage purposes exists on such affected land. Such easements shall be adequate for such discharge of drainage and for the carrying off of such water and for the maintenance, repair and reconstruction of the same, including the right of passage over and upon the same by vehicles, machinery and other equipment for such purposes, and which shall be of sufficient width for such passage and work and that would provide ingress to and egress from a public right-of-way. The width of the easement shall be determined by the Township Engineer, but in no case be less than 20 feet in width. The owner shall convey, free of charge or cost, such easement to the Township upon demand.
- B. Stormwater management easements shall be provided by the property owner, if necessary, for:
  - 1. Access for inspections and maintenance.
  - 2. Preservation of stormwater runoff conveyance, infiltration and detention areas and other BMPs, by persons other than the property owner. The purpose of the easement shall be specified in any agreement.
- C. All easements shall be fully described with metes ad bounds on the BMP operations and maintenance plan.

**ARTICLE IX  
Prohibitions**

**§23-901. Prohibited discharges and connections.**

- A. Any stormwater drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge, including sewage, process wastewater, and wash water to enter the regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth or Northampton Township separate storm sewer system which are not composed entirely of stormwater, except:
  - 1. As provided in Subsection C below; and

2. Discharges allowed under a State or Federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth:
1. Discharges or flows from firefighting activities;
  2. Discharges from potable water sources, including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC);
  3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands;
  4. Diverted stream flows and springs;
  5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps;
  6. Non-contaminated HVAC condensation and water from geothermal systems;
  7. Residential (i.e. not commercial) vehicle wash water where cleaning agents are not utilized;
  8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
- D. In the event that the municipality or PADEP determines that any of the discharges identified in Subsection C significantly contribute to pollution of a regulated small MS4 or the waters of this Commonwealth, the municipality or PADEP will notify the responsible person(s) to cease the discharge.

**§23-902. Roof drains and Sump Pumps.**

- A. Roof drains shall not be connected to streets, sanitary or storm sewers, or roadside ditches; except as provided in §23-901.B.
- B. When it is more advantageous to connect directly to streets or storm sewers, connections of roof drains to streets or roadside ditches may be permitted by the Township.
- C. Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs, where feasible, and to the maximum extent practicable satisfy the criteria for disconnected impervious areas, provided, however, that roof drains may be connected to streets, roadside ditches or storm drains upon determination by the Township Engineer that such connection is the only practical alternative or will provide other offsetting advantages.

**§23-903. Alteration of SWM BMPs.**

- A. No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures that were installed as a requirement of this Ordinance unless it is part of an approved maintenance program and written approval of the Township has been obtained.

- B. No person shall place any structure, fill, landscaping, or vegetation into a stormwater facility or BMP or within a drainage easement which would limit or alter the functioning of the stormwater facility or BMP without the written approval of the Township.

## **ARTICLE X**

### **Enforcement and Penalties**

#### **§23-1001. Enforcement.**

- A. The Board of Supervisors of Northampton Township or its designee is hereby authorized and directed to enforce all the provisions of this Chapter. All inspections regarding compliance with the stormwater management (SWM) site plan and this Chapter shall be the responsibility of the Township Engineer or other qualified persons designated by Northampton Township.
- B. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Site Plan and pursuant to the requirements of this Chapter. It shall be unlawful to alter or remove any structure required by the SWM site plan pursuant to this Chapter or to allow the property to remain in a condition which does not conform to the approved SWM site plan without written approval from the Township.
- C. Whenever the Township finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the Township may order compliance by written notice to the responsible person. Such notice may, without limitation, require the following remedies:
  - 1. Performance of monitoring, analyses, and reporting;
  - 2. Elimination of prohibited connections or discharges;
  - 3. Cessation of any violating discharges, practices, or operations;
  - 4. Abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
  - 5. Payment of a fine to cover administrative and remediation costs;
  - 6. Implementation of stormwater facilities and best management practices (BMPs); and
  - 7. Operation and maintenance (O&M) of stormwater facilities and BMPs.
- D. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violation(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work will be done by the Township or designee and the expense may be charged to the violator.
- E. Failure to comply within the time specified may subject a violator to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Township from pursuing any and all other remedies available in law or equity.

**§23-1002. Suspension and Revocation of Permits and Approvals.**

- A. Any building, land development, or other permit or approval issued by the Township may be suspended or revoked, in whole or in part, by the municipality for:
  - 1. Non-compliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement;
  - 2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the Regulated Activity; or
  - 3. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life, health, or property of others.
- B. A suspended approval may be reinstated by the Township when:
  - 1. The Township or designee has inspected and approved the corrections to the violations that caused the suspension; and
  - 2. The Township is satisfied that all applicable violations in this Ordinance have been corrected.
- C. Any permit or approval that has been revoked by the Township cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Chapter.
- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Township may provide a limited time period for the owner to correct the violation. In these cases, the Township will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the Township may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

**§23-1003. Penalties.**

- A. Any person violating the provisions of this Chapter guilty of a misdemeanor and upon conviction, shall be subject to a fine of not more than \$1,000 for each violation, recoverable with costs. Each day that the violation continues shall constitute a separate offense and the applicable fines are cumulative.
- B. In addition, the Township may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

**§23-1004. Appeals.**

- A. Any person aggrieved by any action pursuant to this Ordinance may appeal to the Board of Supervisors of Northampton Township within 30 days of that action. The Board of Supervisors shall, within 30 days of receipt of an appeal, schedule a hearing to consider the appeal. The proceeding shall be governed by the Pennsylvania Local Agency Law, 2Pa.C.S.A §751 et seq.

B. Any person aggrieved by any decision of the Board of Supervisors of Northampton Township, relevant to the provisions of this Ordinance, may appeal to the County Court of Common Pleas in the County where the activity has taken place within 30 days of the Township's decision.

#### Appendices

**Appendix A. Stormwater Controls and Best Management Practices Operations and Maintenance Agreement.**

See attached PDF.

**Appendix B. Stormwater Management Design Criteria.**

See attached PDF.

**Appendix C. SWM Site Plan Checklist.**

See attached PDF.

**Appendix D. Maps of Management Districts.**

See attached PDF.

**Appendix E. Low Impact Development (LID) Practices.**

See attached PDF.

**Appendix F. Disconnected Impervious Area (DIA).**

See attached PDF.

**Appendix G. Small Project Stormwater Management (SWM) Site Plan.**

See attached PDF.

**SECTION 2. SEVERABILITY.**

In the event that any section, sentence, clause, phrase or word of this ordinance shall be declared illegal, invalid or unconstitutional by any Court of competent jurisdiction, such declaration shall not prevent or otherwise foreclose enforcement of any of the remaining portions of this ordinance.

**SECTION 3. REPEALER.**

All ordinances or parts of ordinances inconsistent herewith or in conflict with any of the specific terms enacted hereby, to the extent of said inconsistencies or conflicts, are hereby specifically repealed.

ORDAINED and ENACTED by the Board of Supervisors of Northampton Township this 28<sup>th</sup> day of September, 2022.

BOARD OF SUPERVISORS  
NORTHAMPTON TOWNSHIP



\_\_\_\_\_  
Adam Selisker, Chairman

ATTEST:   
Paula Gasper, Secretary

**APPENDIX A: STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT**

**THIS AGREEMENT**, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between \_\_\_\_\_, (hereinafter the “Landowner”), and \_\_\_\_\_, \_\_\_\_\_ County, Pennsylvania, (hereinafter “Municipality”);

**WITNESSETH**

**WHEREAS**, the Landowner is the owner of certain real property as recorded by deed in the land records of \_\_\_\_\_ County, Pennsylvania, Deed Book \_\_\_\_\_ at Page \_\_\_\_\_, (hereinafter “Property”).

**WHEREAS**, the Landowner is proceeding to build and develop the Property; and

**WHEREAS**, the Stormwater Controls and BMP Operations and Maintenance Plan approved by the Municipality (hereinafter referred to as the “Plan”) for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of Best Management Practices (BMPs); and

**WHEREAS**, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site stormwater Best Management Practices be constructed and maintained on the Property; and

**WHEREAS**, for the purposes of this agreement, the following definitions shall apply:

BMP – “Best Management Practice;” activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Municipal Stormwater Management Ordinance, including but not limited to infiltration trenches, seepage

pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grassed swales, forested buffers, sand filters and detention basins.

**WHEREAS**, the Municipality requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his successors and assigns, and

**NOW, THEREFORE**, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific maintenance requirements noted on the Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.



5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality. In the event that a claim is asserted against the Municipality, its designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.
8. The Municipality shall inspect the BMP(s) at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of \_\_\_\_\_ County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

(SEAL)

For the Landowner:

ATTEST:

\_\_\_\_\_ (City, Borough, Township)

County of \_\_\_\_\_, Pennsylvania

I, \_\_\_\_\_, a Notary Public in and for the County and State aforesaid, whose commission expires on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, do hereby certify that \_\_\_\_\_ whose name(s) is/are signed to the foregoing Agreement bearing date of the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_, has acknowledged the same before me in my said County and State.

**GIVEN UNDER MY HAND THIS** \_\_\_\_\_ day of \_\_\_\_\_, 200\_.

\_\_\_\_\_  
NOTARY PUBLIC

\_\_\_\_\_  
(SEAL)

## **APPENDIX B: STORMWATER MANAGEMENT DESIGN CRITERIA**

### **TABLE B-1 DESIGN STORM RAINFALL AMOUNT**

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)  
[http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html).

### **FIGURE B-1 ATLAS 14 TYPE II S-CURVES FOR ALL FREQUENCY STORMS – DOYLESTOWN GAGE (36-2221)**

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)  
[http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html).

### **TABLE B-2 NATURAL RESOURCE PROTECTION STORMWATER MANAGEMENT CONTROLS**

Source: PA BMP Manual Chapter 8, pg 33

### **TABLE B-3 GUIDANCE TO CALCULATE THE 2-YEAR, 24-HOUR VOLUME INCREASE FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS**

Source: PA BMP Manual Chapter 8, pg 37

### **TABLE B-4 RUNOFF CURVE NUMBERS**

Source: NRCS (SCS) TR-55

### **TABLE B-5 VOLUME CONTROL CALCULATION GUIDANCE FOR NONSTRUCTURAL BMPS**

Source: PA BMP Manual Chapter 8, pg 34

### **TABLE B-6 VOLUME CONTROL CALCULATION GUIDANCE FOR STRUCTURAL BMPS**

Source: PA BMP Manual Chapter 8, pg 38

### **TABLE B-7 RATIONAL RUNOFF COEFFICIENTS**

Source: New Jersey Department of Transportation, Technical Manual for Stream Encroachment,  
August, 1984

### **TABLE B-8 MANNING ROUGHNESS COEFFICIENTS**

**TABLE B-1  
DESIGN STORM RAINFALL AMOUNT (INCHES)**

The design storm rainfall amount chosen for design should be obtained from the National Oceanic and Atmospheric Administration Atlas 14 interactive website:  
[http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html)

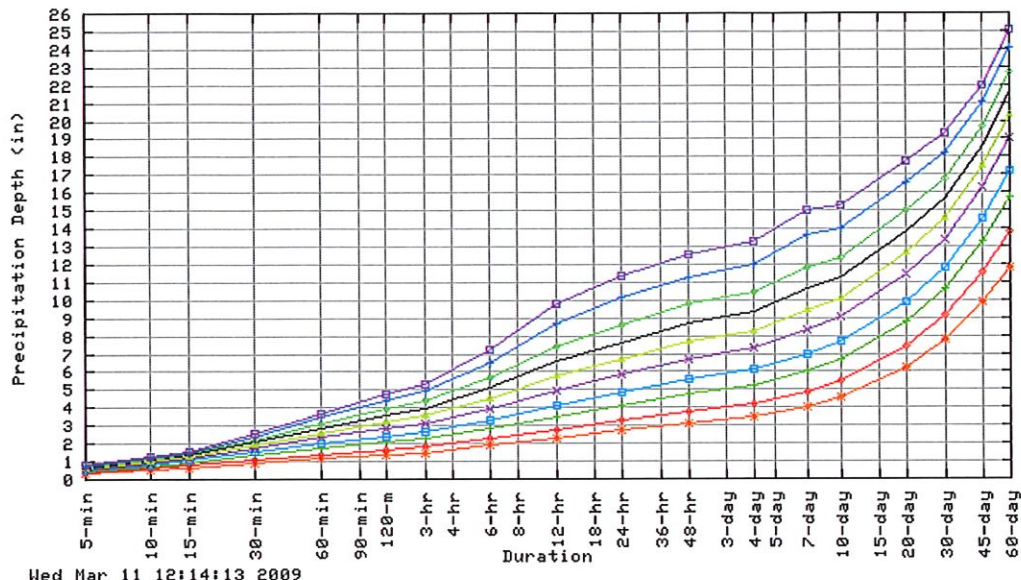
Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)  
[http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html)

| Precipitation Frequency Estimates (inches) |          |           |           |           |           |            |      |      |          |       |       |       |       |           |           |           |           |           |
|--|----------|-----------|-----------|-----------|-----------|------------|------|------|----------|-------|-------|-------|-------|-----------|-----------|-----------|-----------|-----------|
| ARI*<br>(years)                            | 5<br>min | 10<br>min | 15<br>min | 30<br>min | 60<br>min | 120<br>min | 3 hr | 6 hr | 12<br>hr | 24 hr | 48 hr | 4 day | 7 day | 10<br>day | 20<br>day | 30<br>day | 45<br>day | 60<br>day |
| 1  | 0.34     | 0.54      | 0.68      | 0.93      | 1.15      | 1.38       | 1.51 | 1.89 | 2.30     | 2.71  | 3.13  | 3.48  | 4.07  | 4.61      | 6.23      | 7.76      | 9.85      | 11.81     |
| 2  | 0.40     | 0.64      | 0.81      | 1.12      | 1.40      | 1.67       | 1.83 | 2.28 | 2.78     | 3.26  | 3.78  | 4.19  | 4.87  | 5.51      | 7.39      | 9.14      | 11.57     | 13.83     |
| 5  | 0.47     | 0.76      | 0.96      | 1.36      | 1.75      | 2.10       | 2.30 | 2.86 | 3.50     | 4.11  | 4.76  | 5.24  | 6.02  | 6.71      | 8.81      | 10.65     | 13.30     | 15.78     |
| 10   | 0.53     | 0.84      | 1.06      | 1.54      | 2.01      | 2.42       | 2.66 | 3.32 | 4.11     | 4.81  | 5.57  | 6.09  | 6.96  | 7.68      | 9.93      | 11.83     | 14.60     | 17.23     |
| 25   | 0.59     | 0.94      | 1.19      | 1.76      | 2.34      | 2.86       | 3.15 | 3.98 | 4.99     | 5.83  | 6.71  | 7.30  | 8.30  | 9.03      | 11.44     | 13.36     | 16.25     | 19.04     |
| 50   | 0.63     | 1.00      | 1.27      | 1.92      | 2.60      | 3.21       | 3.54 | 4.52 | 5.74     | 6.70  | 7.66  | 8.29  | 9.41  | 10.11     | 12.61     | 14.52     | 17.46     | 20.35     |
| 100  | 0.67     | 1.07      | 1.35      | 2.07      | 2.85      | 3.56       | 3.94 | 5.09 | 6.55     | 7.63  | 8.67  | 9.33  | 10.59 | 11.23     | 13.79     | 15.66     | 18.61     | 21.57     |
| 200  | 0.71     | 1.13      | 1.42      | 2.21      | 3.11      | 3.92       | 4.35 | 5.69 | 7.43     | 8.64  | 9.75  | 10.44 | 11.83 | 12.39     | 14.98     | 16.79     | 19.69     | 22.70     |
| 500  | 0.76     | 1.20      | 1.51      | 2.40      | 3.44      | 4.41       | 4.90 | 6.54 | 8.73     | 10.12 | 11.30 | 12.01 | 13.60 | 14.00     | 16.58     | 18.23     | 21.02     | 24.08     |
| 1000                                       | 0.79     | 1.24      | 1.56      | 2.53      | 3.69      | 4.78       | 5.34 | 7.23 | 9.82     | 11.35 | 12.57 | 13.29 | 15.04 | 15.28     | 17.80     | 19.31     | 21.96     | 25.04     |

\* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

# FIGURE B-1 Atlas 14 Type II S-Curves for All Frequency Storms – Doylestown Gage (36-2221)

Partial duration based Point Precipitation Frequency Estimates - Version: 3  
40.3 N 75.1333 W 305 ft



Hed Mar 11 12:14:13 2009

| Average Recurrence Interval (years) |   |
|-------------------------------------|---|
| 1                                   | → |
| 2                                   | → |
| 5                                   | → |
| 10                                  | → |
| 25                                  | → |
| 50                                  | → |
| 100                                 | → |
| 200                                 | → |
| 500                                 | → |
| 1000                                | → |

**TABLE B-2: NATURAL RESOURCE PROTECTION  
STORMWATER MANAGEMENT CONTROLS**

| <b>Existing Natural Sensitive Resource</b> | <b>Mapped in the ERSAM?<br/>Yes/No/n/a</b> | <b>Total Area (Ac.)</b> | <b>Area to be Protected (Ac.)</b> |
|--|--|-------------------------|-----------------------------------|
| Waterbodies                                |  |                         |                                   |
| Floodplains                                |  |                         |                                   |
| Riparian Areas / Buffers                   |  |                         |                                   |
| Wetlands                                   |  |                         |                                   |
| Vernal Pools                               |  |                         |                                   |
| Woodlands                                  |  |                         |                                   |
| Natural Drainage Ways                      |  |                         |                                   |
| Steep Slopes, 15%-25%                      |  |                         |                                   |
| Steep Slopes, over 25%                     |  |                         |                                   |
| Other:                                     |  |                         |                                   |
| Other:                                     |  |                         |                                   |
| <b>Total Existing:</b>                     |  |                         |                                   |

**TABLE B-3: GUIDANCE TO CALCULATE THE 2-YEAR, 24-HOUR VOLUME INCREASE FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS**

| Existing Conditions:<br>Cover Type/Condition | Soil Type | Area (sf) | Area (ac) | CN | S | la (0.2*S) | Q Runoff (in) | Runoff Volume (ft3) |
|--|-----------|-----------|-----------|----|---|------------|---------------|---------------------|
| Woodland                                     |           |           |           |    |   |            |               |                     |
| Meadow                                       |           |           |           |    |   |            |               |                     |
| Impervious                                   |           |           |           |    |   |            |               |                     |
| <b>Total:</b>                                |           |           |           |    |   |            |               |                     |

| Developed Conditions:<br>Cover Type/Condition | Soil Type | Area (sf) | Area (ac) | CN | S | la (0.2*S) | Q Runoff (in) | Runoff Volume (ft3) |
|---|-----------|-----------|-----------|----|---|------------|---------------|---------------------|
|   |           |           |           |    |   |            |               |                     |
|   |           |           |           |    |   |            |               |                     |
|   |           |           |           |    |   |            |               |                     |
| <b>Total:</b>                                 |           |           |           |    |   |            |               |                     |

2-year Volume Increase (ft3):

TABLE B-4. Runoff Curve Numbers (from NRCS (SCS) TR-55)

| LAND USE DESCRIPTION  | Hydrologic Condition | HYDROLOGIC SOIL GROUP |    |    |    |
|---|----------------------|-----------------------|----|----|----|
|   |                      | A                     | B  | C  | D  |
| Open Space  |                      |                       |    |    |    |
| Grass cover < 50%   | Poor                 | 68                    | 79 | 86 | 89 |
| Grass cover 50% to 75%  | Fair                 | 49                    | 69 | 79 | 84 |
| Grass cover > 75%   | Good                 | 39                    | 61 | 74 | 80 |
| Meadow  |                      | 30                    | 58 | 71 | 78 |
| Agricultural  |                      |                       |    |    |    |
| Pasture, grassland, or range –<br>Continuous forage for grazing       | Poor                 | 68                    | 79 | 86 | 89 |
| Pasture, grassland, or range –<br>Continuous forage for grazing.      | Fair                 | 49                    | 69 | 79 | 84 |
| Pasture, grassland, or range –<br>Continuous forage for grazing       | Good                 | 39                    | 61 | 74 | 80 |
| Brush-weed-grass mixture<br>with brush the major element.             | Poor                 | 48                    | 67 | 77 | 83 |
| Brush-weed-grass mixture<br>with brush the major element.             | Fair                 | 35                    | 56 | 70 | 77 |
| Brush-weed-grass mixture<br>with brush the major element.             | Good                 | 30                    | 48 | 65 | 73 |
| Fallow Bare soil  | -----                | 77                    | 86 | 91 | 94 |
| Crop residue cover (CR)   | Poor                 | 76                    | 85 | 90 | 93 |
|   | Good                 | 74                    | 83 | 88 | 90 |
| Woods – grass combination<br>(orchard or tree farm)                   | Poor                 | 57                    | 73 | 82 | 86 |
|   | Fair                 | 43                    | 65 | 76 | 82 |
|   | Good                 | 32                    | 58 | 72 | 79 |
| Woods   | Poor                 | 45                    | 66 | 77 | 83 |
|   | Fair                 | 36                    | 60 | 73 | 79 |
|   | Good                 | 30                    | 55 | 70 | 77 |
| Commercial (85% Impervious)   |                      | 92                    | 94 | 95 |    |
| Industrial (72% Impervious)   |                      | 88                    | 91 | 93 |    |
| Institutional (50% Impervious)  |                      | 82                    | 88 | 90 |    |
| Residential districts by average lot size:                            |                      |                       |    |    |    |
|   | % Impervious         |                       |    |    |    |
| 1/8 acre or less *<br>(town houses)                                   | 65                   | 77                    | 85 | 90 | 92 |
| 1/4 acre  | 38                   | 61                    | 75 | 83 | 87 |
| 1/3 acre  | 30                   | 57                    | 72 | 81 | 86 |
| 1/2 acre  | 25                   | 54                    | 70 | 80 | 85 |
| 1 acre  | 20                   | 51                    | 68 | 79 | 84 |
| 2 acres   | 12                   | 46                    | 65 | 77 | 82 |
| Farmstead   |                      | 59                    | 74 | 82 | 86 |
| Smooth Surfaces (Concrete, Asphalt,<br>Gravel or Bare Compacted Soil) | 98                   | 98                    | 98 | 98 |    |
| Water   | 98                   | 98                    | 98 | 98 |    |
| Mining/Newly Graded Areas<br>(Pervious Areas Only)                    | 77                   | 86                    | 91 | 94 |    |

\* Includes Multi-Family Housing unless justified lower density can be provided.

Note: Existing site conditions of bare earth or fallow ground shall be considered as meadow when choosing a CN value.



**TABLE B-5: VOLUME CONTROL CALCULATION GUIDANCE FOR  
NONSTRUCTURAL BMPS**

**Type of Nonstructural BMP**

|   | AREA (sq ft) | * | Runoff * 1/12 =<br>Volume (in) | Volume Reduction(ft <sup>3</sup> ) |
|---|--------------|---|--------------------------------|------------------------------------|
| <b>Use of Natural Drainage Feature</b>  |              |   |                                |                                    |
| <i>Utilize natural flow pathways</i>  | _____ sq ft  |   | * 1/4" * 1/12 =                | _____ cu ft                        |
| <b>Minimum Soil Compaction</b>  |              |   |                                |                                    |
| <i>Lawn</i>   | _____ sq ft  |   | * 1/3" * 1/12 =                | _____ cu ft                        |
| <i>Meadow</i>   | _____ sq ft  |   | * 1/3" * 1/12 =                | _____ cu ft                        |
| <b>Protecting existing trees (not located in protected area)</b>  |              |   |                                |                                    |
| For trees within 20 feet of impervious cover:   |              |   |                                |                                    |
| <i>Tree Canopy</i>  | _____ sq ft  |   | * 1" * 1/12 =                  | _____ cu ft                        |
| For trees within 20-100 feet of impervious cover:   |              |   |                                |                                    |
| <i>Tree Canopy</i>  | _____ sq ft  |   | * 1/2" * 1/12 =                | _____ cu ft                        |
| <b>Rooftop Disconnection</b>  |              |   |                                |                                    |
| For runoff directed to pervious and/or vegetative areas where infiltration occurs   |              |   |                                |                                    |
| <i>Roof Area</i>  | _____ sq ft  |   | * 1/4" * 1/12 =                | _____ cu ft                        |
| <b>Impervious Disconnection</b>   |              |   |                                |                                    |
| For runoff from impervious surfaces such as streets and concrete directed to pervious and/or vegetative areas where infiltration occurs |              |   |                                |                                    |
| <i>Impervious Area</i>  | _____ sq ft  |   | * 1/4" * 1/12 =                | _____ cu ft                        |
| <b>Total Volume Reduction</b>   |              |   |                                | _____ cu ft                        |

\* represents multiply

**TABLE B-6: VOLUME CONTROL CALCULATION GUIDANCE FOR STRUCTURAL BMPS**

$$\text{Required Volume Control (ft}^3\text{)} - \text{Nonstructural Volume Control (ft}^3\text{)} = \text{Structural Volume Requirement (ft}^3\text{)}$$

Table B-3                      Table B-5

| Type                                     | Proposed Structural BMP               | Section in BMP Manual | Area (sq ft) | Storage Volume (cu ft) |
|--|---------------------------------------|-----------------------|--------------|------------------------|
| Infiltration and / or Evapotranspiration | Porous Pavement                       | 6.4.1                 |              |                        |
|  | Infiltration Basin                    | 6.4.2                 |              |                        |
|  | Infiltration Bed                      | 6.4.3                 |              |                        |
|  | Infiltration Trench                   | 6.4.4                 |              |                        |
|  | Rain Garden/Bioretention              | 6.4.5                 |              |                        |
|  | Dry Well/Seepage Pit                  | 6.4.6                 |              |                        |
|  | Constructed Filter                    | 6.4.7                 |              |                        |
|  | Vegetative Swale                      | 6.4.8                 |              |                        |
|  | Vegetative Filter Strip               | 6.4.9                 |              |                        |
|  | Infiltration Berm                     | 6.4.10                |              |                        |
| Evaporation and / or Reuse               | Vegetative Roof                       | 6.5.1                 |              |                        |
|  | Capture and Re-use                    | 6.5.2                 |              |                        |
| Runoff Quality                           | Constructed Wetlands                  | 6.6.1                 |              |                        |
|  | Wet Pond / Retention Basin            | 6.6.2                 |              |                        |
|  | Dry Extended Detention Basin          | 6.6.3                 |              |                        |
|  | Water Quality Filters                 | 6.6.4                 |              |                        |
| Restoration                              | Riparian Buffer Restoration           | 6.7.1                 |              |                        |
|  | Landscape Restoration / Reforestation | 6.7.2                 |              |                        |
|  | Soil Amendment                        | 6.7.3                 |              |                        |
| Other                                    | Level Spreader                        | 6.8.1                 |              |                        |
|  | Special Storage Areas                 | 6.8.2                 |              |                        |
|  | other                                 |                       |              |                        |

