NESHAMINY CREEK WATERSHED
ACT 167
STORMWATER MANAGEMENT
ORDINANCE

Implementing the requirements of the
Neshaminy Creek Watershed
Act 167 Stormwater Management Plan
(includes Little Neshaminy Creek Watershed)

ORDINANCE NO._____

WARMINSTER TOWNSHIP, BUCKS COUNTY,

PENNSYLVANIA

Adopted at a Public Meeting Held on

_____, 20__

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ARTICLE I. GENERAL PROVISIONS

§101. Short Title

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

§102. Statement of Findings

The Board of Supervisors of Warminster Township finds that:

A. Inadequate management of accelerated stormwater runoff resulting from development and redevelopment throughout a watershed increases flood 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, and threatens public health and safety.

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 streambanks, 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 Warminster Township and all the people of the Commonwealth, their resources, and the environment.

D. Stormwater is an important water resource by providing groundwater recharge for water supplies and 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).

G. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the municipality.

§103. Purpose

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

A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 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. Provide for proper operation and maintenance of all stormwater management facilities and Best Management Practices (BMPs) that are implemented in Warminster Township.

§104. Statutory Authority

The Board of Supervisors of Warminster Township 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. Second Class Township Code (Act 69 of 1933, P.L. 103; 53 P.S. § 65101, as amended).

§105. Applicability/Regulated Activities

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.

In the event of any conflict between the regulations and requirements set forth in this Ordinance, the Zoning Ordinance [Chapter 27], the Subdivision and Land Development Ordinance [Chapter 22], Stormwater Management Ordinance [Chapter 26 Part 4] or other requirements of Warminster Township, the more restrictive standard or the regulation imposing the higher standard shall be controlling. The standards and requirements set forth in this Ordinance and those similar standards and requirements set forth in the Township's Subdivision and Land Development Ordinance and Stormwater Management Ordinance are intended to be read together when determining compliance.

A. Regulated activities include, but are not limited to;

1. Land development,
2. Subdivisions,
3. 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,
4. Construction of new buildings or additions to existing buildings,
5. Redevelopment,
6. Prohibited or polluted discharges,
7. Alteration of the natural hydrologic regime,
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.
10. Any of the above Regulated Activities which were approved more than five (5) years prior to the effective date of this Ordinance are resubmitted for municipal approval.

§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 Section 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.

Table 106.1 Impervious Surface Exemption Thresholds for the Neshaminy Creek Watershed

Ordinance Article or Section	Proposed Impervious Surface		
	0 – 1,000 sq. ft.	1,001 – 5000 sq. ft.	5,000 + sq. ft.
Article IV SWM Site Plan Requirements	Exempt	Not Exempt	Not Exempt
§303 Volume Control Requirements	Not Exempt	Not Exempt	Not Exempt
§304 Peak Rate Control Requirements	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.		

C. Agricultural activity is exempt from the peak rate control requirements and SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code 102.

D. Forest management and timber operations are exempt from the peak rate control requirements and SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code 102.

E. Any aspect of BMP maintenance to an existing SWM system made in accordance with plans and specifications previously approved by the Township is exempt.

F. The use of land for gardening and landscaping for home consumption is exempt from the requirements of this ordinance.

G. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in §301.D through L.

H. 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, Warminster Township may deny exemptions.

3. Exemptions are limited to specific portions of this Ordinance.

4. HQ and EV Streams – Warminster Township may deny exemptions in high quality (HQ) or exceptional value (EV) waters and Source Water Protection Areas (SWPA).

5. Maintenance Exemption – Any maintenance to an existing stormwater management system made in accordance with plans and specifications approved by the Township Engineer or Warminster Township.

§107. Repealer

Any other Ordinance or Ordinance provision of Warminster Township inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

§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.

§109. Compatibility with Other Ordinance or Legal Requirements

Approvals issued 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.

ARTICLE II. DEFINITIONS

§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."

§202. Definitions

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, as herein defined, or agent of the landowner, who has filed an application for approval to engage in any Regulated Activity defined in §105 of this Ordinance.

As-built Drawings – 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, Township, and Township Engineer 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 (BMP) – 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 "nonstructural." In this Ordinance, nonstructural 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 pipe, conduit, or similar structure including appurtenant works which carries surface 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.

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).

Designee – The agent of Bucks County, the 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.

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., five (5) year storm) and duration (e.g., twenty-four (24) hours), and used in the design and evaluation of stormwater management systems.

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.

Developer – A person, partnership, association, corporation, or other entity, or any responsible person therein or agent thereof, that undertakes any regulated activity of this Ordinance.

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 – The specific tract or parcel of land where any regulated activity set forth in §105 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 – 1. (verb) To release water from a project, site, aquifer, drainage basin or other point of interest (verb); 2. (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.

Disturbed Areas – 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 without ownership of the soil.

Drainage Permit – A permit issued by Warminster Township 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, 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. If the initial condition of the site is undeveloped land, the land use shall be considered as “meadow” unless the natural land cover is proven to generate a lower curve number or Rational “c” value, such as forested lands.

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**.**

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 – The area along a natural water course which is periodically overflowed by water therefrom and which has been designated by ordinance of Warminster Township pursuant to the Warminster Township Floodplain Ordinance and Map.

Floodway – The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Forest Management/Timber Operations – Planning and associated activities necessary for the management of forestland. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, 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 – elected municipal officials of Warminster Township (e.g. Township Supervisors).

Grade – 1. (noun) A slope, usually of a road, channel or natural ground specified in percent and shown on plans as specified herein. 2. (verb) To finish the surface of a roadbed, the top of an embankment, or the bottom of excavation.

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 §306.A of this Ordinance.

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 – A classification of soils by the Natural Resources Conservation Service, 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.

Impervious Surface – Surfaces which do not absorb water and which prevent the infiltration of water into the ground. Any area which has been or is proposed to be modified from grass, dirt, vegetation, wooded, or groundcover, including but not limited to the area of all buildings, streets, parking areas, driveways, roads, sidewalks, swimming pools, and any areas in concrete, asphalt, porous pavers, packed stone, or other similar materials shall be considered impervious surfaces. Impervious surfaces also include other areas determined to be impervious by the Township Engineer.

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 ground (e.g., french drains, seepage pits, 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:

(i) The improvement of one (1) lot or two (2) or more contiguous lots, tracts, or parcels of land for any purpose involving:
   a. A group of two (2) 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
   b. The division or allocation of land or space, whether initially or cumulatively, between or among two (2) or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features;

(ii) A subdivision of land.

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 – Practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities.

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 – Warminster 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.

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

Outfall – "Point source" as described in 40 CFR § 122.2 at the point where Warminster Township'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 at a given point and time resulting 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.

Pipe – A culvert, closed conduit, or similar structure including appurtenances which conveys stormwater.

Planning Commission – The Planning Commission of Warminster Township, Bucks County, Pennsylvania.

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.

Post Construction – 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 storm sewer system, but not necessarily designed to meet the volume requirements of §303.

Pervious Surface – A surface that allows the infiltration of water into the ground.

Project Site – The specific area of land where any Regulated Activities in the municipality are 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 the 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/milling and re-paving are not considered to be redevelopment and are not considered earth disturbance. Interior remodeling projects and tenant improvements are also not considered to be redevelopment. Utility trenches in streets are not considered redevelopment. The limit of disturbance for a utility trench shall be restricted to the trench width and include staging areas outside of an impervious surface.

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 92, 25 Pa. Code 102, or the Clean Streams Law. Earth disturbance activity one (1) acre or more with a point source discharge to surface waters of the Warminster Township storm sewer system, or five (5) acres or more regardless of the planned runoff. This includes earth disturbance on any portion of, or during any stage of, a larger common plan of development. For road maintenance activities, this only includes those activities involving twenty-five (25) acres or more earth disturbance.

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 controlled 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 3 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 probability an event will occur in any given year. Typically displayed as a whole number, e.g. twenty-five (25) year event, and represents the inverse of the frequency of that event. For example, the twenty-five (25) year return period rainfall gives the probability, 1/25 or four (4) percent, which that size storm will occur in any given year.

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.

SALDO – Subdivision and Land Development Ordinance.

Sediment - Soils or other materials, both mineral and organic, transported by surface water as a product of erosion.

