STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. 2025-__

MUNICIPALITY OF LOWER MAKEFIELD TOWNSHIP

BUCKS COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on

_____

Prepared by HRG

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Section 101. Short Title

This Ordinance shall be known and may be cited as the "Lower Makefield Township Stormwater Management Ordinance."

Section 102. Statement of Findings

The governing body of the Township finds that:

A. Inadequate planning and management of accelerated runoff of stormwater resulting from impervious surfaces, development, and redevelopment throughout a watershed increases runoff volumes, flows, and velocities; contributes to erosion and sedimentation; overtaxes the carrying capacity of streams and storm sewers; changes the natural hydrologic patterns of surface waters which increases scour and erosion of streambeds and streambanks; destroys aquatic habitat; elevates aquatic pollutant concentration and loadings such as sediments, nutrients, heavy metals, and pathogens; greatly increases the cost of public facilities to convey and manage stormwater; undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces groundwater recharge; threatens public health and safety; and increases nonpoint source pollution of water resources.

B. Existing improvements that lack compliant stormwater controls and are proposed for re-development disproportionately increase the cost of comprehensive stormwater management for the Township.

C. Through project design, impacts from stormwater runoff can be minimized to maintain the natural hydrologic regime, and sustain high water quality, groundwater recharge, stream baseflow, and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage stormwater runoff is through nonstructural project design, minimizing impervious surfaces and sprawl, avoiding sensitive areas (i.e. stream buffers, floodplains, steep slopes), and designing to topography and soils to maintain the natural hydrologic regime.

D. A comprehensive program of stormwater management (SWM), including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare, and the protection of the people of the Township and all the people of the Commonwealth, their resources, and the environment.

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

F. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.

G. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1. infiltrate and recharge, 2. evapotranspire, and/or 3. harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of predevelopment hydrology.

H. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES) program.

Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the Township and its watersheds by maintaining the natural hydrologic regime and by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93, state permit requirements, as applicable, and the Act of October 4, 1978 (P.L. 864, No. 167), as amended, known as the Stormwater Management Act or Act 167, 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. Address the quality of stormwater discharges from the development site.

E. Preserve natural drainage systems.

F. Manage stormwater runoff close to the source, reduce runoff volumes, and mimic predevelopment hydrology by requiring a minimum of structures and relying on natural processes.

G. Provide procedures and performance standards for stormwater planning and management.

H. Focus on infiltration of stormwater to maintain groundwater recharge to prevent degradation of surface and groundwater quality, and to otherwise protect water resources.

I. Promote nonstructural best management practices.

J. Promote alternative project designs and layouts that minimize impacts to surface and ground water.

K. Prevent scour and erosion of stream banks and streambeds.

L. Preserve and restore the flood-carrying capacity of streams.

M. Maintain existing flows and quality of streams and watercourses in the Township.

N. Provide proper operation and maintenance (O&M) of all SWM Facilities and best management practices (BMPs) that are implemented within the Township.

O. Provide performance standards and design criteria for Township-wide stormwater management and planning.

P. Provide standards to meet NPDES permit requirements.

Q. Provide standards to meet certain requirements of the Municipal Separate Stormwater Sewer System (MS4) NPDES Stormwater Regulations.

R. Provide standards to meet *Neshaminy Creek Watershed Stormwater Management Plan*[1] and *Delaware River South Watershed Act 167 Stormwater Management Plan*[2] requirements.

Section 104. Statutory Authority

The Township is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended, updated, and/or replaced; Act of May 1, 1933, P.L. 103, No. 69, The Second Class Township Code, as amended, updated, and/or replaced; and/or the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., The Stormwater Management Act, as amended, updated, and/or replaced.

Section 105. Applicability

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. Regulated activities include, but are not limited to:

A. Earth disturbance

B. Land development

C. Subdivisions

D. Prohibited or polluted discharges

E. Alteration of the natural hydrologic regime

F. Construction or reconstruction of, or addition of new impervious or semipervious surfaces (i.e., driveways, parking lots, roads, etc.)

G. Construction of new buildings or additions to existing buildings

H. Redevelopment

I. Construction or alteration of diversion piping or encroachments in any natural or man-made channel

J. Construction or alteration of nonstructural and structural stormwater management best management practices (BMPs) or appurtenances thereto.