**Total Volume Control from Structural BMPs:** \_\_\_\_\_

**TABLE B.7. RATIONAL RUNOFF COEFFICIENTS**  
By Hydrologic Soils Group and Overland Slope (%)

| Land Use          | A     |      |      | B    |      |      | C    |      |      | D    |      |      |
|-------------------|-------|------|------|------|------|------|------|------|------|------|------|------|
|                   | 0.2%  | 2-6% | 6%+  | 0.2% | 2-6% | 6%+  | 0.2% | 2-6% | 6%+  | 0.2% | 2-6% | 6%+  |
| Cultivated Land   | 0.08s | 0.13 | 0.16 | 0.11 | 0.15 | 0.21 | 0.14 | 0.19 | 0.26 | 0.18 | 0.23 | 0.31 |
|                   | 0.14s | 0.18 | 0.22 | 0.16 | 0.21 | 0.28 | 0.20 | 0.25 | 0.34 | 0.24 | 0.29 | 0.41 |
| Pasture           | 0.12  | 0.20 | 0.30 | 0.18 | 0.28 | 0.37 | 0.24 | 0.34 | 0.44 | 0.30 | 0.40 | 0.50 |
|                   | 0.15  | 0.25 | 0.37 | 0.23 | 0.34 | 0.45 | 0.30 | 0.42 | 0.52 | 0.37 | 0.50 | 0.62 |
| Meadow            | 0.10  | 0.16 | 0.25 | 0.14 | 0.22 | 0.30 | 0.20 | 0.28 | 0.36 | 0.24 | 0.30 | 0.40 |
|                   | 0.14  | 0.22 | 0.30 | 0.20 | 0.28 | 0.37 | 0.26 | 0.35 | 0.44 | 0.30 | 0.40 | 0.50 |
| Forest            | 0.05  | 0.08 | 0.11 | 0.08 | 0.11 | 0.14 | 0.10 | 0.13 | 0.16 | 0.12 | 0.16 | 0.20 |
|                   | 0.08  | 0.11 | 0.14 | 0.10 | 0.14 | 0.18 | 0.12 | 0.16 | 0.20 | 0.15 | 0.20 | 0.25 |
| Residential       |       |      |      |      |      |      |      |      |      |      |      |      |
| Lot Size 1/8 Acre | 0.25  | 0.28 | 0.31 | 0.27 | 0.30 | 0.35 | 0.30 | 0.33 | 0.38 | 0.33 | 0.36 | 0.42 |
|                   | 0.33  | 0.37 | 0.40 | 0.35 | 0.39 | 0.44 | 0.38 | 0.42 | 0.49 | 0.41 | 0.45 | 0.54 |
| Lot Size 1/4 Acre | 0.22  | 0.26 | 0.29 | 0.24 | 0.29 | 0.33 | 0.27 | 0.31 | 0.36 | 0.30 | 0.34 | 0.40 |
|                   | 0.30  | 0.34 | 0.37 | 0.33 | 0.37 | 0.42 | 0.36 | 0.40 | 0.47 | 0.38 | 0.42 | 0.52 |
| Lot Size 1/3 Acre | 0.19  | 0.23 | 0.26 | 0.22 | 0.26 | 0.30 | 0.25 | 0.29 | 0.34 | 0.28 | 0.32 | 0.39 |
|                   | 0.28  | 0.32 | 0.35 | 0.30 | 0.35 | 0.39 | 0.33 | 0.38 | 0.45 | 0.36 | 0.40 | 0.50 |
| Lot Size 1/2 Acre | 0.16  | 0.20 | 0.24 | 0.19 | 0.23 | 0.28 | 0.22 | 0.27 | 0.32 | 0.26 | 0.30 | 0.37 |
|                   | 0.25  | 0.29 | 0.32 | 0.28 | 0.32 | 0.36 | 0.31 | 0.35 | 0.42 | 0.34 | 0.38 | 0.48 |
| Lot Size 1 Acre   | 0.14  | 0.19 | 0.22 | 0.17 | 0.21 | 0.26 | 0.20 | 0.25 | 0.31 | 0.24 | 0.29 | 0.35 |
|                   | 0.22  | 0.26 | 0.29 | 0.24 | 0.28 | 0.34 | 0.28 | 0.32 | 0.40 | 0.31 | 0.35 | 0.46 |
| Industrial        | 0.67  | 0.68 | 0.68 | 0.68 | 0.68 | 0.69 | 0.68 | 0.69 | 0.69 | 0.69 | 0.69 | 0.70 |
|                   | 0.85  | 0.85 | 0.86 | 0.85 | 0.86 | 0.86 | 0.86 | 0.86 | 0.87 | 0.86 | 0.86 | 0.88 |
| Commercial        | 0.71  | 0.71 | 0.72 | 0.71 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 |
|                   | 0.88  | 0.88 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.89 | 0.90 | 0.89 | 0.89 | 0.90 |
| Streets           | 0.70  | 0.71 | 0.71 | 0.71 | 0.72 | 0.74 | 0.72 | 0.73 | 0.76 | 0.73 | 0.75 | 0.78 |
|                   | 0.76  | 0.77 | 0.79 | 0.80 | 0.82 | 0.84 | 0.84 | 0.85 | 0.89 | 0.89 | 0.91 | 0.95 |
| Open Space        | 0.05  | 0.10 | 0.14 | 0.08 | 0.13 | 0.19 | 0.12 | 0.17 | 0.24 | 0.16 | 0.21 | 0.28 |
|                   | 0.11  | 0.16 | 0.20 | 0.14 | 0.19 | 0.26 | 0.18 | 0.23 | 0.32 | 0.22 | 0.27 | 0.39 |
| Parking           | 0.85  | 0.86 | 0.87 | 0.85 | 0.86 | 0.87 | 0.85 | 0.86 | 0.87 | 0.85 | 0.86 | 0.87 |
|                   | 0.95  | 0.96 | 0.97 | 0.95 | 0.96 | 0.97 | 0.95 | 0.96 | 0.97 | 0.95 | 0.96 | 0.97 |

s Runoff coefficients for storm recurrence intervals less than 25 years.

s Runoff coefficients for storm recurrence intervals of 25 years or more.

Source: Ravlis, W.J., S.L. Wong and R.H. McCuen, 1981, "Comparison of Urban Flood Frequency Procedures", Preliminary Draft, U.S. Department

**TABLE B-8. MANNING'S ROUGHNESS COEFFICIENTS**

| DESCRIPTION   | Manning's n-value |
|---|-------------------|
| Smooth-wall Plastic Pipe  | 0.011             |
| Concrete Pipe   | 0.012             |
| Smooth-lined Corrugated Metal Pipe  | 0.012             |
| Corrugated Plastic Pipe   | 0.024             |
| Annular Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated)  |                   |
| 68 mm × 13 mm (2 2/3 in × 1/2 in) Corrugations  | 0.024             |
| 75 mm × 25 mm (3 in × 1 in) Corrugations  | 0.027             |
| 125 mm × 25 mm (5 in × 1 in) Corrugations   | 0.025             |
| 150 mm × 50 mm (6 in × 2 in) Corrugations   | 0.033             |
| Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated)  |                   |
| 75 mm × 25 mm (3 in × 1 in), 125 mm × 25 mm (5 in × 1 in), or 150 mm × 50 mm (6 in × 2 in) Corrugations                           | 0.024             |
| Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated)  |                   |
| 68 mm × 13 mm (2 2/3 in × 1/2 in) Corrugations  |                   |
| a. Lower Coefficients*  |                   |
| 450 mm (18 in) Diameter   | 0.014             |
| 600 mm (24 in) Diameter   | 0.016             |
| 900 mm (36 in) Diameter   | 0.019             |
| 1200 mm (48 in) Diameter  | 0.020             |
| 1500 mm (60 in) Diameter or larger  | 0.021             |
| b. Higher Coefficients**  | 0.024             |
| Annular or Helically Corrugated Steel or Aluminum Alloy Pipe Arches or Other Non-Circular Metal Conduit (Plain or Polymer coated) | 0.024             |
| Vitrified Clay Pipe   | 0.012             |
| Ductile Iron Pipe   | 0.013             |
| Asphalt Pavement  | 0.015             |
| Concrete Pavement   | 0.014             |
| Grass Medians   | 0.050             |
| Grass – Residential   | 0.30              |
| Earth   | 0.020             |
| Gravel  | 0.030             |
| Rock  | 0.035             |
| Cultivated Areas  | 0.030 - 0.050     |
| Dense Brush   | 0.070 - 0.140     |
| Heavy Timber (Little undergrowth)   | 0.100 - 0.150     |
| Heavy Timber (w/underbrush)   | 0.40              |
| Streams:  |                   |
| a. Some Grass And Weeds (Little or no brush)  | 0.030 - 0.035     |
| b. Dense Growth of Weeds  | 0.035 - 0.050     |
| c. Some Weeds (Heavy brush on banks)  | 0.050 - 0.070     |

**Notes:**

\* Use the lower coefficient if any one of the following conditions apply:

- a. A storm pipe longer than 20 diameters, which directly or indirectly connects to an inlet or manhole, located in swales adjacent to shoulders in cut areas or depressed medians.
- b. A storm pipe which is specially designed to perform under pressure.

\*\*Use the higher coefficient if any one of the following conditions apply:

- a. A storm pipe which directly or indirectly connects to an inlet or manhole located in highway pavement sections or adjacent to curb or concrete median barrier.
- b. A storm pipe which is shorter than 20 diameters long.
- c. A storm pipe which is partly lined helically corrugated metal pipe.

## APPENDIX C-1: SAMPLE SWM SITE PLAN APPLICATION

Application is hereby made for review of the NESHAMINY CREEK WATERSHED MODEL ACT 167 and NPDES STORMWATER MANAGEMENT ORDINANCE and related data as submitted herewith in accordance with the \_\_\_\_\_ Township/Borough Stormwater Management and Earth Disturbance Ordinance.

Final Plan \_\_\_\_\_ Preliminary Plan \_\_\_\_\_ Sketch Plan \_\_\_\_\_

Date of Submission \_\_\_\_\_ Submission No. \_\_\_\_\_

1. Name of subdivision or development \_\_\_\_\_

2. Name of Applicant \_\_\_\_\_ Telephone No. \_\_\_\_\_

(if corporation, list the corporation's name and the names of two officers of the corporation)

\_\_\_\_\_ Officer 1

\_\_\_\_\_ Officer 2

Address \_\_\_\_\_

Zip \_\_\_\_\_

Applicants interest in subdivision or development  
(if other than property owner give owners name and address)

3. Name of property owner \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_

Zip \_\_\_\_\_

4. Name of engineer or surveyor \_\_\_\_\_ Telephone No. \_\_\_\_\_

Address \_\_\_\_\_

Zip \_\_\_\_\_

5. Type of subdivision or development proposed:

|                                       |                         |                              |
|---------------------------------------|-------------------------|------------------------------|
| _____ Single-Family Lots              | _____ Townhouses        | _____ Commercial (Multi-Lot) |
| _____ Two Family Lots                 | _____ Garden Apartments | _____ Commercial (One-Lot)   |
| _____ Multi-Family Lots               | _____ Mobile-Home Park  | _____ Industrial (Multi-Lot) |
| _____ Cluster Type Lots               | _____ Campground        | _____ Industrial (One-Lot)   |
| _____ Planned Residential Development | _____ Other (_____)     |                              |

6. Linear feet of new road proposed \_\_\_\_\_ L.F.

7. Area of proposed and existing impervious area on the entire tract.

- a. Existing (to remain) \_\_\_\_\_ S.F. \_\_\_\_\_ % of Property
- b. Proposed \_\_\_\_\_ S.F. \_\_\_\_\_ % of Property

8. Stormwater

a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions for the designated design storm? \_\_\_\_\_

b. Design storm utilized (on-site conveyance systems) (24 hr.) \_\_\_\_\_  
No. of Subarea \_\_\_\_\_  
Watershed Name \_\_\_\_\_

Explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

c. Does the submission and/or district meet the criteria for the applicable Management District? \_\_\_\_\_

d. Number of subarea(s) from Ordinance Appendix D of the Neshaminy Creek Watershed Stormwater Management Plan. \_\_\_\_\_

e. Type of proposed runoff control \_\_\_\_\_

f. Does the proposed stormwater control criteria meet the requirements/guidelines of the Stormwater Ordinances? \_\_\_\_\_

If not, what waivers are requested? \_\_\_\_\_  
\_\_\_\_\_

Reasons \_\_\_\_\_

g. Does the plan meet the requirements of Article III of the Stormwater Ordinances? \_\_\_\_\_

If not, what waivers are requested? \_\_\_\_\_

Reasons Why \_\_\_\_\_  
\_\_\_\_\_

h. Was TR-55, June 1986 utilized in determining the time of concentration? \_\_\_\_\_  
\_\_\_\_\_

i. What hydrologic method was used in the stormwater computations? \_\_\_\_\_  
\_\_\_\_\_

j. Is a hydraulic routing through the stormwater control structure submitted? \_\_\_\_\_  
\_\_\_\_\_

- k. Is a construction schedule or staging attached? \_\_\_\_\_
  - l. Is a recommended maintenance program attached? \_\_\_\_\_
9. Erosion and Sediment Pollution Control (E&S):
- a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the [County Name] County Conservation District? \_\_\_\_\_
  - b. Total area of earth disturbance \_\_\_\_\_ S.F.
10. Wetlands
- a. Have wetlands been delineated by someone trained in wetland delineation? \_\_\_\_\_
  - b. Have the wetland lines been verified by a state or federal permitting authority? \_\_\_\_\_
  - c. Have the wetland lines been surveyed? \_\_\_\_\_
  - d. Total acreage of wetland within the property \_\_\_\_\_
  - e. Total acreage of wetland disturbed \_\_\_\_\_
  - f. Supporting documentation \_\_\_\_\_
11. Filing
- a. Has the required fee been submitted? \_\_\_\_\_  
Amount \_\_\_\_\_
  - b. Has the proposed schedule of construction inspection to be performed by the Applicant's engineer been submitted? \_\_\_\_\_
  - c. Name of individual who will be making the inspections \_\_\_\_\_
  - d. General comments about stormwater management at the development \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF APPLICATION:

COMMONWEALTH OF PENNSYLVANIA  
 COUNTY OF [County Name].