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.

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 a 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, including:

A. Each stream segment in Pennsylvania has a "designated use," such as "cold water fishery" or "potable water supply," which are listed in Chapter 93. These uses must be protected and maintained, under State regulations.

B. "Existing uses" are those attained as of November 1975, regardless of whether they have been designated in Chapter 93. Regulated earth disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.

C. Water quality involves the chemical, biological and physical characteristics of surface water bodies. After regulated earth disturbance activities are complete, these characteristics can be impacted by addition of pollutants such as sediment, and change in habitat through increased flow volumes and/or rates as a result of changes in land surface area from those activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, streambed, and structural integrity of the waterway to prevent these impacts.

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

Stormwater – The surface runoff generated by precipitation reaching the ground surface.

Stormwater Management Best Management Practices – Is abbreviated as **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 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 one hundred (100) feet in length upstream to downstream which encloses a regulated Water of the Commonwealth.

Streambank 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 (2) 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 ten (10) acres, not involving any new street or easement of access or any residential dwelling, shall be exempted.

Surface Waters of the 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 of Pennsylvania.

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 §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.

Total Site Area – The area of a site that is to be disturbed and all onsite areas, whether disturbed or undisturbed, that will drain to a proposed stormwater management facility.

Township Engineer – A professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed as the municipal engineer for Warminster Township.

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 Commonwealth – Any and all rivers, streams, creeks, rivulets, 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 body of water, whether natural or artificial.

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

Wetland – Those 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. Wetlands generally include swamps, marshes, bogs, fens, and similar areas.

ARTICLE III. STORMWATER MANAGEMENT

§301. General Requirements

A. Applicants proposing Regulated Activities in the Neshaminy Creek watershed that do not fall under the exemption criteria shown in §106 shall submit a Stormwater Management (SWM) Site Plan consistent with the Neshaminy Creek Watershed SWM Plan to Warminster 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 Warminster Township issues written approval of a SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.

B. SWM Site Plans approved by Warminster Township, in accordance with Article IV, shall be on-site throughout the duration of the Regulated Activity.

C. Warminster Township may, after consultation with the Department of Environmental Protection (PADEP), 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 (April 15, 2000), as amended and updated.

E. For all Regulated Activities, implementation of the volume controls in §303 of this Ordinance is required.

F. 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 5,000 or more square feet of impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance. For projects that add less than 5,000 square feet of impervious area to a parcel, only the additional impervious area on the parcel is subject to the requirements of this Ordinance, as specified in Table 106.1.

G. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written approval of the adjacent property owner(s) from the developer. Such stormwater flows shall be subject to the requirements of this Ordinance.

H. 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.

3. To the maximum extent practicable, 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,* Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006).

I. 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.

J. The design of all facilities over karst shall include an evaluation of measures to minimize the risk of adverse effects.

K. 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.

L. 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. NOAA's Atlas 14 can be accessed at http://hdsc.nws.noaa.gov/hdsc/pfds/

M. 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 Storm Water Management Act.

N. Various BMPs and their design standards are listed in the *Pennsylvania Stormwater Best Management Practices Manual* (PA BMP Manual).

§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.

§303. 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.

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, 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 must use the Design Storm Method in subsection C below. For small projects that propose 1,000 square feet or less of impervious, subsection D should be used.

A. **Design-Storm Method (Any Regulated Activity):** This method requires detailed modeling based on site conditions. For modeling assumptions refer to §305.A.

1. Post-development total runoff should not 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 on the following page. The calculated volume shall be either reused, evapotranspired, or infiltrated through structural or nonstructural means.

   Soil Cover Complex Method:

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

   P = 2-year Rainfall (in)

   S = (1000 / CN) – 10, the potential maximum retention (including initial abstraction, Ia)

   Step 2: Runoff Volume (Cubic Feet) = Q x Area x 1/12

   Q = Runoff (in)

   Area = SWM Area (sq ft)

B. **Simplified Method (Regulated activities less than or equal to 1 acre):**

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

Volume (cubic feet) = (2″ runoff / 12 inches) * impervious surface (sq ft)

2. At least the first inch (1**″**) of runoff volume from the new impervious surfaces shall be permanently removed from the runoff flow—i.e., it shall not be released into the surface waters of the Commonwealth. The calculated volume shall be either reused, evapotranspired or infiltrated through structural or nonstructural means.

Volume (cubic feet) = (1″ runoff / 12 inches) * impervious surface (sq ft)

3. Infiltration facilities should be designed to accommodate the first half inch (0.5**″**) of the permanently removed runoff.

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 and a SWM Site Plan submission is required for the regulated activity, the applicant shall determine and display the total acreage of protected area where no disturbance is proposed on the plan. 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.

Stormwater Management Site Area =
{Total Site Area (for both pre & post development conditions) – Protected Area}

Natural Resource Areas should be calculated based upon Warminster Township's Environmental and Natural Resource Protection Standards found in the Zoning Ordinance [Chapter 27] and Subdivision and Land Development Ordinance [Chapter 22]. For additional reference see Chapter 5 Section 5.4.1 of the PA BMP manual.

2. Calculate the volume controls provided through nonstructural BMPs.

3. Volume controls provided through nonstructural BMPs should be subtracted from the required volume to determine the necessary structural BMPs.

Required Volume Control (ft^3) – Nonstructural Volume Control (ft^3) = Structural Volume Requirement (ft^3)

4. Calculate the volume controls provided through structural BMPs. 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. Infiltration BMPs shall be constructed on soils that have the following characteristics:

    a. The minimum separation between the bottom of the infiltration BMPs and the top of bedrock and/or seasonally high water table and/or groundwater (limiting zones) shall be:

        i. for runoff from impervious surfaces associated with residential land use and/or pervious surface runoff associated with both residential uses and nonresidential uses: A minimum depth of thirty-six (36) inches between the intended bottom of facility and limiting zones.

        ii. for runoff from impervious surface associated with nonresidential uses: A minimum depth of thirty-six (36) inches between the bottom of facility and limiting zones. The minimum required separation between the limiting zone may be increased at the Township's discretion if project specific conditions, such as anticipated contaminants, dictate greater prevention of groundwater contamination.

        iii. for rooftop runoff: A minimum depth of twenty-four (24) inches between the intended bottom of the facility and limiting zones.

    b. An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests. A minimum of 0.25 inches/hour (in/hr) should be utilized and for acceptable rates a safety factor of fifty (50) percent should be applied for design purposes (e.g., for soil which measured 0.5 in/hr, the BMP design should use 0.25 in/hr to insure safe infiltration rates after construction).

    c. All open-air infiltration facilities shall be designed to completely infiltrate runoff volume within three (3) 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. Field testing guidelines are indentified in Appendix A. 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 sub-grade stability; infiltration may not be ruled out without conducting these tests.

    b. Provide field testing data at the elevation of the proposed infiltration surface or zone to determine the appropriate percolation rate and/or 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 Warminster 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 Warminster Township.

D. **Small Project Stormwater Management Rate Control Requirements**

This section applies to only small projects (residential and non-residential) that propose less than 1,000 square feet of new impervious.

1. Newly planted deciduous trees can reduce runoff volume by 6 cubic feet. Newly planted evergreen trees can reduce runoff volume by 10 cubic feet.

2. Projects that proposed between 0 square feet and 500 square feet of new impervious are required to plant trees that would reduce runoff volume by 10 cubic feet. Projects that proposed between 501 square feet and 1,000 square feet of new impervious are required to plant trees that would reduce runoff volume by 20 cubic feet.

3. Proposed deciduous or evergreen trees must be selected, planted, maintained, and replaced in accordance with the requirements of §523 of the Subdivision and Land Development Ordinance.

4. Deciduous or evergreen trees planted to meet the requirements of this section shall be subject to the requirements of Article VII and be covered by an Operations and Maintenance agreement with Warminster Township in accordance with §705.

5. If an Applicant demonstrates the required number of plantings can not be accommodated on the property, the Applicant is required to pay a fee-in-lieu of landscaping in an amount as specified in the Warminster Township Fee Schedule.

§304. 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 304.1. Development sites must control proposed development conditions runoff rates to existing conditions runoff rates for the design storms in accordance with Table 304.1.