Section 106. Repealer

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

Section 107. Severability

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Section 108. Compatibility with Other Requirements

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, rule, act, law, regulation or Ordinance.

Section 109. Erroneous Permit

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

Section 110. Waivers

A. If the Township determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the Township may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 110, paragraphs B and C.

B. Waivers or modifications of the requirements of this Ordinance may be approved by the Township if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing. The written request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved, and the proposed modification. Any Stormwater Management (SWM) Site Plan, Report, or other related changes not matching the written request are considered void.

C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Township unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

ARTICLE II – DEFINITIONS

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 words and phrases “includes”, “including”, “for example”, “e.g.”, and/or other related words and phrases shall not limit the term to the specific example, but are intended to extend their meaning to all other instances of like kind and character.

C. The word “person” includes an individual, firm, association, organization, partnership, trust, company, corporation, unity 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.”

These definitions do not necessarily reflect the definitions contained in other, potentially-related regulations or statues unless otherwise stated, and are intended for this Ordinance only.

Agricultural Activity – Activities associated with agricultural operations as defined in the Pennsylvania Municipalities Planning Code, as amended, updated, and/or replaced. Examples may include agricultural cultivation; agricultural operation; animal heavy-use areas; the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, and harvesting crops; pasturing and raising of livestock; and installation of approved agriculturally- related conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

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

Applicant – A landowner, developer, or other person/entity who has filed an application to the Township for approval to engage in any regulated activity at a project site in the Township. “Applicant” also refers to any person/entity that may be exempt from certain, but not all, provisions 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 components and changes to the approved contract documents. These documents, or a copy of same, are turned over to the qualified professional at the completion of the project.

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. Piped springs are not exempt from being classified as groundwater due to human activity.

Best Management Practice (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 “non-structural.” In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include but are not limited to a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, 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.

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.

Conservation District – A conservation district, as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)), that has the authority under a delegation agreement executed with DEP to administer

and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

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

Curve Number – Value used in the NRCS Type-II Curve Number Runoff Method (SCS). 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 purpose which impounds or may impound water or another fluid or semifluid.

DEP (Department) – The Pennsylvania Department of Environmental Protection.

Designee – The agent of 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., a 5-year storm) and duration (e.g., 24 hours) used in the design and evaluation of stormwater management systems. Also see Return Period.

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 that seeks to undertake a land development or subdivision.

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

Development Site (Site) – See Project Site.

Discharge –

A. (verb) To release water from a project, site, aquifer, drainage basin or other point of interest;

B. (Noun) The rate and volume of flow of water such as in a stream, generally expressed in cubic feet or cubic feet per second, respectively. (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 redirect or directed to pervious area, which allows for infiltration, filtration, and increased time of concentration (as specified in Appendix F, Disconnected Impervious Area)

Disturbed Area – An 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 Easement (SWM Conservation Easement)– A right granted by a landowner to a grantee, allowing the use of private land for stormwater management or stormwater conveyance purposes.

Earth Disturbance Activity – A construction or other human activity which disturbs the surface of the land, including but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; parking lot maintenance; building construction; 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 natural process by which the surface of the land 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 accelerate 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 Condition – The dominant land cover and/or condition during the 5-year period immediately preceding a proposed regulated activity.

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

Facility, Conveyance – Any structure or practice that is designed and/or constructed to transmit or otherwise transfer stormwater runoff from one location to another. Typical Conveyance Facilities include but are not limited to: swales and other open channel facilities; stormsewers; and pipe culverts.

Facility, Erosion and Sediment Control – Any structure or practice that is designed and/or constructed to capture, reduce, prevent, or otherwise mitigate the effects of stormwater runoff and sedimentation. Typical Erosion and Sediment Control Facilities include but are not limited to: erosion control matting, silt fence, silt sock, inlet protection, temporary seeding, and sediment ponds. **Erosion and Sediment Control Facility** may be designated as **ESC Facility** throughout this Ordinance.

Facility, Stormwater Management – Any structure or practice that is designed and/or constructed to store or otherwise attenuate stormwater runoff. Typical stormwater management facilities include but are not limited to: detention and retention basins; rain gardens; and infiltration facilities. **Stormwater Management Facility** may be designated as **SWM Facility** throughout this Ordinance.