On this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, before me, the undersigned officer, personally appeared \_\_\_\_\_ who being duly sworn, according to law, deposes and says that \_\_\_\_\_ owners of the property described in this application and that the application was made with \_\_\_\_\_ knowledge





## PROPOSED SCHEDULE OF FEES

*(It is recommended that Municipalities adopt a fee schedule independent of the Ordinance so that fee schedules can be adjusted as need arises without having to go through the Ordinance revision public hearing process).*

Subdivision name \_\_\_\_\_ Submittal No. \_\_\_\_\_

Owner \_\_\_\_\_ Date \_\_\_\_\_

Engineer \_\_\_\_\_

|   |  |          |
|---|--|----------|
| 1. Filing fee   |  | \$ _____ |
| 2. Land use   |  |          |
| 2a. Subdivision, campgrounds, mobile home parks, and multi-family dwelling where the units are located in the same local watershed. |  | \$ _____ |
| 2b. Multi-family dwelling where the designated open space is located in a different local watershed from the proposed units.        |  | \$ _____ |
| 2c. Commercial/industrial.  |  | \$ _____ |
| 3. Relative amount of earth disturbance   |  |          |
| 3a. Residential   |  |          |
| road <500 l.f.  |  | \$ _____ |
| road 500-2,640 l.f.   |  | \$ _____ |
| road >2,640 l.f.  |  | \$ _____ |
| 3b. Commercial/industrial and other impervious area   |  |          |
| <3,500 s.f.   |  | \$ _____ |
| 3,500-43,460 s.f.   |  | \$ _____ |
| >43,560 s.f.  |  | \$ _____ |
| 4. Relative size of project   |  |          |
| 4a. Total tract area  |  |          |
| <1 ac   |  | \$ _____ |
| 1-5 ac  |  | \$ _____ |
| 5.1-25 ac   |  | \$ _____ |
| 25.1-100 ac   |  | \$ _____ |
| 100.1-200 ac  |  | \$ _____ |
| >200 ac   |  | \$ _____ |
| 5. Stormwater control measures  |  |          |
| 5a. Detention basins & other controls which require a review of hydraulic routings (\$ per control).                                |  | \$ _____ |
| 5b. Other control facilities which require storage volume calculations but no hydraulic routings. (\$ per control)                  |  | \$ _____ |
| 6. Site inspection (\$ per inspection)  |  | \$ _____ |
| Total   |  | \$ _____ |

All subsequent reviews shall be 25 percent the amount of the initial review fee unless a new application is required as per Section 406 of the stormwater ordinance. A new fee shall be submitted with each revision in accordance with this schedule.

## APPENDIX C-2: SWM SITE PLAN CHECKLIST

---

Project: \_\_\_\_\_  
Municipality: \_\_\_\_\_  
Engineer: \_\_\_\_\_  
Submittal No: \_\_\_\_\_  
Date: \_\_\_\_\_  
Project ID: \_\_\_\_\_ (for Municipal use ONLY)

---

### SECTION I: REGULATED ACTIVITIES

Reference: Section 105

1. Is the Proposed Project within the Neshaminy Creek watershed?  Yes  No
2. Does the Proposed Project meet the definition of a "Regulated Activity"?  Yes  No

**STOP** – If you have checked NO for either of the above questions, you are not required to submit a Stormwater Management Plan under the Neshaminy Creek Stormwater management Ordinance.

---

### SECTION II: EXEMPTION

Reference: Section 106

1. Does the regulated activity create an Impervious Surface less than or equal to 1,000 square feet?  
 Yes  No
2. Does the regulated activity create an Impervious Surface greater than 1,000 square feet but less than 5,000 square feet?  Yes  No
3. Does the regulated activity involve an Agricultural Activity?  Yes  No
4. Does the regulated activity involve Forest Management or Timber Operations?  Yes  No

Parcel IS Exempt from the SWM Site Plan and Peak Rate Control   
Parcel IS Exempt from Peak Rate Control   
Parcel IS NOT Exempt

---

### SECTION III: VOLUME CONTROLS

Reference: Section 303

#### A. Site Disturbance Minimization

1. Has an Existing Resource and Site Analysis Map (ERSAM) been prepared?  
 Yes  No, Explain \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

2. Are any of the following environmentally sensitive areas identified on site?

- |                               |                              |                             |                                  |
|-------------------------------|------------------------------|-----------------------------|----------------------------------|
| Steep Slopes                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Ponds / Lakes / Vernal Pools  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Streams                       | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Wetlands                      | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Hydric Soils                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Flood plains                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Stream Buffer Zones           | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Hydrologic Soil Groups A or B | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Recharge Areas                | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |
| Others: _____                 | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Unknown |

3. Does the site layout plan avoid environmentally sensitive areas identified on site?

- Yes    No, Explain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**B. Post-development Runoff Volume Control**

1. What method is used to calculate the required volume control?

- Design-storm method    Simplified method

2. What is the level of runoff volume (ft<sup>3</sup>) required to be controlled from the post-development site?  
\_\_\_\_\_ (ft<sup>3</sup>)

**C. Stormwater runoff control measures**

1. What is the level of runoff volume (ft<sup>3</sup>) controlled through nonstructural BMPs? \_\_\_\_\_ (ft<sup>3</sup>)

2. What is the level of runoff volume (ft<sup>3</sup>) controlled through structural BMPs? \_\_\_\_\_ (ft<sup>3</sup>)

3. Have provisions been installed to promote infiltration on site?

- Yes    No, Explain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Have provisions been installed to promote evapotranspiration, capture or reuse on site?

- Yes    No, Explain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_

SECTION V: PEAK RATES

Reference: Section 304

1. In which of the following Storm Water Management District(s) is the site located?

|                          |   |
|--------------------------|---|
| <input type="checkbox"/> | A |
| <input type="checkbox"/> | B |
| <input type="checkbox"/> | C |

2. Does the Proposed Conditions Runoff meet the Criteria established in Table 304.1?

Yes  No, if you answered Yes proceed to Section VI.

---

SECTION VI: CALCULATION METHODOLOGY

Reference: Section 305 and Ordinance Appendix B

1. Which method(s) are utilized in the site stormwater management plan for computing stormwater runoff rates and volumes?

- |  |  |
|--|--|
| <input type="checkbox"/> TR-20           | <input type="checkbox"/> PSRM            |
| <input type="checkbox"/> TR-55           | <input type="checkbox"/> Rational Method |
| <input type="checkbox"/> HEC-1 / HEC-HMS | <input type="checkbox"/> Other: _____    |

2. Was Table B-1 or Figure B-1 utilized in rainfall determination?

Yes  No, Explain \_\_\_\_\_

---

---

3. Was Table B-4 (Runoff Curve Numbers) or Table B-7 (Rational Runoff Coefficients) utilized in calculations for runoff?

Yes  No, Explain \_\_\_\_\_

---

---

---

SECTION IX: OTHER REQUIREMENTS

Reference: Section 306

1. Is the proposed activity considered a "Stormwater hot spot" as defined in Ordinance Appendix G?  
 Yes  No, If yes, what pre-treatment BMPs are planned?
- 

2. Have proposed wet detention basins incorporated biologic control consistent with the West Nile Virus Guidelines presented in Ordinance Appendix G?

Yes    No    Not Applicable

---

**SECTION X: FACILITY OPERATION AND MAINTENANCE PLAN**

Reference: Section 702

1. Has a Stormwater Control and BMP Operations and Maintenance Plan been approved by the Municipality?

Yes    No, Explain \_\_\_\_\_

---

2. Who shall assume responsibility for implementing the Stormwater Control and BMP Operations and Maintenance Plan?

|  |  |
|--|--|
| <input type="checkbox"/> Municipality  | <input type="checkbox"/> Homeowner Association |
| <input type="checkbox"/> Private Owner | <input type="checkbox"/> Other _____           |

**APPENDIX D. MAPS OF MANAGEMENT DISTRICTS**

NESHAMINY CREEK  
STORMWATER MANAGEMENT PLAN  
PHASE II STUDY

APPENDIX D  
MANAGEMENT  
DISTRICTS

Legend

- MANAGEMENT DISTRICTS
- SUBAREAS
- STREAMS
- WATER BODIES
- COUNTY BOUNDARY
- MUNICIPAL BOUNDARY
- ROADS**
- Interstate
- US Federal Highway
- PA State Route
- Other State Road

Prepared For:  
Bucks County Planning Commission  
The Almshouse  
Neshaminy Manor  
Doylestown, PA

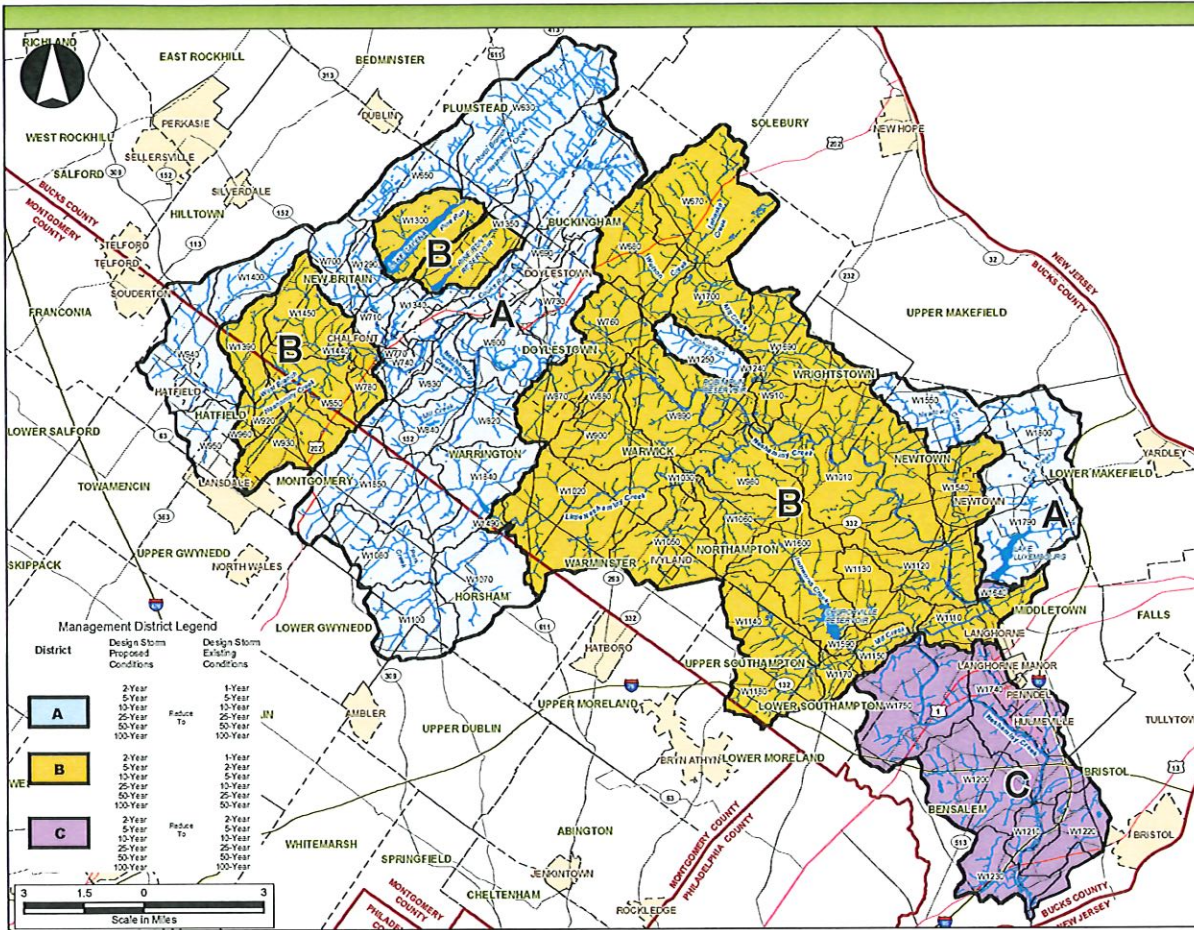
**NOTES:**  
Portions of this map were generated from the existing data sources as listed below. These existing data sources were utilized for base mapping purposes and are shown for spatial reference only. These data sources did not enter into any computations or affect the reliability of the hydrological analyses. Borton-Lawson Engineering has found some inaccuracies in some of these data sources and has corrected the data where these discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the base data.

**DATA SOURCES:**  
Watershed boundary, PA DEP, updated by B.E. Municipal and County Boundaries, PENNDOT  
Roads, PENNDOT  
Streams, Waters and Wetlands County Planning Commission  
Water Bodies, Derived from the Streams Data Management Office and B. E. Lawson Engineering, B.E.

**Acronyms:**  
PENNDOT - Pennsylvania Department of Transportation  
PA DEP - Pennsylvania Department of Environmental Protection  
B.E. - Borton Lawson Engineering

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Tel: 570-821-1999  
Lehigh Valley  
3033 Acers Place  
Bethlehem, PA 18017  
Tel: 484-821-0470

PREPARED BY: WES DATE: 12/15/2006 CHECKED BY: PROJECT NO.: 2003-1412-00



NESHAMINY CREEK  
STORMWATER MANAGEMENT PLAN  
PHASE II STUDY

APPENDIX D1  
MANAGEMENT  
DISTRICTS

- Legend**
- MANAGEMENT DISTRICTS
  - SUBAREAS
  - STREAMS
  - WATER BODIES
  - COUNTY BOUNDARY
  - MUNICIPAL BOUNDARY
  - ROADS**
  - Interstate
  - US Federal Highway
  - PA State Route
  - Other State Road