Table 304.1
Peak Rate Runoff Control Standards In The Neshaminy Creek Watershed
(includes Little Neshaminy Creek)

Design Storm Post-Development (Proposed Conditions)	Design Storm Pre-Development (Existing Conditions)
2-year	1-year
5-year	2-year
10-year	5-year
25-year	10-year
50-year	25-year
100-year	50-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 in this section of the Ordinance.

C. Runoff Volume Standard – Post-Development stormwater runoff volume being discharged from any regulated activity shall not exceed predevelopment stormwater runoff volume being discharged for up to the two (2) year design storm for each watershed or design point on the site.

D. 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.

E. Site Areas – The stormwater management site area is the only area subject to the management district criteria. The stormwater management site area includes on-site areas that are not proposed to be disturbed, but drain to a proposed stormwater management facility. Non-impacted areas or non-regulated activities bypassing the stormwater management facilities would not be subject to the management district criteria.

F. Criteria for Redevelopment Sites – For redevelopment sites, meet the full requirements specified by Table 304.1 and Sections 304.A through 304.D.

§305. 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. For the wooded portion of sites use a ground cover of "woods in good condition." An area is classified as wooded if a continuous canopy of trees covers an area greater than one-quarter (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).

2. For development and 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 twenty (20) percent of the impervious surface area shall be considered meadow in the model for existing conditions.

B. Stormwater runoff peak discharges from all development sites with a drainage area greater than one (1) acre shall be calculated using a generally accepted calculation technique that is based on the NRCS Soil Cover Complex Method. Table 305.1 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. Warminster Township may allow the use of the Dekalb Rational Method (Q=CIA) to estimate peak discharges from drainage areas that contain one (1) acre of less, 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.

TABLE 305.1
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.
PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1.
Dekalb Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites 1 acre or less, or as approved by Warminster Township and/or Township Engineer.
Other Methods	Varies	Other computation methodologies approved by Warminster Township

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, Volume 2 Version 3 rain data corresponding to the Doylestown rain gage for the precipitation depth data and the partial duration time series using the upper bound of the ninety (90) percent confidence interval as follows:

Precipitation Frequency (inches)	
Design Storm (years)	**24 hr**
1	2.94
2	3.54
5	4.45
10	5.20
25	6.29
50	7.21
100	8.21

This data may also be directly retrieved from the NOAA Atlas 14 website: 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.

D. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow & return periods from NOAA Atlas 14, Volume 2 Version 3 rain data corresponding to the Doylestown rain gage for the precipitation intensity data and the partial duration time series using the upper bound of the ninety (90) percent confidence interval as follows:

Precipitation Intensity (in/hr)										
Design Storm (years)	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**	**3 hr**	**6 hr**	**12 hr**	**24 hr**
1	4.45	3.55	2.96	2.03	1.27	0.76	0.56	0.35	0.21	0.12
2	5.29	4.24	3.55	2.45	1.54	0.92	0.67	0.42	0.26	0.15
5	6.23	4.99	4.21	2.99	1.92	1.15	0.85	0.53	0.32	0.19
10	6.91	5.53	4.66	3.37	2.20	1.33	0.98	0.61	0.38	0.22
25	7.72	6.15	5.20	3.85	2.56	1.57	1.16	0.73	0.46	0.26
50	8.29	6.61	5.58	4.20	2.84	1.76	1.30	0.83	0.53	0.30
100	8.86	7.04	5.93	4.54	3.13	1.95	1.45	0.94	0.60	0.34

1. 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 from time to time by NRCS). Times-of-concentration for channel & pipe flow shall be computed using Manning's equation and the following roughness coefficients:

TABLE 305.2
Roughness Coefficients (Manning's "n") For Overland Flow
Source: U.S. Army Corps of Engineers, HEC-1 Users Manual

Surface Description	n
Dense Growth	0.4 - 0.5
Pasture	0.3 - 0.4
Lawns	0.2 - 0.3
Bluegrass Sod	0.2 - 0.5
Short Grass Prairie	0.1 - 0.2
Sparse Vegetation	0.05 - 0.13
Base Clay-Loam Soil (eroded)	0.01 - 0.03
Concrete/Asphalt - very shallow depths (less than 1/4 inch)	0.10 - 0.15
- small depths (1/4 inch to several inches)	0.05 - 0.10

TABLE 305.3
Roughness Coefficients (Manning's "n") For Channel Flow

Reach Description	n
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012 - 0.027[1]
High Density Polyethylene (HDPE) Pipe	
Corrugated	0.021 - 0.029[2]
Smooth Lined	0.012 - 0.020[2]

[1] Depending upon type, coating and diameter

[2] Values recommended by the American Concrete Pipe Association, check Manufacturer's recommended value.

E. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be based on TR-55.

F. Runoff coefficients (C) for both existing and proposed conditions for use in the Rational Method shall be consistent with Table 305.4 below.

TABLE 305.4 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	0.08[a]	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14[b]	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	0.25	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

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[a] Runoff coefficients for storm recurrence intervals less than 25 years.

[b] Runoff coefficients for storm recurrence intervals of 25 years or more.

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

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 top-soiling 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 municipality 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 Warminster Township.

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 one (1) acre in size, the design storm hydrograph shall be computed using a

calculation method that produces a full hydrograph. Warminster Township 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.

§306. Best Management Practice (BMP) Design and Construction Criteria

The design of BMPs used to manage stormwater impacts from regulated activities, to meet state water quality requirements, and to otherwise meet the purposes of this Ordinance shall be in accordance with the design requirements in §§518, 520, 521, 522, 523, and 529 of the Subdivision and Land Development Ordinance.

§307. Other Requirements

A. Hot Spots

1. The use of infiltration BMPs is prohibited on hot spot land use areas, such as vehicle fueling stations, public works storage areas, recycling facilities, fleet storage areas, facilities that make or store hazardous materials, etc.

2. Stormwater runoff from hot spot land uses shall be pretreated. In no case may the same BMP be employed consecutively to meet this requirement.

B. West Nile Guidance Requirements

All wet basin designs shall incorporate biologic controls to deter the breeding of mosquitoes.

ARTICLE IV. STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

§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 Warminster Township and an approval of an adequate Erosion and Sediment (E&S) Control Plan review from Warminster Township or County Conservation District.

§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 Warminster Township 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 §402.B.

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 Conservation District for the Erosion & Sedimentation Plan as required by Warminster Township, county or state regulations.

5. A general description of proposed nonpoint source pollution controls.

6. Appropriate sections from the municipalities' Subdivision and Land Development Ordinance, 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. This shall include, but not be limited to:

a. Site Features:

1) The location of the project relative to highways, municipal boundaries or other identifiable landmarks.
2) The locations of all existing and proposed utilities, sanitary sewers, and water lines on site and to within fifty (50) feet of property lines.
3) Proposed structures, roads, paved areas, and buildings.
4) The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
5) 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 bio-retention facilities, low impact development, bioretention, or vegetative basins).
6) The locations and minimum setback distances of existing and proposed on-lot wastewater facilities and water supply wells.
7) The location of all erosion and sediment control facilities.
8) 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.

b. Natural Site Conditions:

1) 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, and
    - floodplains.

    The area of each of these sensitive areas shall be calculated and should be consistent with the runoff volume calculation §303.C.1.

2) A detailed site evaluation for projects proposed in areas of frequent flooding, karst topography, and other environmentally sensitive areas, such as brownfields and source water protection areas.

3) Existing and proposed contour lines (2 ft).

4) The total extent of the drainage area upstream from the site and all down gradient receiving channels, swales and waters to which stormwater runoff or drainage will be discharged.

5) An overlay showing soil types and boundaries and a statement as to where the soils data was obtained. Overlay shall include a table identifying each soil type, hydrologic soil group, construction limitations and resolutions. Delineation of soils on the site shall be based on the Official Soil Survey provided by the U.S. Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/) and onsite soil study. Soil study shall be conducted by a soil scientist and shall include sufficient probes/deep holes to evaluate application of BMPs.

c. 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 §301.

d. 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 date of submission.

d. A graphic and written scale of one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.

e. A north arrow.

f. 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 commensurate with the maintenance and access requirements determined in the design of the BMP.

g. A key map showing all existing man-made features beyond the property boundary that would be affected by the project.

h. 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.

i. 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 Neshaminy Creek Watershed Act 167 Stormwater Management Ordinance or Plan."

j. A statement, signed by the Applicant, acknowledging that any revision to the approved SWM Site Plan must be approved by Warminster Township and that a revised E&S Plan must be submitted to the Conservation District.