FEMA – Federal Emergency Management Agency.

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

Floodplain – Any land area susceptible to inundation by water from any natural source or the one-hundred-year floodway and that maximum area of land that is likely to be flooded by a one-hundred-year flood as delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended, updated, and/or replaced from time to time by DEP). For the purposes of this Ordinance, it is assumed that the floodplain encompasses the floodway.

Floodway – The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed – absent evidence to the contrary – that the floodway extends from the stream to 50 feet landward from the top of the bank of the stream.

Forest Management/Timber Operations – Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

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

Governing Body – The Lower Makefield Township Board of Supervisors.

Grade –

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

B. (verb) To finish the surface of a roadbed, the top of an embankment, or the bottom of excavation.

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

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.

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).

Hotspot Use – Any proposed land use or activity that has the potential to have an increased amount of stormwater pollutant runoff, generally based upon its use or generation of pollutants, including but not limited to: chemicals, oil-based products, pesticides, fertilizers, large traffic volume, and/or outdoor storage. Example uses include but are not limited to automobile repair, filling, and washing facilities; automobile, boat, and trailer storage and/or sales; commercial and/or retail uses with parking lots; restaurants with drive-thrus; industrial or heavy manufacturing establishments; warehousing; athletic fields; golf courses; and swimming pools not accessory to an individual residential use.

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

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

Hydrologic Soil Group (HSG) – Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS[3,4]).

Impervious Surface (Impervious Area) – A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include but not be limited to: roofs; additional indoor living spaces; patios and similar structures (including those made of wood or other planks); rock, crushed stone, or aggregate of any kind; pools, ponds, and other permanent water-storage areas; garages; storage sheds and similar structures; driveways; and any new streets or sidewalks. For the purposes of this definition, structures that are elevated a minimum of eighteen (18) inches above ground level, have completely pervious material beneath the structure, and provide means for water flow through the structure shall be considered pervious (i.e. decks or awnings). Pervious pavement and similar surfaces that are specifically designed to allow for porous infiltration of stormwater are considered partially impervious surfaces in accordance with the Township's Zoning Ordinance §200-50.4. For calculation purposes, 50% of the area covered by pervious pavement shall be considered impervious while the remaining 50% shall be considered grass, in good condition, or similar cover type. Pervious pavement and similar surfaces that are specifically designed to allow for porous infiltration of stormwater may be used if constructed and maintained in accordance with the Township's Zoning Ordinance in lieu of traditional SWM conveyance facilities, such as inlets and pipes, in order to provide for the transmission of stormwater runoff to subsurface SWM Facilities; if this method of transmission is utilized, the surfaces in question are still considered partially impervious surfaces for this Ordinance and the purpose of modeling.

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

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

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

Initial Abstraction (Ia) – The value used to calculate the volume or peak rate of runoff in the NRCS Type-II Curve Number Runoff Method (SCS). 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.

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 (Development) – As defined in the Township's Subdivision and Land Development Ordinance.

Limiting Zone – A soil horizon or condition in the soil profile or underlying strata which includes one of the following:

A. A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.

B. A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.

C. A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of effluent.

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

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 (Township Engineer) – A professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed by Lower Makefield Township as the Township Engineer.

Municipality (Township) – Lower Makefield Township, Bucks County, Pennsylvania.

MS4 – The Municipal Separate Storm Sewer System of the Township as regulated by the laws of the Commonwealth and the United States.

Nonpoint Source Pollution – Pollution that enters a water body from diffuse origins in the Township 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 – USDA Natural Resources Conservation Service (previously SCS).

NRCS Type-II Curve Number Method (SCS) – A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN).

Outfall – "Point source" at the point where the 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.

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

Pervious Area – Any area not defined as an impervious area, typically allows the infiltration of water into the ground.

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

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 plan are completed.

Predevelopment – (See “Existing Condition.”)

Pretreatment – Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system.

Project Site – The specific area of land where any regulated activities in the Township 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 this Ordinance.

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

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

Regulated Activities – Any earth disturbance activities, any activities that involve the alteration or development of land in a manner that may affect stormwater runoff, or any activities that clearly increase the pollution potential of 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.