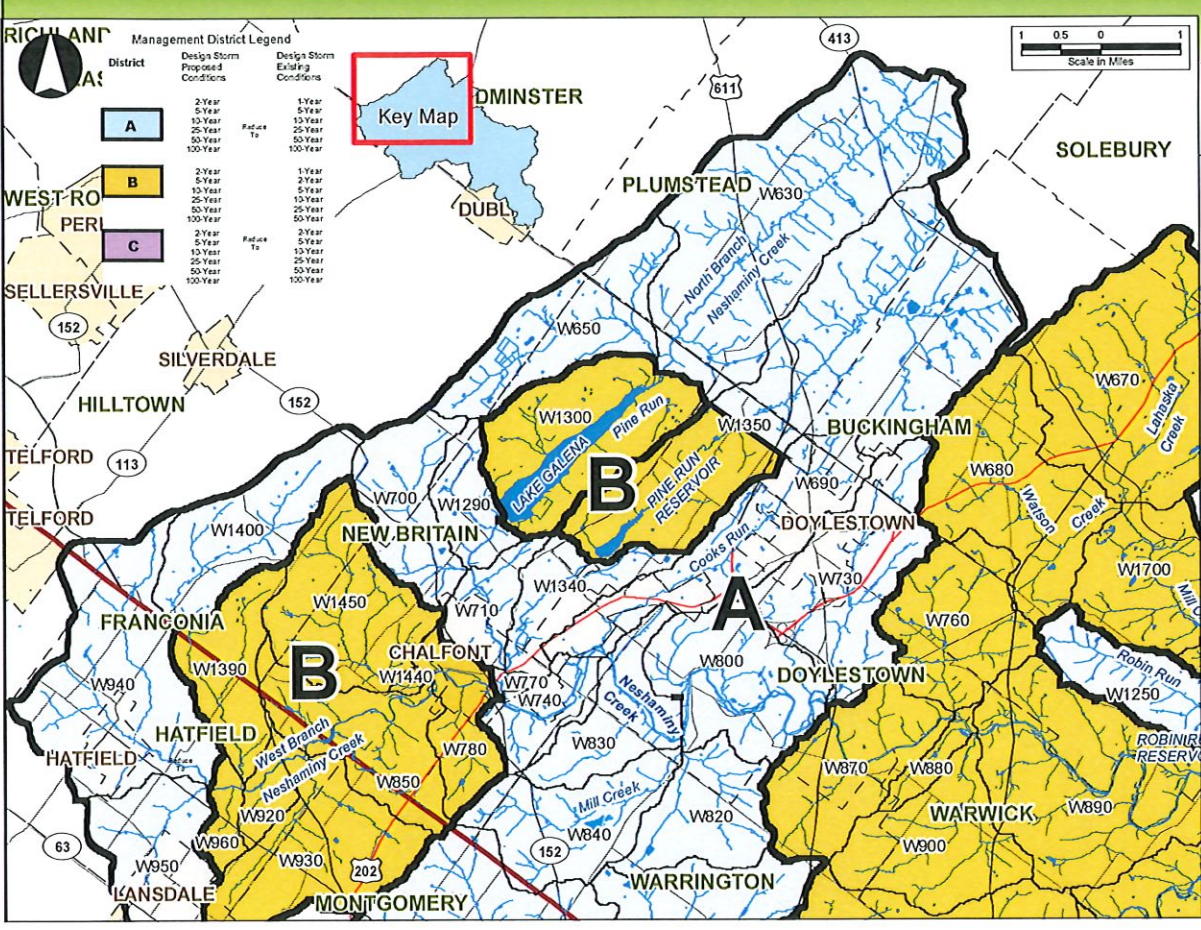
Prepared For:  
Bucks County Planning Commission  
The Almshouse  
Neshaminy Manor  
Doylestown, PA

**NOTES:**  
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**DATA SOURCES:**  
Unincorporated Boundary - PA DEP Updated by BLE  
Municipal and County Boundaries - PennDOT  
Roads - PennDOT  
Streams - Bucks and Montgomery County Planning Commission  
Water Bodies - Derived from the Streams Data Management Database and Subarea Database by BLE

Approved:  
PennDOT - Pennsylvania Department of Transportation  
PA DEP - Pennsylvania Department of Environmental Protection  
BLE - Borton Lawson Engineering

Prepared By: WEB  
Date: 12/15/2006  
Checked By:  
Project No.: 2003-1412-00



**Management District Legend**

| District | Design Storm Proposed Conditions                              | Design Storm Existing Conditions  |
|----------|---|---|
| A        | 2 Year<br>5 Year<br>10 Year<br>25 Year<br>50 Year<br>100 Year | 1 Year<br>2 Year<br>5 Year<br>10 Year<br>25 Year<br>50 Year<br>100 Year |
| B        | 2 Year<br>5 Year<br>10 Year<br>25 Year<br>50 Year<br>100 Year | 3 Year<br>5 Year<br>10 Year<br>25 Year<br>50 Year<br>100 Year           |
| C        | 2 Year<br>5 Year<br>10 Year<br>25 Year<br>50 Year<br>100 Year | 3 Year<br>5 Year<br>10 Year<br>25 Year<br>50 Year<br>100 Year           |

**Neighborhoods:** RICHLAND, WEST ROYAL, PERKIOMANS, SELLSVILLE, HILLTOWN, TELFORD, FRANCONIA, HATFIELD, LANSDALE, MONTGOMERY, WARRINGTON, WARWICK, DOYLESTOWN, BUCKINGHAM, SOLEBURY, PLUMSTEAD, DUBLIN, MINSTER.

**Water Bodies:** LAKE GALENA, PINE RUN RESERVOIR, ROBINER RESERVOIR.

**Roads:** 63, 113, 152, 202, 413, 611, 811, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000.



NESHAMINY CREEK  
STORMWATER MANAGEMENT PLAN  
PHASE II STUDY

APPENDIX D2  
MANAGEMENT  
DISTRICTS

- Legend**
- MANAGEMENT DISTRICTS
  - SUBAREAS
  - STREAMS
  - WATER BODIES
  - COUNTY BOUNDARY
  - MUNICIPAL BOUNDARY
- ROADS**
- Interstate
  - US Federal Highway
  - PA State Route
  - Other State Road

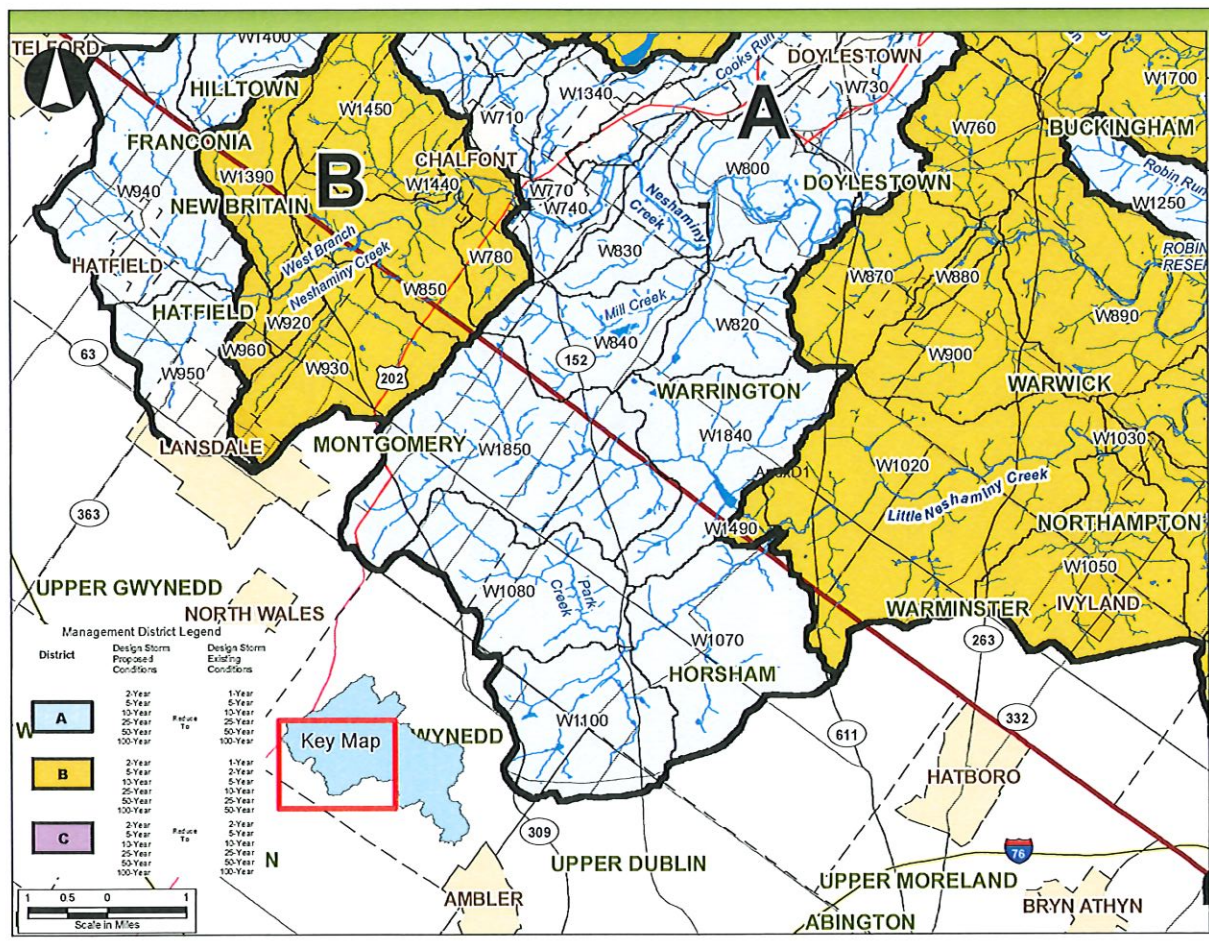
Prepared For:  
Bucks County Planning Commission  
The Alphonse  
Neshaminy Manor  
Doylestown, PA

**NOTES:**  
Portions of this map were generated from the existing data sources as listed below. These existing data sources were utilized for base mapping purposes and are shown for spatial reference only. These data sources did not enter into any computations or affect the reliability of the hydrological analyses. Barton-Lawson Engineering has found some inaccuracies in some of these data sources and has corrected the data where these discrepancies were obvious, however it was not a part of this ACT 167 Plan to correct all of the data.

**DATA SOURCES**  
National Boundary - PACER Updated by BUE  
Municipal and County Boundaries - PACER  
Roads - PACER  
Streams - Bucks and Montgomery County Planning Commission  
Water Bodies - Derived from the Stream Data Management Districts and Subareas Collected by BUE

Anonymous  
PACER - Pennsylvania Department of Transportation  
PACER - Pennsylvania Department of Environmental Protection  
BUE - Barton-Lawson Engineering

Prepared By: VEB  
DATE: 12/5/2006  
Checked By:  
PROJECT NO.: 2003-1412-02



**UPPER GWYNEDD  
NORTH WALES**

Management District Legend

| District | Design Storm Proposed Conditions                              | Design Storm Existing Conditions                              |
|----------|---|---|
| <b>A</b> | 2-Year<br>5-Year<br>10-Year<br>25-Year<br>50-Year<br>100-Year | 1-Year<br>5-Year<br>10-Year<br>25-Year<br>50-Year<br>100-Year |
| <b>B</b> | 2-Year<br>5-Year<br>10-Year<br>25-Year<br>50-Year<br>100-Year | 1-Year<br>5-Year<br>10-Year<br>25-Year<br>50-Year<br>100-Year |
| <b>C</b> | 2-Year<br>5-Year<br>10-Year<br>25-Year<br>50-Year<br>100-Year | 1-Year<br>5-Year<br>10-Year<br>25-Year<br>50-Year<br>100-Year |

Scale in Miles: 1 0.5 0 1

NESHAMINY CREEK  
STORMWATER MANAGEMENT PLAN  
PHASE II STUDY

APPENDIX D3  
MANAGEMENT  
DISTRICTS

Legend

- MANAGEMENT DISTRICTS
- SUBAREAS
- STREAMS
- WATER BODIES
- COUNTY BOUNDARY
- MUNICIPAL BOUNDARY
- ROADS**
- Interstate
- US Federal Highway
- PA State Route
- Other State Road

Prepared For:  
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The Administration  
Neshaminy Manor  
Doylestown, PA

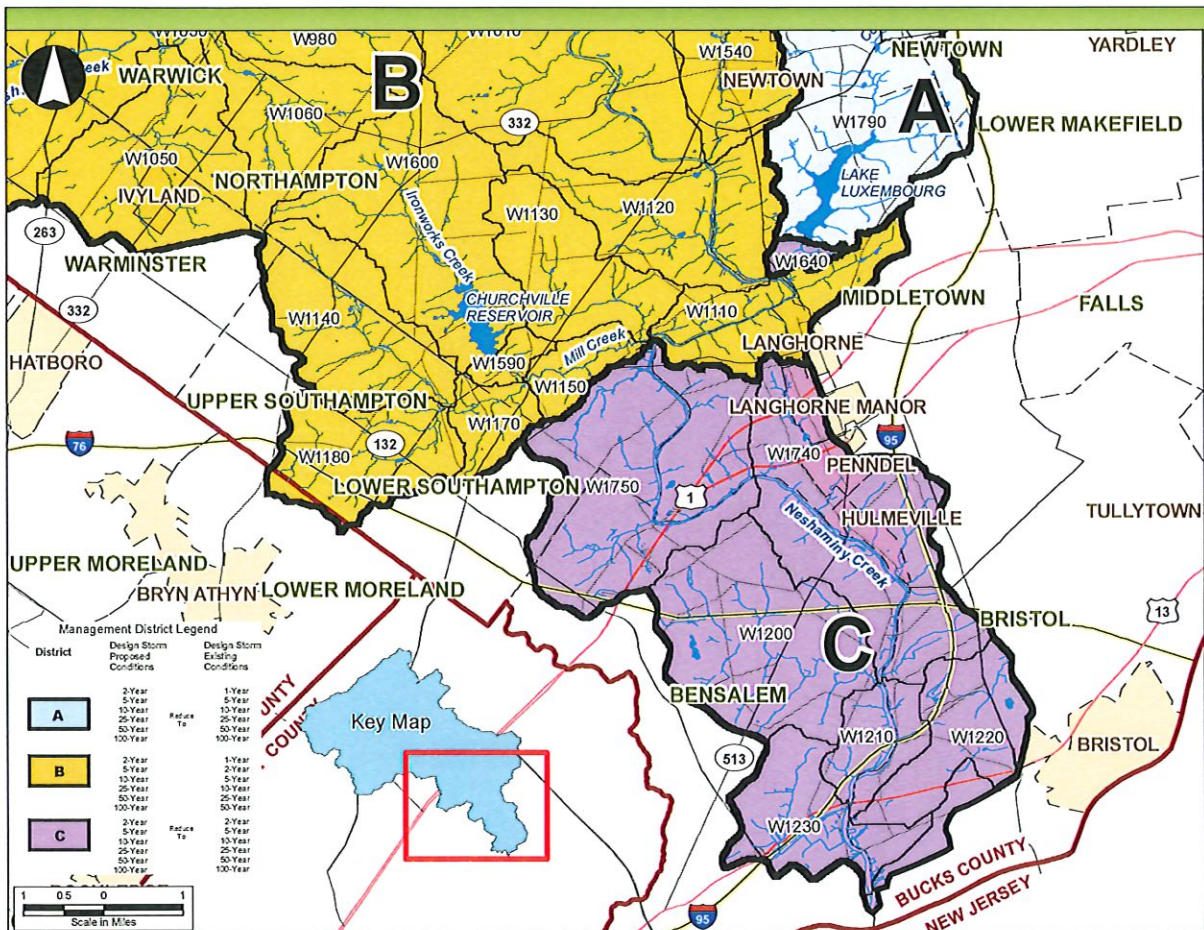
NOTES:  
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DATA SOURCES:  
Watershed Boundary - PA DEP updated by BLE  
Municipal and County Boundaries - PennDOT  
Roads - PennDOT  
Streams - Bucks and Montgomery County Planning Commission  
Water Bodies - Obtained from the Stream Data Management Database and Subareas Defined by BLE