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 & Maintenance (O&M) Plan for all existing and proposed physical stormwater management facilities, as well as schedules and costs for O&M activities. This plan shall address long-term ownership and responsibilities for O&M.

§403. Plan Submission

Warminster Township 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. For regulated activities specified in §105.A.1 and 2:

1. The stormwater management plan shall be submitted by the developer to the Code Enforcement Officer as part of the preliminary plan submission for the subdivision or land development.

2. Four (4) copies of the stormwater management plan shall be submitted.

3. Distribution of the stormwater management plan shall be made by the Code Enforcement Officer as follows:

a. One (1) copy to the Board of Supervisors.

b. One (1) copy to the Planning Commission.

c. One (1) copy to the Township Engineer.

d. One (1) copy to the Township file.

4. Applicant shall be responsible to make applications to Buck County Planning Commission and Bucks County Conservation District. The Township shall be copied on all correspondence.

C. For all other regulated activities specified under §105.A:

1. The stormwater management plan shall be accompanied by the requisite fee as specified in this Ordinance.

2. Two (2) copies of the stormwater management plan shall be submitted to the Code Enforcement Officer.

3. Distribution of the stormwater management plan shall be made by the Code Enforcement Officer as follows:

   a. One (1) copy to the Township Engineer.

   b. One (1) copy to the Township file.

4. Applicant shall be responsible to make applications to Bucks County Conservation District. The Township shall be copied on all correspondence.

D. For regulated activities requiring permits from PaDEP 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. The Township shall be copied on all correspondence.

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 Warminster Township or PADEP.

§404. Stormwater Management (SWM) Site Plan Review

A. The SWM Site Plan shall be reviewed by a Qualified Professional on behalf of Warminster Township for consistency with the provisions of this Ordinance and other requirements of Warminster Township as referenced in this Ordinance. After review, the Qualified Professional shall provide a written recommendation for Warminster 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. Warminster Township will notify the applicant in writing within forty-five (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 ninety (90) days. If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by Warminster Township. If Warminster Township disapproves the SWM Site Plan, Warminster Township shall cite the reasons for disapproval in writing.

§405. Modification of Plans

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 Warminster Township shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

§406. Resubmission of Disapproved SWM Site Plans

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing Warminster Township's concerns, to Warminster Township in accordance with this Article. The applicable review fee must accompany a resubmission of a disapproved SWM Site Plan.

§407. Authorization to Construct and Term of Validity

A. Warminster Township's approval of an SWM Site Plan authorizes the regulated activities contained in the SWM Site Plan for a maximum term of validity of five (5) years following the date of approval. Warminster Township may specify a term of validity shorter than five (5) years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date Warminster Township signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to §407 within the term of validity, Warminster Township may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by Warminster Township shall be resubmitted in accordance with §406 of this Ordinance.

B. Any subdivision or land development (regulated activities §105.A.1 and 2) or building permit application (regulated activities §105.A.3, 4, and 5) shall not be approved if the stormwater management plan has been found to be inconsistent with this Ordinance.

ARTICLE V. INSPECTIONS

§501. Inspections

A. Warminster Township shall inspect all phases of the installation of the Best Management Practices (BMPs) and/or stormwater management (SWM) facilities as deemed appropriate by Warminster Township.

B. Prior to construction of the stormwater management facilities specified in the approved stormwater management plan, the developer must provide a schedule of inspections along with a final inspection and submission of "as-built" drawings to the Township Engineer.

C. The Township Engineer shall inspect all phases of development of the site including, but not limited to:

1. Completion of preliminary site preparation including stripping of vegetation, stockpiling of topsoil, and construction of temporary stormwater management and erosion control facilities.

2. Completion of rough grading, but prior to placing top soil, permanent drainage or other site development improvements and ground covers.

3. During construction of the permanent stormwater facilities.

4. Upon completion of permanent stormwater management facilities, including established ground covers and plantings.

5. Upon completion of any final grading, vegetative control measures or other site restoration work done in accordance with the approved stormwater management plan and permit.

D. No work shall begin on a subsequent stage until the proceeding stage has been inspected and/or approved by the Township Engineer.

E. It is the responsibility of the developer to notify the Township Engineer forty-eight (48) hours in advance of the completion of each phase of development.

F. During any stage of the work, if Warminster Township determines that the BMPs and/or stormwater management facilities are not being installed in accordance with the approved SWM Site Plan, Warminster 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.

G. Any portion of the work which does not comply with the approved stormwater management plan must be corrected by the developer within ten (10) days. No work may proceed on any subsequent phase of the stormwater management plan, the subdivision or land development, or building construction until the required corrections have been made.

H. If at any stage of the work the Township Engineer determines that the soil or other conditions are not as stated or shown in the approved application, the same may refuse

to approve further work and the Township may revoke existing permits until a revised stormwater management plan is submitted and approved, as required by §405 of this Ordinance. If the revised stormwater management plan cannot remedy the situation, Warminster Township reserves the right to cancel its approval and halt all work except for that work required to eliminate the activity and return the site to pre-activity conditions as much as is reasonably possible.

I. If the Township Engineer discovers that the facilities or measures installed may be in violation of Chapter 102, "Erosion Control," of the Clean Streams Law provision, the Township Engineer will refer these violations to the Bucks County Conservation District.

J. A final inspection of all BMPs and/or stormwater management facilities shall be conducted by Warminster Township to confirm compliance with the approved SWM Site Plan prior to the issuance of any Occupancy Permit.

K. When the developer has completed all the required facilities, he shall notify Warminster Township in writing by certified or registered mail, and shall send a copy of such notice to the Code Enforcement Officer of Warminster Township. The Board of Supervisors shall, within ten (10) days after receipt of such notice, authorize the Township Engineer to inspect the required facilities. Following this final inspection, the Township Engineer shall promptly file a report, in writing, with the Board of Supervisors and shall mail a copy of the report to the developer by certified or registered mail. The report shall be made and mailed within thirty (30) days after receipt by the Township Engineer of the aforesaid authorization by the Board of Supervisors.

L. 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, which were reviewed and received approval by Warminster Township, shall be submitted to Warminster Township.

M. The as-built submission shall include a certification of completion signed by a Qualified Professional verifying that all SWM BMPs have been constructed according to the approved plans and specifications. If any Qualified Professionals contributed to the construction plans, they must sign and seal the completion certificate.

ARTICLE VI. FEES AND EXPENSES

§601. Municipal Stormwater Management (SWM) Site Plan Review and Inspection Fee

Fees shall be established by Warminster Township to cover plan review and construction inspection costs incurred by Warminster Township. All fees shall be paid by the Applicant at the time of SWM Site Plan submission. No permit to being any work on the project shall be issued until the requisite fees have been paid. 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 Warminster Township's costs for reviewing SWM Site Plans and conducting inspections pursuant to §501. Warminster Township shall periodically update the review and inspection fee schedule to ensure that review costs are adequately reimbursed.

§602. Expenses Covered by Fees

The fees required by this Ordinance (unless otherwise waived by Warminster Township) shall, at a minimum, cover:

A. Administrative costs.

B. The review of the Stormwater (SWM) Site Plan by Warminster Township and its Township Engineer. Review shall mean all technical review, meetings, and discussions relative to the Plan.

C. Stormwater management permit issuance.

D. The review of As-built Drawings. Review shall mean all technical review, meetings, and discussions relative to the Plan.

E. The site inspections.

F. The inspection of SWM facilities and drainage improvements during construction.

G. The final inspection at the completion of the construction of the SWM facilities and drainage improvements presented in the SWM Site Plan.

H. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

ARTICLE VII. MAINTENANCE RESPONSIBILITIES

§701. Performance Guarantee

A. The Board of Supervisors shall, prior to the issuance of a stormwater management permit and/or approval of a final subdivision/land development plan and stormwater management plan, require financial security as a performance guarantee for stormwater management control facilities in a form to be approved by the Warminster Township Solicitor. If required by the developer, in order to facilitate financing, the Board of Supervisors may furnish the developer with a signed resolution indicating approval of the subdivision/land development plan and stormwater management plan contingent upon the developer obtaining a satisfactory financial security. The record plan shall not be signed nor recorded until a financial improvement agreement is executed. The resolution or letter of contingent approval shall expire and be deemed to be revoked if the financial security agreement is not executed within ninety (90) days, unless a written extension is granted by the Board of Supervisors; such extension shall not be unreasonably withheld and shall be placed in writing at the request of the developer.

B. Where required, the developer shall file with the Board of Supervisors financial security in an amount sufficient to cover the costs of the stormwater management facilities. Without limitation as to other types of financial security which the Township may approve, such approval shall not be unreasonably withheld; Federal or Commonwealth chartered lending institution irrevocable letters of credit and restrictive or escrow accounts shall be deemed acceptance financial security. Such financial security shall be posted with a bonding company or Federal or Commonwealth chartered lending institution chosen by the developer, provided said bonding company or lending institution is authorized to conduct such business within the Commonwealth. Such bond or other security shall provide for, and secure to the public, completion of the stormwater management facilities which may be required on or before the date fixed in the formal action of approval or accompanying agreement for completion of the improvements.

C. The amount of financial security shall be equal to one hundred ten (110) percent of the cost to install the required facilities estimated as of ninety (90) days following the date scheduled for completion.

D. If a developer requires more than one (1) year from the date of posting of the financial security to complete the required facilities, the amount of financial security may be increased by an additional ten (10) percent for each one (1) year period beyond the first anniversary date from posting of financial security or to an amount not exceeding one hundred ten (110) percent of the cost of completing the required facilities as reestablished on or about the expiration of the preceding one (1) year period by using the above bidding procedure.

E. The amount of financial security required shall be based upon an estimate of the cost of the facilities submitted by the developer and prepared by a professional engineer licensed as such in this Commonwealth and certified by such engineer to be a fair and reasonable estimate of such cost. The Board of Supervisors, upon the recommendation of the Township Engineer, may refuse to accept such estimate for good cause shown. If the developer and the Board of Supervisors are unable to agree upon an estimate, then the estimate shall be recalculated and recertified by another professional engineer

licensed as such in this Commonwealth and chosen mutually by the Board of Supervisors and the developer. The estimate certified by the third engineer shall be presumed fair and reasonable and shall be the final estimate. In the event that a third engineer is so chosen, fees for the services of said engineer shall be paid equally by Warminster Township and the developer.

F. In the case where development is projected over a period of years, the Board of Supervisors may authorize submission of stormwater management plan applications by sections or stages of development so as to required or guarantee that stormwater management facilities in both current and future stages of development will provide the protection of the finally approved stage of the development.

G. As the work of installing the required stormwater facilities proceeds, the developer may request the Board of Supervisors to release or authorize to release, from time to time, such portions of the financial security necessary for payment to the contractor or contractors performing the work. Any such requests shall be in writing addressed to the Board of Supervisors which shall have forty-five (45) days from receipt of such request within which to allow the Township Engineer to certify, in writing, to the Board of Supervisors that such portion of the work upon the facilities has been completed in accordance with the stormwater management plan and permit. Upon such certification, the Board of Supervisors shall authorize release by the bonding company or lending institution of an amount as estimated by the Township Engineer fairly representing the value of the facilities completed, or, if the Board of Supervisors fails to act within a forty-five (45) day period, the Board of Supervisors shall be deemed to have approved the release of funds as requested. The Board of Supervisors may, prior to final release, require retention of ten (10) percent of the estimated cost of the aforesaid facilities. The final release of the financial security provisions shall be permitted only after receipt by the Board of Supervisors of certification and "as-builts" as required by this Ordinance.

H. In the event that any stormwater management facilities which may be required have not been installed as provided in this Ordinance or in accordance with the approved stormwater management plan, the Board of Supervisors has the power to enforce any corporate bond or other security by appropriate legal and equitable remedies. If proceeds of such bond or other security are insufficient to pay the cost of installing or making repairs or corrections to all the facilities covered by said security, the Board of Supervisors may, at its option, install part of such facilities in all or part of the development and may institute appropriate legal or equitable action to recover the monies necessary to complete the remainder of the facilities. All of the proceeds, whether resulting from the security or from any legal or equitable action brought against the developer, or both, shall be used solely for the installation of the stormwater management facilities covered by such security and not for any other purpose.

§702. Maintenance Responsibility and Guarantees

A. The maintenance responsibilities for permanent stormwater runoff control facilities shall be determined based upon the type of ownership of the property which is controlled by the facilities.

1. Single Entity Ownership. Where the permanent stormwater runoff control facilities are designed to manage runoff from property in a single entity ownership as defined below, the maintenance responsibility for the stormwater control facilities shall be with the single entity owner. The stated responsibility of the entity related to owning and maintaining the facilities shall be submitted with the

stormwater management plan for determination of their adequacy. Approval of the stormwater management plan shall depend upon the approval of these terms. These terms shall be in writing, shall be in recordable form and shall, in addition to any other terms deemed necessary by the Board of Supervisors, contain a provision permitting inspection at any reasonable time by the Township Engineer of all such facilities deemed critical in the public welfare. A single entity shall be defined as an association, public or private corporation, partnership, firm, trust, estate or any other legal entity empowered to own real estate, exclusive of an individual lot owner.

2. Township Ownership. Where the Board of Supervisors has accepted an offer of dedication of the permanent stormwater management facilities, the Board of Supervisors shall be responsible for maintenance. Upon approval of the stormwater management facilities by the Board of Supervisors, the developer shall provide a financial security, in a form approved by the Warminster Township Solicitor for maintenance guarantees, as follows:

   a. *Construction Maintenance Bond*. The Board of Supervisors may require the posting of a maintenance bond to secure the structural integrity of said facilities as well as the functioning of said facilities in accordance with the design and specifications as depicted on the approved stormwater management plan for a term not to exceed eighteen (18) months from the date of acceptance of dedication. Said financial security shall be the same type as required in §701 with regard to installation of such facilities, and the amount of the financial security shall not exceed fifteen (15) percent of the actual cost of installation of said facilities. A cash contribution can be used as the financial security in lieu of a maintenance bond, although the contribution must be equivalent to the amount that would be estimated for the maintenance bond.

   b. *Long-Term Maintenance Bond*. The long-term maintenance bond shall be in an amount equal to the present worth of maintenance of the facilities for a ten (10) year period. The estimated annual maintenance cost for the facilities shall be based on a fee schedule provided by the Township Engineer and adopted by the Board of Supervisors. The fee schedule must be reasonable. A cash contribution can be used in lieu of the long-term maintenance bond, although the contribution must be equivalent to the amount that would be estimated for the maintenance bond.

   c. *Documentation*. The terms of the maintenance guarantees shall be documented as part of the stormwater management phase as per §401, §703, §704 of this Ordinance.

For certain types of facilities, the Board of Supervisors may benefit by transferring the maintenance responsibility to an individual or group of individuals residing within the controlled area. These individuals may have the permanent stormwater control facilities adjacent to their lots or otherwise have an interest in the proper maintenance of the facilities. In these instances, the Board of Supervisors and the individual(s) may enter into a formal agreement for the maintenance of the facilities whereby Warminster Township shall maintain ownership of the facilities and be responsible for periodic inspections.

3. Individual Lot Ownership. Where any stormwater management facility is located on an individual lot, and maintenance thereof is the responsibility of that landowner, a description of the facility or systems and the terms of the required maintenance shall be incorporated as a part of the deed to the property. The deed shall be recorded with the County Recorder of Deeds within ninety (90) days following the Board of Supervisors' approval. In addition, the Board of Supervisors may require as a condition of approval that a deed conveying any interest in such lot contain language indicating that the conveyance is subject to an express covenant by the grantee that the grantee will maintain the stormwater management facility.

4. Multi-Entity Ownership. In cases where property is in multiple owner (i.e. many individual ownership of various portions of the property on which stormwater facilities are located) the developer(s) shall enter into an agreement with the Township to determine the maintenance of the permanent stormwater facilities. If maintenance is prescribed for each individual lot owner, the requirements of §702.A.3 shall apply.