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

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

Retention Volume/Removed Runoff – The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

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

Riparian Buffer – A permanent area of trees and shrubs located adjacent to streams, lakes, ponds, and wetlands.

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.

SALDO – Lower Makefield Township’s Subdivision and Land Development Ordinance.

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

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

Sediment Pollution – The placement, discharge or any other introduction of sediment into the waters of the commonwealth.

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.

Separate Storm Sewer System – A conveyance or system of conveyances (including roads with drainage systems, Township 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.

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) water.

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

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

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

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

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

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 Permit – The permit prepared by the applicant or his or her representative providing necessary details, including but not limited to disturbance area, impervious areas, and other items. Stormwater Management Permit will be designated as SWM Permit throughout this Ordinance, and shall be divided into two categories:

1. Minor SWM Permit – Regulated activities that result in: the alteration or development of 1,000-5,000 SF of land in a manner that may affect stormwater runoff; earth disturbances of 5,000 to 43,559 SF; and/or the cumulative increase of 1,000-5,000 SF of impervious area. “Cumulative” shall include incremental and phased development.
2. Major SWM Permit – Regulated activities that result in: the alteration or development of greater than 5,000 SF of land in a manner that may affect stormwater runoff; earth disturbances of greater than or equal to 43,560 SF; and/or the cumulative increase of greater than 5,000 SF of impervious area. Regulated activities taking place on sites: 1. with greater than 5,000 SF of existing impervious area within the limit of disturbance that are not controlling the runoff from the existing impervious area in a manner consistent with this Ordinance; and 2. whose activities do not qualify for the exemptions listed in Section 302, shall also fall under the category of Major SWM Permit. “Cumulative” shall include incremental and phased development.

Stormwater Management Report – The report prepared by the applicant or his or her representative documenting the necessary design computations and data in order to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance. Stormwater Management Report will be designated as SWM Report throughout this Ordinance.

Stormwater Management Site Plan – The plan prepared by the applicant or his or her representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance. Stormwater Management Site Plan will be designated as SWM Site Plan throughout this Ordinance.

Subarea (Subwatershed) – The smallest drainage unit of a watershed for which stormwater management criteria have been established in the SWM Site Plan.

Subdivision – As defined in the Township’s Subdivision and Land Development Ordinance.

Surface 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 waters, or parts thereof, whether natural or artificial, within or on the boundaries of the commonwealth.

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

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.

USDA – United States Department of Agriculture.

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

Watershed – Region or area drained by a river, watercourse, or other surface water of this Commonwealth.

Wellhead – A structure built over a well, or the source of water for a well.

Wellhead Protection Area – The surface and subsurface area surrounding a water supply well, well field, spring, or infiltration gallery supplying a public water system, through which contaminants are reasonably likely to move towards and reach the water source.

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

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

ARTICLE III – STORMWATER MANAGEMENT STANDARDS

Section 301. General Requirements

A. For all regulated activities, SWM Facilities 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. Various SWM BMPs and their design standards are listed in the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual[5]), as amended, updated, and/or replaced (to be replaced by the Pennsylvania Post-Construction Stormwater Management Manual, PCSM Manual), which shall be followed unless otherwise noted within this or other Ordinances or regulations of the Township.

B. For all regulated activities, ESC Facilities 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 E&S BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual* (E&S Manual[6]), as amended, updated, and/or replaced, which shall be followed unless otherwise noted within this or other Ordinances or regulations of the Township. The erosion and sediment controls and grading guidance within the Township's Subdivision and Land Development Ordinance shall apply for all regulated activities.

C. For all regulated activities, implementation of the volume controls in Section 307 of this Ordinance is required.

D. 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 environmentally sensitive features including, but not limited to, floodplains, floodplain soils, ponds, wetlands, steep slopes, and woodland areas in accordance with the Township's Subdivision and Land Development Ordinance and Zoning Ordinance.

      b. Create, maintain, repair or extend riparian buffers.

      c. Avoid erosive flow conditions in natural flow pathways.

      d. Minimize thermal impacts to waters of this Commonwealth.

      e. Disconnect impervious surfaces (i.e., disconnected impervious areas, DIAs) by directing runoff to pervious areas, wherever possible. See Appendix F for detail on DIAs.

      f. Prevent pollution of stormwater runoff by ceasing activities that clearly contaminate runoff.