Authoring:  
PennDOT - Pennsylvania Department of Transportation  
PA DEP - Pennsylvania Department of Environmental Protection  
BLE - Bortons-Lawson Engineering

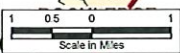
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PREPARED BY: VAS      CHECKED BY:  
DATE: 12/9/2006      PROJECT NO.: 2003-1412-00



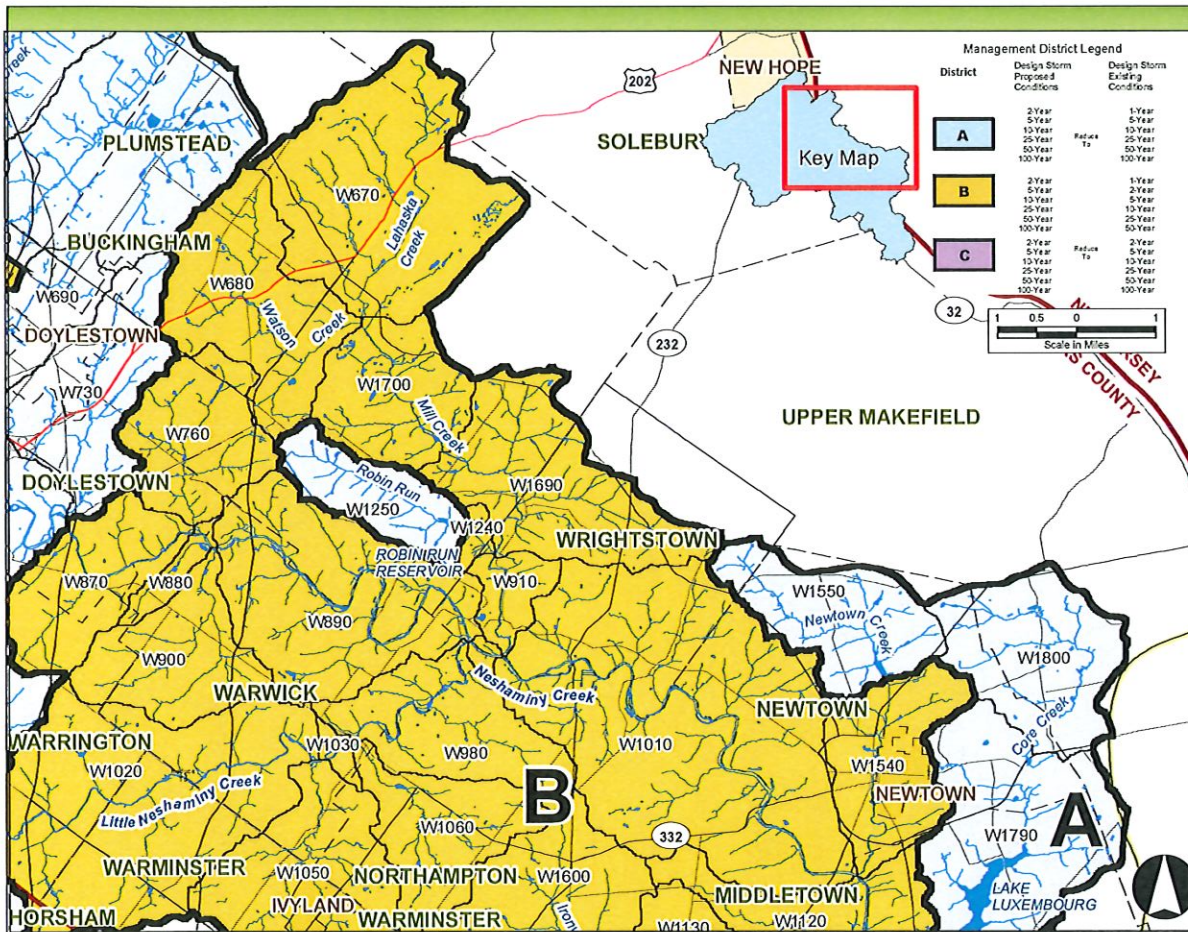
Management District Legend

| District | Design Storm Proposed Conditions | Design Storm Existing Conditions |
|----------|----------------------------------|----------------------------------|
| A        | 2-Year                           | 1-Year                           |
|          | 5-Year                           | 5-Year                           |
|          | 10-Year                          | 10-Year                          |
|          | 25-Year                          | 25-Year                          |
|          | 50-Year                          | 50-Year                          |
| B        | 2-Year                           | 2-Year                           |
|          | 5-Year                           | 5-Year                           |
|          | 10-Year                          | 10-Year                          |
|          | 25-Year                          | 25-Year                          |
|          | 50-Year                          | 50-Year                          |
| C        | 2-Year                           | 2-Year                           |
|          | 5-Year                           | 5-Year                           |
|          | 10-Year                          | 10-Year                          |
|          | 25-Year                          | 25-Year                          |
|          | 50-Year                          | 50-Year                          |



NESHAMINY CREEK  
STORMWATER MANAGEMENT PLAN  
PHASE II STUDY

APPENDIX D4  
MANAGEMENT  
DISTRICTS



Prepared For:  
Bucks County Planning Commission  
The Almshouse  
Neshaminy Manor  
Doylestown, PA

**NOTES:**  
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**DATA SOURCES**  
National Boundary - PACIR, Updated by B.L.E. Municipal and County Boundaries - FeriDOT  
Streams - Bucks and Montgomery County Planning Commission  
Subarea - FeriDOT  
Water Bodies - Derived from the Stream Data Management Districts and Subareas Defined by B.L.E.

**Analysis:**  
FeriDOT - Pennsylvania Department of Transportation  
PADEP - Pennsylvania Department of Environmental Protection  
B.L.E. - Barton-Lawson Engineering

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PREPARED BY: WJB DATE: 12/15/2006 CHECKED BY: PROJECT NO.: 2003-1412-00

## APPENDIX E: LOW IMPACT DEVELOPMENT (LID) PRACTICES

### ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

Natural hydrologic conditions can be altered radically by poorly planned development practices, such as introducing unnecessary impervious surfaces, destroying existing drainage swales, constructing unnecessary storm sewers, and changing local topography. A traditional drainage approach of development has been to remove runoff from a site as quickly as possible and capture it in a detention basin. This approach leads ultimately to the degradation of water quality as well as expenditure of additional resources for detaining and managing concentrated runoff at some downstream location.

The recommended alternative approach is to promote practices that will minimize post-development runoff rates and volumes and will minimize needs for artificial conveyance and storage facilities. To simulate predevelopment hydrologic conditions, infiltration is often necessary to offset the loss of infiltration by the creation of impervious surfaces. Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. A well-designed site will contain a mix of all those features.

Sometimes regulations create obstacles for an applicant interested in implementing low impact development techniques on their site. A municipality should consider examining their ordinances and amending the sections which limit LID techniques. For example, a municipality could remove parking space minimums and establish parking space maximums to reduce the area of impervious surface required. Other allowable regulations to promote LID includes permitting curb cuts or wheel stops instead of requiring curbs and allowing sumped landscaping where the runoff can drain instead of requiring raised beds. These small changes to ordinances can remove the barriers which prevent applicants from pursuing LID practices.

The following describes various LID techniques:

1. **Protect Sensitive and Special Value Resources:** See Section 5.4 of the *Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006)*.

- a. **Preserving Natural Drainage Features.** Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. However, this objective is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern—streets and adjacent storm sewers are typically located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or

filtration. Developments designed to fit site topography also minimizes the amount of grading on site.

- b. **Protecting Natural Depression Storage Areas.** Depressional storage areas either have no surface outlet or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filling or draining, thereby obliterating their ability to reduce surface runoff volumes and trap pollutants. The volume and release rate characteristics of depressions should be protected in the design of the development site. The depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

2. **Reduce Impervious Coverage:** See Section 5.7 of the *Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006)*.

- a. **Avoiding Introduction of Impervious Areas.** Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways, and other features producing impervious surfaces should be evaluated to minimize impacts of runoff.
- b. **Disconnecting Impervious Surfaces (DIA's):** Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff, and should help reduce concentration of runoff to a single point in the development. (See Ordinance Appendix F for additional description)
- c. **Reducing Street Widths.** Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. Municipal planners and traffic designers should encourage narrower neighborhood streets which ultimately could lower maintenance.
- d. **Limiting Sidewalks to One Side of the Street.** A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines. Where appropriate, backyard trails should be constructed using pervious materials.
- e. **Reducing Building Setbacks.** Reducing building setbacks reduces impervious cover associated with driveway and entry walks and is most readily accomplished along low-traffic streets where traffic noise is not a problem.

3. **Disconnect/Distribute/Decentralize:** See Section 5.8 of the *Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006)*.
  - a. **Routing Roof Runoff Over Lawns.** Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connections of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.
  - b. **Reducing the Use of Storm Sewers.** By reducing use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical for some development sites, especially if there are concerns for areas that do not drain in a “reasonable” time. The practice requires educating local citizens and public works officials, who expect runoff to disappear shortly after a rainfall event.
4. **Cluster and Concentrate:** See Section 5.5 of the *Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006)*. Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings occurs with street length, which also will reduce costs of the development. Cluster development “clusters” the construction activity onto less sensitive areas without substantially affecting the gross density of development.

In summary, a careful consideration of the existing topography and implementation of a combination of the above mentioned techniques may avoid construction of costly stormwater control measures. Benefits include reduced potential of downstream flooding, water quality improvement of receiving streams/water bodies and enhancement of aesthetics and reduction of development costs. Other benefits include more stable baseflows in receiving streams, improved groundwater recharge, reduced flood flows, reduced pollutant loads, and reduced costs for conveyance and storage.

## APPENDIX F: DISCONNECTED IMPERVIOUS AREA (DIA)

### ROOFTOP DISCONNECTION

When rooftop downspouts are directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the rooftop may qualify as completely or partially DIA and a portion of the impervious rooftop area may be excluded from the calculation of total impervious area.

A rooftop is considered to be completely or partially disconnected if it meets the requirements listed below:

- The contributing area of a rooftop to each disconnected discharge is 500 square feet or less, and
- The soil, in proximity of the roof water discharge area, is not designated as hydrologic soil group “D” or equivalent, and
- The overland flow path from roof water discharge area has a positive slope of 5% or less.

For designs that meet these requirements, the portion of the roof that may be considered disconnected depends on the length of the overland path as designated in Table F.1.

**Table F.1: Partial Rooftop Disconnection**

| <b>Length of Pervious Flow Path *</b><br>(ft) | <b>Roof Area Treated as Disconnected</b><br>(% of contributing area) |
|---|--|
| 0 – 14  | 0  |
| 15 – 29                                       | 20   |
| 30 – 44                                       | 40   |
| 45 – 59                                       | 60   |
| 60 – 74                                       | 80   |
| 75 or more                                    | 100  |

\* Flow path cannot include impervious surfaces and must be at least 15 feet from any impervious surfaces.

If the discharge is concentrated at one or more discrete points, no more than 1,000 square feet may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the edge of the pavement, this requirement is waived; however, there must be a provision for the establishment of vegetation along the pavement edge and temporary stabilization of the area until vegetation becomes stabilized.

#### REFERENCE

Philadelphia Water Department. 2006. *Stormwater Management Guidance Manual*. Section 4.2.2: Integrated Site Design. Philadelphia, PA.

## APPENDIX G: SMALL PROJECT STORMWATER MANAGEMENT (SWM) SITE PLAN

This Small Project SWM Site Plan is included as an option for municipalities to adopt to give small regulated activities the opportunity to submit a non-engineered stormwater management plan. The requirements of this site plan alternative are consistent with the volume control requirements of the *Neshaminy Creek Watershed Stormwater Management Plan (SMP)*. The Bucks County Planning Commission recommends that this site plan be applied only to residential development activities proposing less than or equal to 5,000 square feet of impervious surface and less than 1 acre of earth disturbance. These recommendations are the result of a multi-municipal roundtable discussion and guidance from PADEP and the Bucks and Montgomery County Conservation Districts. The following table is an example of how the exemption criteria of the Neshaminy Creek Watershed SMP Model Ordinance could change as the result of adopting this site plan alternative into the municipal stormwater management regulations.

| Ordinance Article or Section                                 | Type of Project  | Proposed Impervious Surface |  |                 |
|--|--|-----------------------------|--|-----------------|
|  |  | 0 – 1,000 sq. ft.           | 1,001 – 5,000 sq. ft.                    | 5,000 + sq. ft. |
| §23-402, SWM Site Plan Requirements                          | All Development  | Exempt                      | Not Exempt (except residential activity) | Not Exempt      |
| Appendix 23-G, Non-engineered Small Project Site Plan        | Only Residential Development Applicable  | Exempt                      | Applicable                               | Exempt          |
| §23-304, Volume Control Requirements                         | All Development  | Not Exempt                  | Not Exempt                               | Not Exempt      |
| §23-305, Peak Rate Control Requirements                      | All Development  | Exempt                      | Exempt                                   | Not Exempt      |
| §23-303, Erosion and Sediment Pollution Control Requirements | Must comply with Title 25, Chapter 102 of the PA Code and any other applicable state, county and municipal codes. PADEP requires an engineered post-construction SWM Plan with projects proposing earth disturbance greater than 1 acre. |                             |  |                 |



## Small Project Stormwater Management Site Plan

This small project stormwater site plan has been developed to assist those proposing residential projects to meet the requirements of the *Neshaminy Creek Watershed Stormwater Management Plan* Model Ordinance without having to hire professional services to draft a formal stormwater management plan. This small project site plan is only permitted for residential projects proposing less than or equal to 5,000 square feet of impervious surface and less than 1 acre of earth disturbance.

### A. What is an applicant required to submit?

A brief description of the proposed stormwater facilities, including types of materials to be used, total square footage of proposed impervious areas, volume calculations, and a simple sketch plan showing the following information:

- Location of proposed structures, driveways, or other paved areas with approximate surface area in square feet.
- Location of any existing or proposed onsite septic system and/or potable water wells showing proximity to infiltration facilities.
- Bucks or Montgomery County Conservation District erosion and sediment control “Adequacy” letter as required by Municipal, County or State regulations.