B. The failure of any person, individual lot owner or private entity to properly maintain any stormwater management facility shall be construed to be a violation of this Ordinance and is declared to be a public nuisance, subject to §905, "Penalties."

C. Liability Insurance. If, in the opinion of the Board of Supervisors based upon a report of the Township Solicitor, the nature of the work is such that it may create a hazard to human life or endanger adjoining property or streets, the Board of Supervisors shall, before issuing the stormwater management permit, require that the applicant file a certificate of insurance showing that there exists insurance against claims for damages for personal injury, bodily injury, and property damage, including damage to Warminster Township by surface water flow which has been altered on the site. The liability insurance shall be to the amount prescribed by the Township in accordance with the nature of risks involved and include the Township as an additional insured. Such insurance shall be written by a company licensed to do business in the Commonwealth. Neither issuance of the stormwater management permit nor compliance with the provisions hereto or any conditions imposed by the Township shall relieve any person from any responsibility for damage otherwise imposed by law, nor impose any liability upon Warminster Township or its officers and employees for damages to persons or property.

§703. Responsibilities for Operations and Maintenance (O&M) of Stormwater Facilities and BMPs

A. 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 forty-five (45) days of approval of the stormwater facility and BMP O&M plan by Warminster Township:

1. The O&M plan, or a summary thereof,

2. O&M agreements under §704, and

3. Easements under §705.

B. Warminster 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.

C. The following items shall be included in the Stormwater Facility and BMP O&M Plan:

1. Map(s) of the project area, in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Bucks County, and shall be submitted on 24-inch x 36-inch sheets. The contents of the maps(s) shall include, but not be limited to:

    a. Clear identification of the location and nature of stormwater facilities and BMPs.

    b. The location of the project site relative to highways, municipal boundaries or other identifiable landmarks.

    c. Existing and final contours at intervals of two (2) feet, or others as appropriate.

    d. Existing streams, lakes, ponds, or other bodies of water within the project site area.

    e. Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved.

    f. The locations of all existing and proposed utilities, sanitary sewers, and water lines on site and within 50 feet of property lines of the project site.

    g. Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added.

    h. Proposed final structures, roads, paved areas, and buildings, and

    i. A twenty (20)-foot-wide access easement around all stormwater facilities and BMPs that would provide ingress to and egress from a public right-of-way.

2. A description of how each stormwater facility and BMP will be operated and maintained, and the identity and contact information associated with the person(s) responsible for O&M.

3. The name of the project site, the name and address of the owner of the property, and the name of the individual or firm preparing the plan, and

4. A statement, signed by the facility owner, acknowledging that the stormwater facilities and BMPs are fixtures that can be altered or removed only after approval by Warminster Township.

D. The Stormwater Facility and BMP O&M 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 Warminster Township, stormwater facilities and BMPs may also be offered for dedication to and maintained by Warminster Township.

2. If a plan includes O&M by single ownership, or if sewers and other public improvements are to be privately owned and maintained, the O&M of stormwater facilities and BMPs shall be the responsibility of the owner or private management entity.

E. Warminster Township shall make the final determination on the continuing O&M responsibilities. Warminster 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. Warminster Township may take enforcement actions against an owner for any failure to satisfy the provisions of this Article and this Ordinance.

§704. Municipal Review of Stormwater Facilities and BMP Operations and Maintenance (O&M) Plan

A. Warminster Township shall review the Stormwater Facilities and BMP O&M Plan for consistency with the purposes and requirements of this ordinance, and any permits issued by PADEP.

B. Warminster Township shall notify the Applicant in writing whether the Stormwater Facility and BMP O&M Plan is approved.

C. Warminster Township shall require a “Record Drawing” of all stormwater facilities and BMPs.

§705. Operations and Maintenance (O&M) Agreement for Privately Owned Stormwater Facilities and BMPs

A. The owner shall sign an O&M agreement with Warminster Township covering all stormwater facilities and BMPs that are to be privately owned. The O&M agreement shall be transferred with transfer of ownership. The agreement shall be prepared by the Municipal Solicitor.

B. 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 Warminster Township.

C. The owner is responsible for the O&M of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, Warminster Township may perform the services required and

charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

§706. Stormwater Management Easements

A. The owner must obtain all necessary real estate rights to install, operate, and maintain all stormwater facilities and areas used for stormwater control in the SWM Site Plan.

B. The owner must provide the municipality easements, or other appropriate real estate rights, to perform inspections and maintenance for the preservation of stormwater runoff conveyance, infiltration, and detention areas.

ARTICLE VIII. PROHIBITIONS

§801. Prohibited Discharges

A. Any 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 waters of the Commonwealth is prohibited.

B. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (i) as provided in Subsection C below, and (ii) discharges allowed under a state or federal permit.

C. The following discharges may be allowed, unless Warminster Township determines that the discharge is a significant contributor to pollution to the waters of the Commonwealth:

1. Discharges from firefighting activities,
2. Potable water sources including water line flushing,
3. Irrigation drainage,
4. Air conditioning condensate,
5. Springs,
6. Water from crawl space pumps,
7. Flows from riparian habitats and wetlands,
8. Uncontaminated water from foundations or from footing drains,
9. Lawn watering,
10. De-chlorinated swimming pool discharges (per Department of Environmental Protection (PADEP) requirements),
11. Uncontaminated groundwater,
12. Water from individual residential car washing, and/or
13. Routine external building wash down (which does not use detergents or other compounds)

D. In the event that Warminster Township or PADEP determines that any of the discharges identified in Subsection C significantly contribute to pollution of the waters of this Commonwealth, Warminster Township or PADEP will notify the responsible person(s) to cease the discharge.

E. Upon notice provided by the municipality under Subsection D, the discharger will have a reasonable time, as determined by the municipality, to cease the discharge consistent with the degree of pollution caused by the discharge.

F. Nothing in this Section shall affect a discharger's responsibilities under state law.

§802. Prohibited Connections

A. The following connections are prohibited, except as provided in §801.C above:

1. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater, and wash

water to enter the separate storm sewer system, and any connections to the storm drain system from indoor drains and sinks; and

2. Any drain or conveyance from a commercial or industrial land use to the separate storm sewer system, which has not been documented in plans, maps, or equivalent records, and approved by the municipality.

§803. Roof Drains

A. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches in order to promote overland flow and infiltration/percolation of stormwater where advantageous to do so.

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 on a case by case basis as determined by the municipality.

C. Roof drains and sump pumps shall discharge to infiltration areas or vegetative BMPs and to the maximum extent practicable satisfy the criteria for disconnected impervious areas (DIAs).

§804. Alteration of SWM BMPs

A. No person shall modify, remove, fill, landscape, or alter any Stormwater Management (SWM) Best Management Practices (BMPs), facilities, areas, or structures unless it is part of an approved maintenance program and written approval of Warminster 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 Warminster Township.

ARTICLE IX. ENFORCEMENT AND PENALTIES

§901. Right-of-Entry

A. Upon presentation of proper credentials, duly authorized representatives of Warminster Township may enter at reasonable times upon any property within Warminster Township to investigate the implementation, condition, or operation and maintenance of the stormwater facilities or Best Management Practices (BMPs) in regard to any aspect governed by this Ordinance.

B. Landowners with stormwater facilities and BMPs on their property shall allow persons working on behalf of Warminster Township ready access to all parts of the premises for the purposes of determining compliance with this Ordinance.

C. Persons working on behalf of Warminster Township shall have the right to temporarily locate on any stormwater facility or BMP in Warminster 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 Warminster Township access to a stormwater facility or BMP is a violation of this Ordinance.

§902. Inspection

Stormwater Management (SWM) Best Management Practices (BMPs) should be inspected for proper operation by the landowner, or the owner's designee (including Warminster Township for dedicated and owned facilities), according to the following list of minimum frequencies:

1. Annually for the first 5 years,
2. Once every 3 years thereafter,
3. During or immediately after the cessation of a 10-year or greater storm, and/or
4. As specified in the Operations and Maintenance (O&M) agreement.

§903. Enforcement

All inspections regarding compliance with the Stormwater Management (SWM) Site Plan and this Ordinance shall be the responsibility of Warminster Township.