   3. Incorporate the techniques and practices for Low Impact Development (LID) practices as outlined in the BMP Manual. See Appendix E for a summary description. The most appropriate BMPs for stormwater management vary from site to site; however, the following principles shall be implemented to the project site to the maximum extent practicable:

      a. Prevent stormwater impacts, especially pollutants.

      b. Mitigate pollutants that cannot be prevented.

      c. Manage stormwater as a resource.

      d. Sustain the hydrologic balance (quantity and quantity).

      e. Integrate stormwater into the initial site design process.

      f. Preserve and utilize natural systems (soil, vegetation, etc.).

      g. Manage stormwater as close to the source as possible.

      h. Disconnect/decentralize/distribute.

      i. Slow down stormwater by increasing the time of concentration, rather than piping and accelerating it.

      j. Inspect and maintain.

   4. Utilize green infrastructure techniques as outlined in the BMP Manual to the maximum extent practicable.

5. If methods other than LID and green infrastructure are proposed to achieve the stormwater controls required under this ordinance, the SWM Site Plan and Report must include a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.

E. For all regulated activities, unless preparation of a SWM Site Plan and Report is specifically exempted in Section 302:

1. Preparation, submission, and implementation of a SWM Site Plan and SWM Report is required.

2. No regulated activities shall commence until the Township issues written approval of a SWM Site Plan and SWM Permit.

F. SWM Site Plans approved by the Township shall be on site throughout the time of construction of the regulated activity.

G. Impervious areas:

1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.

2. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.

3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance. Volume and peak rate controls in Article III do not need to be retrofitted to existing impervious areas unless otherwise specified.

H. Stormwater flows onto adjacent and/or downstream property shall not be created, increased, relocated, significantly concentrated, and/or otherwise detrimentally altered without written approval from the affected property owner(s) and the placement of a SWM Conservation Easement on the affected property per Section 401.Z. Such stormwater flows shall be subject to the requirements of this Ordinance, including but not limited to downstream capacity and erosion analysis.

I. No stormwater or other related discharges shall discharge directly into a public right-of-way or onto paved surfaces intended for vehicular or pedestrian travel (including but not limited to parking lots, public or private roads, sidewalks, shared driveways, etc.) (collectively herein “Public Surfaces”). The term “directly” for the purpose of this Ordinance will be dependent upon site conditions, the concentration and volume of the discharge, and intermediary surfaces, but in no case shall a discharge point directed toward a Public Surface be closer than 10 feet to the Public Surface.

J. The design of all facilities over karst shall include an evaluation of measures to minimize the risk of adverse effects in accordance with Section 403.C.

K. All stormwater discharges with pipe sizes greater than or equal to 12” shall be provided with either reinforced concrete endwalls or plastic end section, and shall also include outlet protection consistent with the E&S Manual.

L. For all regulated activities proposing earth disturbances of greater than 5,000 SF, submission of an erosion and sediment control plan to the County conservation district/reviewing authority for either adequacy review or NPDES permit approval. Subsequent evidence of approval shall also be required.

M. Any regulated activities within an existing, known stormwater management problem area, or having the potential to negatively impact an existing, known stormwater management problem area, may be required by the Township to include additional, reasonable measures beyond those listed within this Ordinance in order to ensure that any effects of the regulated activity do not exacerbate or further contribute to the issues affecting said problem area. In no case shall the applicant be required to resolve the existing, known stormwater management problems beyond the obligations so-listed.

N. The Township may, after consultation with Bucks County Conservation District and/or DEP, approve measure for meeting the state water quality and other stormwater runoff 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.

Section 302. Exemptions

A. Regulated activities that result in any one or more of (1) the alteration or development of 1,000 SF or less of land in a manner that may affect stormwater runoff; (2) earth disturbances of 5,000 SF or less; or (3) the cumulative increase of impervious area 1,000 SF or less since the first regulated instance under this Ordinance or the preceding versions of the Lower Makefield Township stormwater regulations, regardless of whether a permit was properly applied for and received, are exempt from the

requirements in Section 303 to 306, 308 to 312, and Article IV unless the activity is found to be a significant contributor of pollution to the waters of this commonwealth.