### B. Determination of Required Volume Control and Sizing Stormwater Facilities

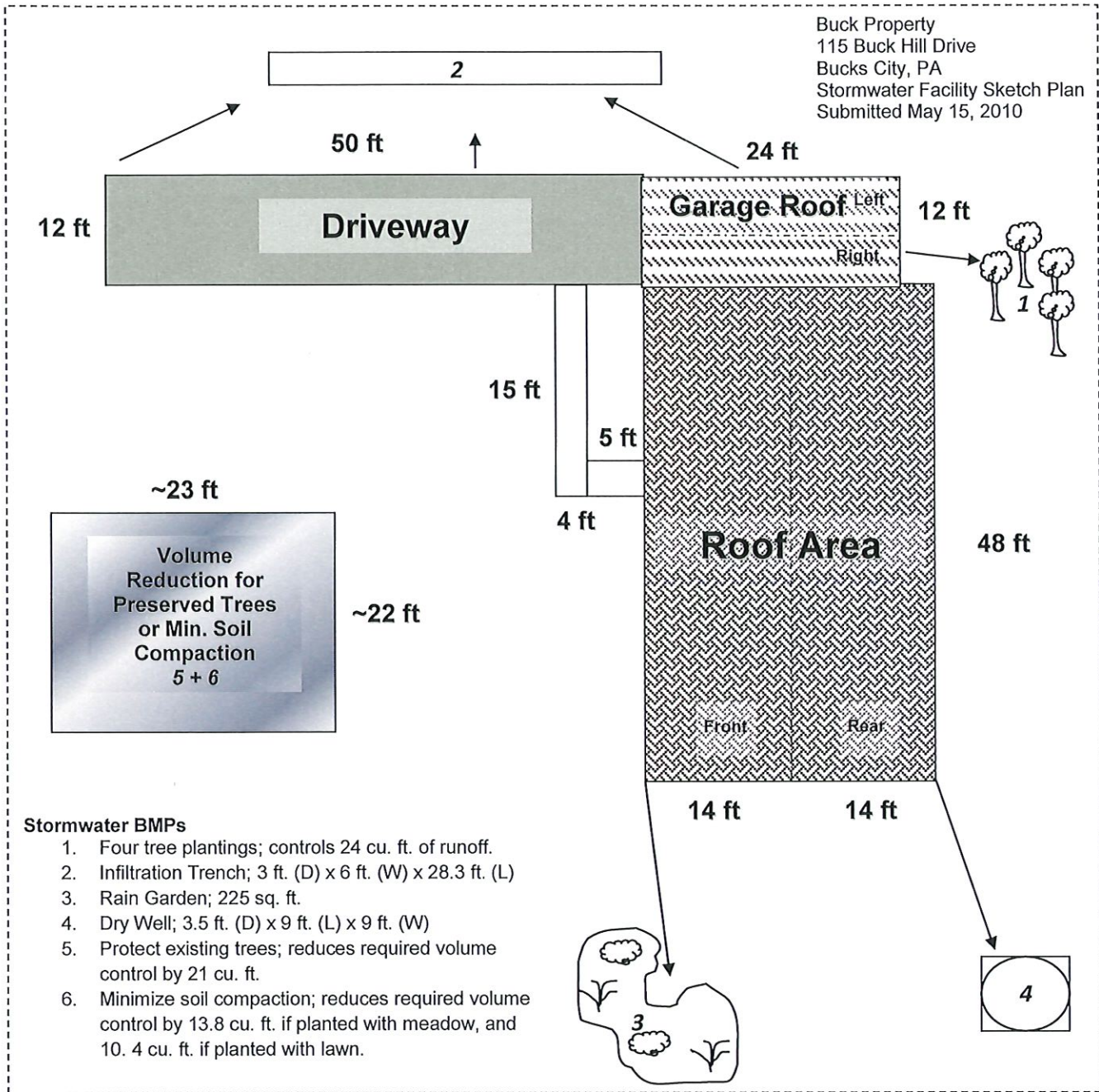
By following the simple steps outlined below in the provided example, an applicant can determine the runoff volume that is required to be controlled and how to choose the appropriate stormwater facility to permanently remove the runoff volume from the site. Impervious area calculations must include all areas on the lot proposed to be covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including impervious surfaces such as sidewalks, driveways, parking areas, patios or swimming pools. Sidewalks, driveways or patios that are designed and constructed to allow for infiltration are not included in this calculation.

#### Site Plan Example: Controlling runoff volume from a proposed home site

##### Step 1: Determine Total Impervious Surfaces

| Impervious Surface  |                     |   | Area (sq. ft.) |
|---------------------|---------------------|---|----------------|
| House Roof (Front)  | 14 ft. x 48 ft.     | = | 672 sq. ft.    |
| House Roof (Rear)   | 14 ft. x 48 ft.     | = | 672 sq. ft.    |
| Garage Roof (Left)  | 6ft. x 24 ft.       | = | 144 sq. ft.    |
| Garage Roof (Right) | 6 ft. x 24 ft.      | = | 144 sq. ft.    |
| Driveway            | 12 ft. x 50 ft.     | = | 1000 sq. ft.   |
| Walkway             | 4 ft. x 20 ft.      | = | 80 sq. ft.     |
|                     |                     |   | -----          |
|                     | Total<br>Impervious |   | 3000 sq ft     |

Figure 1: Sample Site Sketch Plan



**Step 2: Determine Required Volume Control (cubic feet) using the following equation:**

Volume (cu. ft.) = (Total impervious area in square feet x 2 inches of runoff) /12 inches

$$(3,000 \text{ sq. ft.} \times 2 \text{ inches of runoff}) /12 \text{ inches} = 500 \text{ cu. ft.}$$

**Step 3: Sizing the Selected Volume Control BMP**

Several Best Management Practices (BMPs), as described below, are suitable for small stormwater management projects. However, their application depends on the volume required to be controlled, how much land is available, and the site constraints. Proposed residential development activities can apply both non-structural and structural BMPs to control the volume of runoff from the site. A number of different volume control BMPs are described below. Note that Figure 1 is an example of how these BMPs can be utilized in conjunction to control the total required volume on one site.

**Structural BMPs**

**1. Infiltration Trench**

An Infiltration Trench is a linear stormwater BMP consisting of a continuously perforated pipe at a minimum slope in a stone-filled trench. During small storm events, infiltration trenches can significantly reduce volume and serve in the removal of fine sediments and pollutants. Runoff is stored between the stones and infiltrates through the bottom of the facility and into the soil matrix. Runoff should be pretreated using vegetative buffer strips or swales to limit the amount of coarse sediment entering the trench which can clog and render the trench ineffective. In all cases, an infiltration trench should be designed with a positive overflow.

**Design Considerations:**

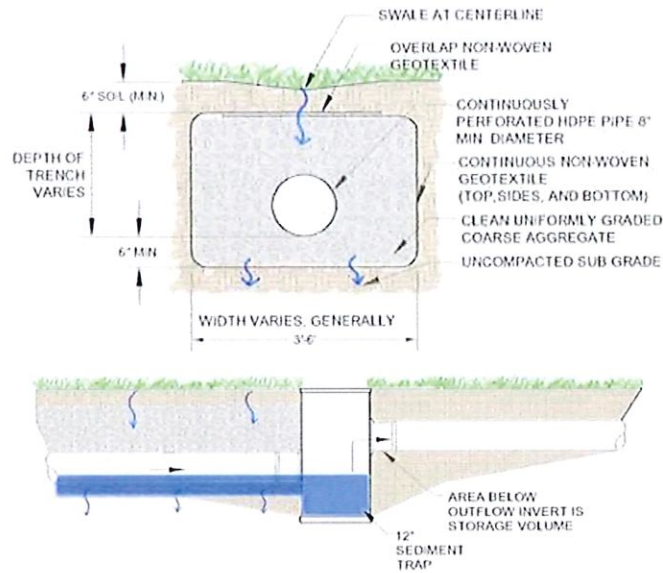
- Although the width and depth can vary, it is recommended that Infiltration Trenches be limited in depth to not more than six (6) feet of stone.
- Trench is wrapped in nonwoven geotextile (top, sides, and bottom).
- Trench needs to be placed on uncompacted soils.
- Slope of the Trench bottom should be level or with a slope no greater than 1%.
- A minimum of 6" of topsoil is placed over trench and vegetated.
- The discharge or overflow from the Infiltration Trench should be properly designed for anticipated flows.
- Cleanouts or inlets should be installed at both ends of the Infiltration Trench and at appropriate intervals to allow access to the perforated pipe.
- Volume of facility = Depth x Width x Length x Void Space of the gravel bed (assume 40%).

**Maintenance:**

- Catch basins and inlets should be inspected and cleaned at least two times a year.
- The vegetation along the surface of the infiltration trench should be maintained in good condition and any bare spots should be re-vegetated as soon as possible.

- Vehicles should not be parked or driven on the trench and care should be taken to avoid soil compaction by lawn mowers.

Figure 3: Infiltration Trench Diagram



Source: PA BMP Guidance Manual, Chapter 6, page 42.

Figure 4: Example of Infiltration Trench Installation



Source: PA BMP Guidance Manual, Chapter 6, Page 46.

## Sizing Example for Infiltration Trench

1. Determine Total Impervious Surface to drain to Infiltration Trench:

|                    |                 |   |            |
|--------------------|-----------------|---|------------|
| Garage Roof (Left) | 6 ft. x 24 ft.  | = | 144 sq ft  |
| Driveway           | 12 ft. x 50 ft. | = | 1000 sq ft |
| Walkway            | 4 ft. x 20 ft.  | = | 80 sq ft   |

2. Determine the required infiltration volume:

$$(1224 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ ft.} = 204 \text{ cu. ft.} / 0.4^* = 510 \text{ cu. ft.}$$

(\*0.4 assumes 40% void ratio in gravel bed)

3. Sizing the infiltration trench facility:

$$\text{Volume of Facility} = \text{Depth} \times \text{Width} \times \text{Length}$$

Set Depth to 3 feet and determine required surface area of trench.

$$510 \text{ cu. ft.} / 3 \text{ ft.} = 170 \text{ sq ft.}$$

The width of the trench should be greater than 2 times its depth ( $2 \times D$ ), therefore in this example the trench width of 6 feet selected.

$$\text{Determine trench length: } L = 170 \text{ sq. ft.} / 6 \text{ ft.} = 28.3 \text{ ft.}$$

*Final infiltration trench dimensions: 3 ft. (D) x 6 ft. (W) x 28.3 ft. (L)*

## 2. Rain Garden

A Rain Garden is a planted shallow depression designed to catch and filter rainfall runoff. The garden captures rain from a downspout or a paved surface. The water sinks into the ground, aided by deep rooted plants that like both wet and dry conditions. The ideal location for a rain garden is between the source of runoff (roofs and driveways) and the runoff destination (drains, stream, low spots, etc).

Design Considerations:

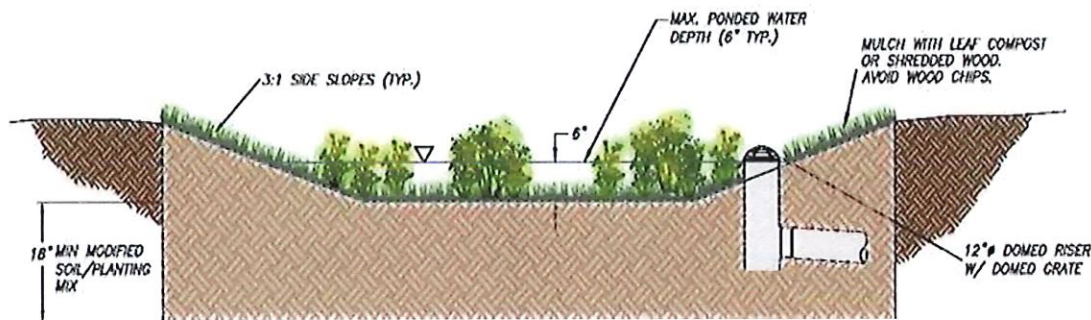
- A maximum of 3:1 side slope is recommended.
- The depth of a rain garden can range from 6 - 8 inches. Pondered water should not exceed 6 inches.
- The rain garden should drain within 72 hours.
- The garden should be at least 10-20 feet from a building's foundation and 25 feet from septic system drainfields and wellheads.
- If the site has clay soils, soil should be amended with compost or organic material.

- Choose native plants. See [http://pa.audubon.org/habitat/PDFs/RGBrochure\\_complete.pdf](http://pa.audubon.org/habitat/PDFs/RGBrochure_complete.pdf) for a native plant list. To find native plant sources go to [www.pawildflower.org](http://www.pawildflower.org).
- At the rain garden location, the water table should be at least 2' below the soil level. If water stands in an area for more than one day after a heavy rain you can assume it has a higher water table and is not a good choice for a rain garden.

Maintenance:

- Water plants regularly until they become established.
- Inspect twice a year for sediment buildup, erosion and vegetative conditions.
- Mulch with hardwood when erosion is evident and replenish annually.
- Prune and remove dead vegetation in the spring season.
- Weed as you would any garden.
- Move plants around if some plants would grow better in the drier or wetter parts of the garden.

Figure 5: Rain Garden Diagram



Source: PA BMP Guidance Manual, Chapter 6 Page 50

**Sizing Example for Rain Garden**

1. Pick a site for the rain garden between the source of runoff and between a low lying area, a.k.a., a drainage area.
2. Perform an infiltration test to determine the depth of the rain garden:
  - Dig a hole 8" x 8"
  - Fill with water and put a popsicle stick at the top of the water level.
  - Measure how far it drains down after a few hours (ideally 4).
  - Calculate the depth of water that will drain out over 24 hours.
3. Determine total impervious surface area to drain to rain garden:

|                    |                 |   |           |
|--------------------|-----------------|---|-----------|
| House Roof (Front) | 14 ft. x 48 ft. | = | 672 sq ft |
|--------------------|-----------------|---|-----------|

#### 4. Sizing the rain garden:

For this example the infiltration test determined 6" of water drained out of a hole in 24 hours. The depth of the rain garden should be set to the results of the infiltration test so 6" is the depth of the rain garden. The sizing calculation below is based on controlling 1" of runoff. First divide the impervious surface by the depth of the rain garden.

$$(672 \text{ sq ft} / 6 \text{ ft.}) = 112 \text{ sq. ft.}$$

In order to control 2" of runoff volume, the rain garden area needs to be multiplied by 2.

$$112 \text{ sq. ft.} * 2 = 224 \text{ sq. ft.}$$

*The rain garden should be about 225 sq. ft. in size and 6" deep.*

### 3. Dry Well (a.k.a., Seepage Pit)

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. By capturing runoff at the source, Dry Wells can dramatically reduce the increased volume of stormwater generated by 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 a larger infiltration are, etc.) will ensure that additional runoff is safely conveyed downstream.