A. Whenever Warminster Township finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, Warminster 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.

B. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(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 Warminster Township and the expense may be charged to the violator.

C. 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 Warminster Township from pursuing any and all other remedies available in law or equity.

§904. Suspension and Revocation of Permits and Approvals

A. Any building, land development, or other permit or approval issued by Warminster Township may be suspended or revoked, in whole or in part, by Warminster Township for:

1. Noncompliance with or failure to implement any provision of the permit;

2. A violation of any provision of this ordinance; 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 permit may be reinstated by Warminster Township when:

1. Warminster Township has inspected and approved the corrections to the stormwater facilities and BMPs or the elimination of the hazard or nuisance, and;

2. Warminster Township is satisfied that all applicable violations in this Ordinance have been corrected.

C. Any permit or approval that has been revoked by Warminster Township cannot be reinstated. The Applicant may apply for a new permit under the procedures outlined of this Ordinance.

§905. Penalties

A. Any person, firm or corporation who shall violate any provision of this Ordinance or who shall fail to comply with any written notice from Warminster Township which describes a condition of noncompliance, upon conviction thereof in an action brought before a district justice in the manner provided for the enforcement of summary offenses under the

Pennsylvania Rules of Criminal Procedure, shall be sentenced to pay a fine of not more than $1,000 plus costs and, in default of payment of said fine and costs, to a term of imprisonment not to exceed 90 days. Each day that the violation continues shall constitute a separate offense and the applicable fines are cumulative.

B. The Bucks County Court of Common Pleas, upon petition, may grant an order to stay, upon cause shown, tolling the per diem fine pending a final adjudication of the violation and judgment.

C. Nothing contained in the Section shall be construed or interpreted to grant to any person or entity other than Warminster Township the right to commence any action for enforcement pursuant to this Section.

§906. Appeals

A. An appeal from any action or decision of the Board of Supervisors concerning regulated activities specified in §105 shall be made to the Bucks County Court of Common Pleas pursuant to Article X-A of the Pennsylvania Municipalities Planning Code.

B. The Board of Supervisors may hear and decide appeals pursuant to the Pennsylvania Municipalities Planning Code, §909.1(b)(6), where it is alleged that the Building Permit/Zoning Officer has failed to follow prescribed procedures or has misinterpreted or misapplied any provision of this Ordinance concerning regulated activities specified in §105.

C. The Warminster Township Zoning Hearing Board may hear and decide pursuant to the Pennsylvania Municipalities Planning Code, §909.1(a)(9), where it is alleged that the Building Permit/Zoning Officer has failed to follow prescribed procedures or has misinterpreted or misapplied any provision of this Ordinance concerning regulated activities specified in §105.

D. Nothing in §§905.B and .C shall be construed to deny the appellant the right to proceed directly to the Bucks County Court of Common Pleas pursuant to the Pennsylvania Municipalities Planning Code, §910.1.

E. The approval of an appeal shall not have the effect of making null and void the intent and purpose of this Ordinance.

NESHAMINY CREEK WATERSHED STORMWATER MANAGEMENT PLAN ORDINANCE ENACTMENT

ENACTED and ORDAINED at a regular meeting of the Board of Supervisors of Warminster Township on the _____ of _____, 20__.

WARMINSTER TOWNSHIP
BOARD OF SUPERVISORS

_____
Ellen S. Jarvis, Chairwoman

_____
Frank Feinberg, Vice-Chairman

_____
Gail E. Johnson, Secretary/Treasurer

_____
Leo I. Quinn, III, Member

_____
Tom E. Panzer, Member

ATTEST:

_____
Secretary

I hereby certify that the foregoing Ordinance was advertised in the _____(name of publication) on _____, 20__, a newspaper of general circulation in the Municipality and was duly enacted and approved as set forth at a regular meeting of the Municipality's governing body held on _____, 20__.

_____
Secretary

APPENDIX A: Site Evaluation and Soil Infiltration Testing Protocol

Purpose of this Protocol

The purpose of the *Site Evaluation and Soil Infiltration Testing Protocol* is to describe soil evaluation and field testing procedures to:

Determine if infiltration BMPs are suitable at a site, and at what locations.

Obtain the required data for infiltration BMP design.

When to Conduct Testing

The Site Development process outlined in Chapters 4 and 5 of the Pennsylvania Stormwater Best Management Practices Manual, December 2006, as amended ("Manual"), describe a process for site development and BMPs. The soil evaluation and infiltration testing investigation should be conducted early in the preliminary design of the project so that information developed in the testing process can be incorporated into the design. The site investigation shall be conducted prior to the development of the Preliminary Plan. The Designer should possess a preliminary understanding of potential BMP locations prior to testing. Prescreening tests may be carried out in advance of siting potential BMP locations.

Who Should Conduct Testing

Qualified professionals who can substantiate, by qualifications and/or experience, their ability to carry out the site evaluation should conduct the test pit soil evaluations. A professional experienced in observing and evaluating soil conditions is necessary to ascertain conditions that might affect BMP performance, which cannot alone be thoroughly assessed with the testing procedures. Such professionals must conduct these evaluations in risk areas, and areas indicated in the Manual as non-preferred locations for testing or BMP implementation.

Importance of Stormwater BMP Areas

Sites are often defined as unsuitable for infiltration BMPs and soil based BMPs due to proposed grade changes (excessive cut or fill) or lack of suitable areas. Many sites will be constrained and unsuitable for infiltration BMPs. However, if suitable areas exist, these areas should be identified early in the design process and should not be subject to a building program that precludes infiltration BMPs. An exemption will not be permitted for development of suitable soils when they can be used for infiltration BMPs.

Safety

As with all field work and testing, attention should be given to all applicable OSHA regulations related to earthwork and excavation. Digging and excavation should never be conducted without adequate notification through the Pennsylvania One Call system (PA OneCaII1-800-242-1776 or www.paonecall.org). Excavations shall not be left unsecured and unmarked, and all applicable authorities must be notified prior to any work.

Township Involvement

Onsite soil evaluations and infiltration testing must be witnessed by a representative from the

Township Engineer's office. Notification of testing shall be made 48 hours in advance.

INFILTRATION TESTING: A MULTI-STEP PROCESS

Infiltration testing is a four-step process to obtain the necessary data for the design of site stormwater management facilities. The four steps include:

1. Background Evaluation
   - Prior to field work (desktop)
   - Based on available published and site specific data
   - Includes consideration of proposed development plan
   - Used to identify potential BMP locations and testing locations
2. Test Pit (Deep Hole) Observation
   - Includes multiple testing locations
   - Provides an understanding of sub-surface conditions
   - Identifies soil limiting zones
3. Infiltration Testing
   - Must be conducted on-site
   - Different testing methods permitted
   - Includes multiple testing locations
4. Design Considerations (Chapter 26)
   - Determination of a suitable infiltration rate for design calculations
   - Consideration of BMP drawdown
   - Consideration of peak rate attenuation
   - Method for slowing fast infiltration rates down

Step 1. Background Evaluation

Prior to performing site testing and developing a detailed site plan, existing conditions at the site should be inventoried and mapped including, but not limited to:

- Existing mapped individual soils and USDA Hydrologic Soil Group classifications.
- Existing geology, including the location of any dikes, faults, fracture traces, solution cavities, landslide prone strata, or other features of note.
- Existing streams (perennial and intermittent, including intermittent swales), water bodies, wetlands, hydric soils, floodplains, alluvial soils, stream classifications, headwaters, high quality and exceptional value streams.
- Existing topography, slope, and drainage patterns.
- Existing and previous land uses.
- Other natural or man-made features or conditions that may impact design, such as past uses of the site, existing nearby structures (buildings, walls), etc.

A sketch plan or preliminary layout plan for development should be evaluated, including:

- The preliminary grading plan and areas of cut and fill.
- The location and water surface elevation of all existing water sources and location(s) of proposed water supply sources and wells.
- The location of all existing and proposed on-site sewage disposal systems.