B. Regulated activities that result in any one or more of (1) the alteration or development of 1,001-5,000 SF of land in a manner that may affect stormwater runoff; (2) earth disturbances of 5,001 to 43,559 SF; and/or (3) the cumulative, including incremental and phased, increase of 1,001-5,000 SF of impervious area shall require a Minor SWM Permit and are exempt from Section 308: Peak Rate Control Standards and Methodologies. If the applicant of a Minor SWM Permit provides a completed Site Design Worksheet for the design of volume controls (see Appendix I), their application is exempt from the requirement in Sections 303 to 312 and Article IV (except Section 410: Closeout, for Minor SWM Permits) of this Ordinance.

Impervious Surface Exemption Thresholds				
Ordinance Article or Section	**Type of Project**	**Proposed Impervious Surface**		
		0 to 1,000 SF	**1,001 to 5,000 SF**	**5,000 + SF**
Article IV (except Section 410)	All Development	Exempt	*Not Exempt	Not Exempt
Section 303 to 306 and 309 to 312	All Development	Exempt	*Not Exempt	Not Exempt
Section 307: Volume Control	All Development	Not Exempt	Not Exempt	Not Exempt
Section 308: Peak Rate Control	All Development	Exempt	Exempt	Not Exempt
E&S Requirements	Must comply with 25 Pa. Code Chapter 102 and any other applicable state, county, and Township codes. PADEP requires an engineered postconstruction SWM plan for projects proposing earth disturbance greater than 1 acre			

*If the applicant of a Minor SWM Permit provides a completed Site Design Worksheet for the design of volume controls (see Appendix I), their application is exempt from the requirements in Sections 303 to 312 and Article IV (except Section 410: Closeout, for Minor SWM Permits).

C. Agricultural activity is exempt from the requirements in Section 308 and Article IV of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

D. Forest management and timber operations are exempt from the requirements in Section 308 and Article IV of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

E. Any aspect of SWM Facility or BMP maintenance to an existing stormwater management system made in accordance with the plans, specifications, and operations and maintenance agreement and plan (where applicable) approved by Lower Makefield Township is exempt.

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

G. Exemptions from any provisions of this chapter shall not relieve the applicant from the requirements in Section 301 and 307. If any of the requirements in Section 301 or 307 are not met, the Township at its sole discretion may revoke any exemptions from any provisions of this Ordinance without the necessity of any proceedings for revocation, and the applicant may be required by the Township to cease all activities and/or comply with the provisions of this Ordinance.

H. Not eligible for exemption: additions, modifications, or alterations to sites, structures, projects, plans, or any other items that previously required stormwater management, whether in part or in whole (for example: adding a 500 SF patio onto a home built as part of a larger subdivision and land development plan that required stormwater management would *not* be an exempt regulated activity), unless the subject lot was allotted a set amount of increase to impervious area (for example: original subdivision and land development plan allocated each lot an additional 1,000 SF of additional impervious area).

I. An exemption shall not relieve the applicant from implementing such measures as are necessary to protect public health, safety, and property.

J. Where drainage problems are documented or known to exist downstream of or are expected from the proposed activity, the Township may deny exemptions.

K. Exemptions are limited to the specific referenced portions of this Ordinance.

L. The Township may deny exemptions in high quality (HQ) or exceptional value (EV) waters and source water protection areas (SWPA).

Section 303. Riparian Buffers

A. For all regulated activities required a Major SWM Permit, a Riparian Buffer Easement shall be created and recorded that encompasses an existing or potential Riparian Buffer.

B. Except as required by Chapter 102, the Riparian Buffer Easement shall be measured to be the greater of the limit of the 100-year floodplain or the watercourse buffer distance as specified in the Natural Resource Protection Requirements section of the Lower Makefield Township Zoning Ordinance measured from the top of the bank for all watercourses, ponds, and wetlands.

C. When present, provision for permanent access to Riparian Buffer Easements shall also be granted to the Township via a note as listed in Section 401.DD.09.

D. Minimum Management Requirements for Riparian Buffers:

   1. Existing native vegetation shall be protected and maintained within the Riparian Buffer Easement. If no or limited existing native vegetation is present, additional native vegetation shall be specified and planted within the Riparian Buffer Easement to create a diverse native plant community appropriate to the intended ecological context of the site.