#### Design Considerations:

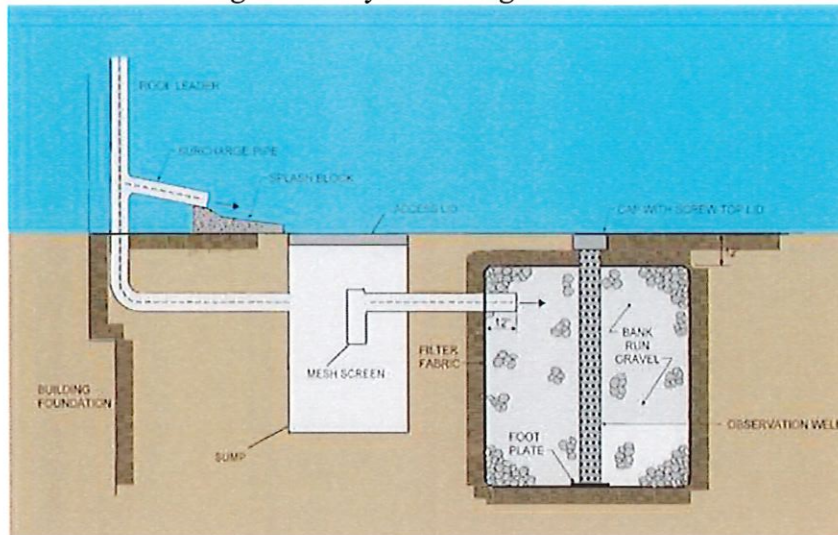
- Dry Wells typically consist of 18 to 48 inches of clean washed, uniformly graded aggregate with 40% void capacity (AASHTO No. 3, or similar). "Clean" gravel fill should average one and one-half to three (1.5 – 3.0) inches in diameter.
- Dry Wells are not recommended when their installation would create a significant risk for basement seepage or flooding. In general, 10 - 20 feet of separation is recommended between Dry Wells and building foundations.
- The facility may be either a structural prefabricated chamber or an excavated pit filled with aggregate.
- Depth of dry wells in excess of three-and-a-half (3.5) feet should be avoided unless warranted by soil conditions.
- Stormwater dry wells must never be combined with existing, rehabilitated, or new septic system seepage pits. Discharge of sewage to stormwater dry wells is strictly prohibited.

#### Maintenance:

- Dry wells should be inspected at least four (4) times annually as well as after large storm events.
- Remove sediment, debris/trash, and any other waste material from a dry well.
- Regularly clean out gutters and ensure proper connections to the dry well.

- Replace the filter screen that intercepts the roof runoff as necessary.

Figure 6: Dry Well Diagram



Source: PA BMP Guidance Manual, Chapter 6, Page 65.

### Sizing Example for Dry Wells:

1. Determine contributing impervious surface area:

|                   |                 |   |             |
|-------------------|-----------------|---|-------------|
| House Roof (Rear) | 14 ft. x 48 ft. | = | 672 sq. ft. |
|-------------------|-----------------|---|-------------|

2. Determine required volume control:

$$(672 \text{ sq. ft.} * 2 \text{ inches of runoff}) / 12 \text{ inches} = 112 \text{ cu. ft.}$$

$$112 \text{ cu ft} / 0.4 = 280 \text{ cu. ft. (assuming the 40% void ratio in the gravel bed)}$$

3. Sizing the dry well:

Set depth to 3.5 ft; Set width equal to length for a square chamber.

$$280 \text{ cu. ft.} = 3.5 \text{ ft.} \times L \times L; L = 9 \text{ ft.}$$

$$\text{Dimensions} = 3.5 \text{ ft. (D)} \times 9 \text{ ft. (L)} \times 9 \text{ ft. (W)}$$



## Non-Structural BMPs

### 1. Tree Plantings and Preservation

Trees and forests reduce stormwater runoff by capturing and storing rainfall in the canopy and releasing water into the atmosphere through evapotranspiration. Tree roots and leaf litter also create soil conditions that promote the infiltration of rainwater into the soil. In addition, trees and forests reduce pollutants by taking up nutrients and other pollutants from soils and water through their root systems. A development site can reduce runoff volume by planting new trees or by preserving trees which existed on the site prior to development. The volume reduction calculations either determine the cubic feet to be directed to the area under the tree canopy for infiltration or determine a volume reduction credit which can be used to reduce the size of any one of the planned structural BMPs on the site.

#### Tree Considerations:

- Existing trees must have at least a 4" trunk caliper or larger.
- Existing tree canopy must be within 100 ft. of impervious surfaces.
- A tree canopy is classified as the continuous cover of branches and foliage formed by a single tree or collectively by the crowns of adjacent trees.
- New tree plantings must be at least 6 ft. in height and have a 2" trunk caliper.
- All existing and newly planted trees must be native to Pennsylvania. See <http://www.dcnr.state.pa.us/forestry/commontr/commontrees.pdf> for a guide book titled *Common Trees of Pennsylvania* for a native tree list.
- When using trees as volume control BMPs, runoff from impervious areas should be directed to drain under the tree canopy.

Determining the required number of planted trees to reduce the runoff volume:

1. Determine contributing impervious surface area:

|                     |                |   |        |
|---------------------|----------------|---|--------|
| Garage Roof (Right) | 6 ft. x 24 ft. | = | 144 ft |
|---------------------|----------------|---|--------|

2. Calculate the required control volume:

$$(144 \text{ sq. ft.} \times 2 \text{ inches of runoff}) / 12 \text{ inches} = 24 \text{ cu. ft.}$$

3. Determine the number of tree plantings:

- A newly planted deciduous tree can reduce runoff volume by 6 cu. ft.
- A newly planted evergreen tree can reduce runoff volume by 10 cu. ft.

$$24 \text{ cu. ft.} / 6 \text{ cu. ft.} = 4 \text{ Deciduous Trees}$$

Determining the volume reduction for preserving existing trees:

1. Calculate approximate area of the existing tree canopy:

~22 sq. ft. x ~23 sq. ft = 500 sq. ft.

2. Measure distance from impervious surface to tree canopy: 35 ft.
3. Calculate the volume reduction credit by preserving existing trees:

- For Trees within 20 feet of impervious cover:  
Volume Reduction cu. ft. = (Existing Tree Canopy sq. ft. x 1 inch) / 12
- For Trees beyond 20 feet but not farther than 100 feet from impervious cover:  
Volume Reduction cu. ft. = (Existing Tree Canopy sq. ft. x 0.5 inch) / 12

$$(500 \text{ sq. ft.} \times 0.5 \text{ inches}) / 12 = 21 \text{ cu. ft.}$$

This volume credit can be utilized in reducing the size of any one of the structural BMPs planned on the site. For example, the 21 cu. ft. could be subtracted from the required infiltration volume when sizing the infiltration trench;

$$510 \text{ cu. ft.} - 21 \text{ cu. ft.} = 489 \text{ cu. ft.}$$

$$489 \text{ cu. ft.} / 3 \text{ ft (Depth)} = 163 / 6 \text{ ft. (Width)} = 27.1 \text{ ft (Length)}$$

Using the existing trees for a volume credit would decrease the length of the infiltration trench to 27.1 ft. instead of 28.3 ft.

## 2. Minimize Soil Compaction and Replant with Lawn or Meadow

When soil is overly compacted during construction it can cause a drastic reduction in the permeability of the soil and rarely is the soil profile completely restored. Runoff from vegetative areas with highly compacted soils similarly resembles runoff from an impervious surface. Minimizing soil compaction and re-planting with a vegetative cover like meadow or lawn, not only increases the infiltration on the site, but also creates a friendly habitat for a variety of wildlife species.

Design Considerations:

- Area shall not be stripped of topsoil.
- Vehicle movement, storage, or equipment/material lay down shall not be permitted in areas preserved for minimum soil compaction.
- The use of soil amendments and additional topsoil is permitted.
- Meadow should be planted with native grasses. Refer to *Meadows and Prairies: Wildlife-Friendly Alternatives to Lawn* at <http://pubs.cas.psu.edu/FreePubs/pdfs/UH128.pdf> for reference on how to properly plant the meadow and for a list of native species.

Determining the volume reduction by minimizing soil compaction and planting a meadow:

1. Calculate approximate area of preserved meadow:

$$\sim 22 \text{ sq. ft.} \times \sim 23 \text{ sq. ft.} = 500 \text{ sq. ft.}$$

2. Calculate the volume reduction credit by minimizing the soil compaction and planting a lawn/meadow:

- For Meadow Areas: Volume Reduction (cu. ft.) = (Area of Min. Soil Compaction (sq. ft.) x 1/3 inch of runoff) / 12

$$(500 \text{ sq. ft.} \times 1/3 \text{ inch of runoff}) / 12 = 13.8 \text{ cu. ft.}$$

- For Lawn Areas: Volume Reduction (cu. ft.) = (Area of Min. Soil Compaction (sq. ft.) x 1/4 inch of runoff) / 12

$$(500 \text{ sq. ft.} \times 1/4 \text{ inch of runoff}) / 12 = 10.4 \text{ cu. ft.}$$

This volume credit can be used to reduce the size of any one of the structural BMPs on the site. See explanation under the volume credit for preserving existing trees for details.

### **Alternative BMP to Capture and Reuse Stormwater**

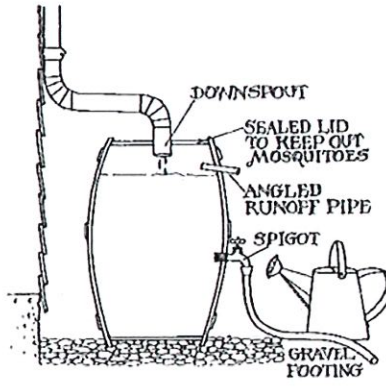
#### **Rain Barrels**

Rain barrels are large containers that collect drainage from roof leaders and temporarily store water to be released to lawns, gardens, and other landscaped areas after the rainfall has ended. Rain barrels are typically between 50 and 200 gallons in size. It is not recommended for rain barrels to be used as a volume control BMP because infiltration is not guaranteed after each storm event. For this reason, a rain barrel is not utilized in the site plan example. However, the information is included to provide an alternative for a homeowner to utilize when considering capture and reuse stormwater methods.

#### **Design Considerations:**

- Rain barrels should be directly connected to the roof gutter/spout.
- There must be a means to release the water stored between storm events to provide the necessary storage volume for the next storm.
- When calculating rain barrel size, rain barrels are typically assumed to be 25% full because they are not always emptied before the next storm.
- Use screens to filter debris and cover lids to prevent mosquitoes.
- An overflow outlet should be placed a few inches below the top with an overflow pipe to divert flow away from structures.
- It is possible to use a number of rain barrels jointly for an area.

Figure 2: Rain Barrel Diagram and Examples



Sources: (top picture) <http://www.citywindsor.ca/DisplayAttach.asp?AttachID=12348>  
 (bottom picture on left) <http://repurposinglife.blogspot.com/2009/05/rainwater-harvesting.html>  
 (bottom picture on right) <http://www.floridata.com/tracks/transplantedgardener/Rainbarrels.cfm>

### Sizing Example for a Rain Barrel

1. Determine contributing impervious surface area:

|                     |                |   |           |
|---------------------|----------------|---|-----------|
| Garage Roof (Right) | 6 ft. x 24 ft. | = | 144 sq ft |
|---------------------|----------------|---|-----------|

2. Determine the amount of rainfall to be captured by the Rain Barrel. A smaller storm, no more than 2", is recommended to calculate the runoff to be captured. This example chose the 1" storm event.

3. Calculate the volume to be captured and reused:

$$(144 \text{ sq. ft.} \times 1 \text{ inch of runoff}) / 12 \text{ inches} = 12 \text{ cu. ft.}$$

4. Size the rain barrel:

$$1 \text{ cu. ft.} = 7.48 \text{ gallons}$$

$$12 \text{ cu. ft.} \times 7.48 = 90 \text{ gallons}$$

$$90 \text{ gallons} \times (0.25^*) = 22.5 \text{ gallons} \text{ (*assuming that the rain barrel is always at least 25\% full)}$$

$$90 \text{ gallons} + 22.5 \text{ gallons} = 112 \text{ gallons}$$

*The rain barrel or barrels should be large enough hold at least 112 gallons of water.*

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## APPENDIX J: REFERENCES

### Articles / Books

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- Lehigh Valley Planning Commission. (2009). *Perkiomen Creek Headwaters Stormwater Management Plan.*

### BMP Manuals

- California  
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– separate file available at <http://www.cabmphandbooks.org/Development.asp>
- Georgia  
Georgia Stormwater Management Manual Volume 2: Technical Handbook (August 2001)  
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Maryland  
2000 Maryland Stormwater Design Manual –  
[http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater\\_design/index.asp](http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.asp)

Massachusetts  
Stormwater Management, Volume Two: Stormwater Technical Handbook (Massachusetts, 1997) – separate file available at <http://www.mass.gov/dep/water/laws/swmpolv2.pdf>

Minnesota  
Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates (July 2001) – <http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>

New Jersey  
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New York  
New York State Stormwater Management Design Manual (2001) –  
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Pennsylvania  
Pennsylvania Stormwater Best Management Practices (2006) –  
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## **Federal**

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA) – <http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm>

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### **Modeling Data**

The SCS Type II rainfall curve ~ National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rain data corresponding to the Doylestown rain gage. This data may be retrieved from the Atlas 14 website: [http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa\\_pfds.html](http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html)