- The location of other features, such as utility rights-of-way, water and sewer lines, etc.
- Existing data such as structural borings, drillings, and geophysical testing.
- The proposed location of development features (buildings, roads, utilities, walls, etc.). In Step 1, the Designer should determine the potential location of infiltration BMPs. The approximate location of these BMPs should be located on the proposed development plan and should serve as the basis for the location and number of tests to be performed on-site.

Important: If the proposed development program is located on areas that may otherwise be suitable for BMP location, or if the proposed grading plan is such that potential BMP locations are eliminated, the designer must revisit the proposed layout and grading plan and adjust the development plan as necessary. Full build-out of areas suitable for infiltration BMPs may not preclude the use of BMPs for volume reduction and groundwater recharge.

Step 2. Test Pits (Deep Holes)

A test pit (deep hole) allows visual observation of the soil horizons and overall soil conditions both horizontally and vertically in that portion of the site. The use of soil borings as a substitute for test pits is not permitted, as visual observation is narrowly limited in a soil boring and the soil horizons cannot be observed in-situ. Borings and other procedures, however, might be suitable for initial screening to develop a preliminary plan for testing, or verification testing.

A test pit consists of a backhoe-excavated trench, 2-1/2 to 3 feet wide, to a depth of 144 inches or less, or until bedrock or fully saturated conditions are encountered. The trench should be benched at a depth of 2-3 feet for access and/or infiltration testing.

At each test pit, the following conditions shall be noted and described. Depth measurements should be described as depth below the ground surface:

_____ Soil Horizons (upper and lower boundary)

_____ Soil Texture and Color for each horizon

_____ Color Patterns (mottling) and observed depth

_____ Soil Structure

_____ Soil Consistence

_____ Estimated Type and Percent Coarse Fragments

_____ Hardpan or Limiting Layers

_____ Depth to Water Table

_____ Depth to Bedrock

_____ Additional comments or observations

At the designer's discretion, soil samples may be collected at various horizons for additional analysis. Following testing, the test pits should be backfilled with the original soil and the surface replaced with the original topsoil. A test pit should never be accessed if soil conditions

are unsuitable for safe entry, or if site constraints preclude entry. OSHA regulations should always be observed.

It is important that the test pit provide information related to conditions at the bottom of the proposed infiltration BMP. Proposed BMP depths of ten (10) feet or greater are discouraged, especially in Karst topography. Except for surface discharge BMPs (filter strips, etc.), the designer is cautioned regarding the proposal of systems that are significantly lower than the existing topography. The suitability for infiltration may decrease, and risk factors are likely to increase. Locations that are not preferred for site testing and subsurface infiltration BMPs include: existing swales, toe slopes, and soil mantels of less than three feet in Karst topography.

The designer and contractor shall limit grading and earthwork to reduce site disturbance and compaction, so that a greater opportunity exists for testing and stormwater management.

The number of test pits varies depending on site conditions and the proposed development plan. General guidelines are as follows:

- For single-family residential subdivisions with on-lot BMPs, one test pit per lot is recommended, preferably within 25 feet of the proposed BMP area. Verification testing should take place when BMPs are sited at greater distances.
- For multi-family and high density residential developments, one test pit per BMP area or acre is recommended.
- For large infiltration areas (basins, commercial, institutional, industrial, and other proposed land uses), multiple test pits should be evenly distributed at the rate of four (4) to six (6) tests per acre of BMP area.

The recommendations above are guidelines. Additional tests should be conducted if local conditions indicate significant variability in soil types, geology, water table levels, bedrock, topography, etc. Similarly, uniform site conditions may indicate that fewer test pits are necessary. Excessive testing and disturbance of the site prior to construction is not recommended.

Step 3. Infiltration Tests/Permeability Tests

A variety of field tests exist for determining the infiltration capacity of a soil. Laboratory tests are not permitted, as a homogeneous laboratory sample does not represent field conditions. Infiltration tests must be conducted in the field. Tests should not be conducted in the rain or within 24 hours of significant rainfall events (>0.5 inches), or when the temperature is below freezing. However, the preferred testing is during the wet season of January to June. This is the period when infiltration is likely to be diminished by saturated conditions. Percolation tests carried out between June 1 and December 31 should use a 24 hour presoaking before the testing. Presoaking is not required for infiltrometer or permeometer testing

At least one test shall be conducted at the proposed bottom elevation of an infiltration BMP, and a minimum of two tests per test pit is recommended. More tests may be warranted if the results for the first two tests are substantially different. The highest rate (inches/hour) for test results should be discarded when more than two are employed for design purposes. The geometric mean should be used to determine the average rate following multiple tests.

Based on observed field conditions, the proposed bottom elevation of a BMP may be revised. Infiltration testing locations and depths should be modified in the field depending upon observed field conditions.

Methodologies discussed in this protocol include:

- Double-ring infiltrometer tests.
- Percolation tests (as described in PA Code Chapter 73).

There are differences between the two referenced methods. A double-ring infiltrometer test estimates the vertical movement of water through the bottom of the test area. The outer ring helps to reduce the lateral movement of water in the soil. A percolation test allows water movement through both the bottom and sides of the test area. For this reason, the measured rate of water level drop in a percolation test must be adjusted to represent the discharge that is occurring on both the bottom and sides of the percolation test hole.

For infiltration basins, an infiltration test should be carried out with an infiltrometer (not percolation test) to determine the saturated hydraulic conductivity rate. This precaution is taken to account for the fact that only the surface of the basin functions to infiltrate, as measured by the test. Alternatively, permeability test procedures that yield a saturated hydraulic conductivity rate can be used (see formulas developed by Elrick and Reynolds (1992), or others for computation of hydraulic conductivity and saturated hydraulic conductivity).

Other testing methodologies and standards that are available, but not discussed herein, include but are not limited to:

- Testing as described in the Maryland Stormwater Manual Appendix D.1 using 4-inch diameter casing.
- ASTM 2003 Volume 4.08, Soil and Rock (I): Designation D 3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using a Double-Ring Infiltrometer.
- ASTM 2002 Volume 4.09, Soil and Rock (II): Designation D 5093-90, Standard Test Method for Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring.
- Guelph Permeameter
- Constant Head Permeameter (Amoozemeter)

A. Methodology for Double-Ring Infiltrometer Test

A double-ring infiltrometer consists of two concentric metal rings. The rings are driven into the ground and filled with water. The outer ring helps to prevent divergent flow. The drop in water level or volume in the inner ring is used to calculate an infiltration rate. The infiltration rate is determined as the amount of water per surface area and time unit that penetrates the soils. The diameter of the inner ring should be approximately 50% to 70% of the diameter of the outer ring, with a minimum inner ring size of 4-inches, preferably much larger. (Bouwer, 1986).

B. Methodology for Percolation Test

This percolation test methodology is based largely on the Pennsylvania Department of Environmental Protection (PADEP) criteria for on-site sewage investigation of soils (as described in Chapter 73 of the Pennsylvania Code). This should include the 24-hour presoak procedure between June 1 and December 31. The presoak is done primarily to simulate saturated conditions in the environment and to minimize the influence of unsaturated flow. If a presoak procedure is not employed between June1 and December 31, then the rate reduction formula described by Elrick and Reynolds (1992), or Fritton, et.,al. (1986) must be used to account for the influence of unsaturated

conditions in the test.

Infiltration Rate = (Percolation Rate) / (Reduction Factor)

Where the Reduction Factor is given by**:

$$R_f = \frac{2d_1 - \Delta d}{DIA} + 1$$

where

d_1	=	Initial Water Depth (in.)
Δd	=	Average/Final Water Level Drop (in.)
DIA	=	Diameter of the Percolation Hole (in.)

The percolation rate is simply divided by the reduction factor as calculated above. In most cases, the reduction factor varies from about 2 to 4 depending on the percolation hole dimensions and water level drop. Wider and shallower tests have lower reduction factors because proportionately less water exfiltrates through the sides.

The Reduction Factor accounts for the exfiltration occurring through the sides of percolation hole. It assumes that the percolation rate is affected by the depth of water in the hole and that the percolating surface of the hole is in uniform soil. If there are significant problems with either of these assumptions then other adjustments may be necessary.

Source: Pennsylvania Stormwater Best Management Practices Manual, December 2006

Step 4. Design Considerations

Refer to §520 of the Subdivision and Land Development Ordinance [Chapter 22] for BMP design considerations and parameters.