   2. Whenever practicable, invasive vegetation shall be actively removed, and the Riparian Buffer Easement shall be specified and planted with native trees, shrubs, and other native vegetation in the invasive vegetation's place to create a diverse native plant community appropriate to the intended ecological context of the site.

E. The Riparian Buffer Easement shall be enforceable by the Township and shall be recorded in the appropriate County Recorder of Deeds Office so that it shall run with the land and shall limit the use of the property located therein. The easement shall allow for continued private ownership and shall count toward the minimum lot area as required by Zoning, unless otherwise specified in the Zoning Ordinance.

F. Any permitted use within the Riparian Buffer Easement shall be conducted in a manner that will maintain the extent of the existing 100-year floodplain, improve or maintain the stream stability, leave native vegetation undisturbed as much as is practicable, and preserve and protect the ecological function of the floodplain and riparian buffer.

G. Specific Prohibitions within Riparian Buffer Easements:

   1. Septic drainfields and sewage disposal systems.

   2. Livestock grazing and access, except areas specifically necessary for livestock crossing of waterways.

H. Specific Requirements for Uses within Riparian Buffer Easements:

   1. All uses shall comply with the ordinances, provisions, and regulations of the Township and any other applicable entities.

   2. All uses shall limit vegetative clearing to the minimum extent necessary for the execution of the use; general clearing of the Riparian Buffer Easement is not permitted.

   3. Trails shall be for non-motorized use only.

   4. Docks, boat ramps, and other similar improvements shall be comprised of stable, non-erosive material(s).

   5. Fences shall not be located within a Riparian Buffer Easement. If a waiver of this ordinance provision is granted, in no case shall a fence be installed within the Riparian Buffer Easement without proper approval from PADEP.

Section 304. SWM Facilities Standards

SWM Facilities shall comply with the below standards as applicable to the proposed facility:

A. Nonstructural BMPs shall be utilized to the maximum extent possible in accordance with the methodology and specifications in the BMP Manual, but in no case shall quantitative nonstructural volume control BMPs be more than 25% of the required volume control. If nonstructural BMPs cannot be used, the reasons why must be demonstrated to the Township's satisfaction.

B. Surface, open-air, BMPs shall be the preferred BMP for stormwater management controls. If methods other than surface, open-air, BMPs are proposed to achieve the stormwater controls required under this ordinance, a waiver of this ordinance requirement shall be requested from the Township. Surface,

open-air, BMP plantings shall be comprised entirely of native plants as identified by the Township's Subdivision and Land Development Ordinance.

C. Pervious pavement systems are encouraged to be utilized in accordance with the standards in the Township's Zoning ordinance.

D. Infiltration facilities shall be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.

E. All facilities shall drain over a period of time not more than 72 hours from the end of the facility's inflow hydrograph, except for bioinfiltration and bioretention facilities where they shall drain over a period of time not more than 96 hours.

F. Low-flow channels are prohibited.

G. Trash racks shall be provided for all orifices equivalent to 12 inches or smaller in diameter.

H. Anti-seep collars shall be provided on all outflow culverts in accordance with the methodology in the E&S Manual unless specified otherwise below.

1. An increase in seepage length of 15 percent must be used in accordance with the requirements for permanent anti-seep collars.
2. Anti-seep collars shall be installed around the pipe barrel within the normal saturation zone of the berm.
3. Anti-seep collars and their connections to the outflow culverts shall be watertight.
4. Anti-seep collars shall extend a minimum of 2 feet beyond the outside of the principal outflow culvert.
5. The maximum spacing between collars shall be 14 times the minimum project of the collar measured perpendicular to the pipe.
6. A minimum of 2 anti-seep collars shall be installed on each outflow culvert.

I. Embankments/berms shall:

1. Not be planted with trees. Only vegetation that is 5 feet or lesser in mature height and tolerant to the conditions of embankment planting (for example: lack of water retainage in the soil) may be planted on berm tops. When this requirement is in conflict with other ordinances or regulations (for example: buffer screenings), relief may be granted from this requirement without the need for a waiver at the sole discretion of the Township Engineer.
2. Whenever possible, conform to natural topography. When such design is impracticable, the construction of the basin shall utilize slopes as flat as possible to blend with the embankment/berm into the terrain.
3. Designed to facilitate regular maintenance, mowing, and periodic de-silting and reseeding, where applicable.
4. Have side slopes no steeper than 4:1.
5. Have the top or toe of any slope located a minimum of 5 feet from any property line.
6. Have a cross-sectional top width of at least 10 feet.
7. Have low erodibility factors as per the E&S Manual and be identified on the SWM Site Plan.
8. Have cutoff/key trenches of impervious material that require fill material. The cutoff trench shall be a minimum of 8 feet wide, 2 feet deep, and have side slopes of 1 to 1.
9. Be placed in a maximum of 8 inch lifts compacted to a minimum of 95% of modified proctor density, as established by ASTM D-1557.
10. Have outlet pipes:
    a. That shall be reinforced concrete pipe with watertight joints.
    b. With energy-dissipating devise placed at the outlets.
    c. Sized to pass the 100-year storm event.
    d. Discharge to a defined watercourse with appropriate separation distance, when applicable, to carry proposed discharge flows.

11. Have emergency spillways:
    g. Capable of providing non-erosive release of the entirety of the postdevelopment 100-year design storm with at least 1 foot of freeboard when the primary outlet structure is blocked.
    h. Whenever possible, be constructed on undisturbed ground.
    i. Be constructed of reinforced concrete or other material approved by the Township Engineer.
    j. Be constructed of material that extends along the upstream and downstream berm embankment slopes.
    k. With an upstream edge a minimum of three feet below the spillway crest elevation.
    l. With a downstream slope extend, as a minimum, to the toe of the berm embankment.
    m. That do not discharge over earthen fill and/or easily eroded material.

J. For subsurface SWM facilities:
    1. Subsurface facilities shall only be considered if surface facilities are not feasible.
    2. Pretreatment shall be provided for all inflows to the subsurface facility.
    3. The excavation shall be performed with equipment that will not compact the bottom of the subsurface facility.
    4. The bottom of the subsurface facility shall be scarified prior to the placement of aggregate, where applicable.
    5. Only clean aggregate with documented porosity, free of fines, shall be allowed.
    6. The tops, bottoms, and sides of all subsurface facilities shall be covered with nonwoven geotextile fabric acceptable to the Township Engineer.
    7. Runoff shall be distributed throughout the entirety of the subsurface facility.
    8. Provisions for the collection of sediment and debris shall be provided in all facilities, including but not limited to, cleanouts and observation ports.
    9. Provide an overflow for extreme storm events that bypasses the proposed outlet structure, where applicable, to safely convey the 100-year design storm.
    10. A minimum of 2 feet of soil cover should be maintained above subsurface SWM facilities for healthy vegetative cover.
    11. Adequate Operation and Maintenance procedures shall be implemented to ensure the subsurface SWM facilities perform as they were intended including but not limited to (1) inspecting inlet controls, outlet controls, storage areas, and pre-treatment devices monthly for trash, sediment accumulation, and any other undesirable material (2) as needed, or at least annually, clean out gutters and catch basins, replace filters, evaluate drawdown time after any storm greater than one inch and (3) annually utilize cleanouts to vacuum or jet the sediment from the system, if present.

K. For permanent wet ponds:
    1. The developer shall demonstrate that such ponds are designed to protect the public health and safety.
    2. A safety bench shall be provided around the perimeter of the permanent water surface. The depth of the bench shall be a maximum of one foot for a width of at least 10 feet.
    3. An area at least 15 feet wide with slopes of 3 to 1 shall be provided from the edge of the safety bench toward the deep-water portion of the pond.
    4. Slopes in the remainder of the pond, below the permanent pool elevation, shall be a maximum of 2 to 1.
    5. Slopes above the permanent water surface shall be in accordance with the design criteria set forth for embankments/berms within this Ordinance.
    6. Wet ponds shall have a deep-water zone of at least 8 feet deep measured from the bottom of the wet pond to the top of the aquatic safety bench in order to prevent stagnation.
    7. Wet ponds shall be equipped with a manually operated drain that can be secured against unauthorized operation to allow the pond to be drained by gravity flow.

8. Wet ponds shall be provided with a water source so that the permanent water surface can be maintained, as necessary, between periods of rainfall.

9. Wet ponds shall be lined with a 4 inch thickness of clay material in order to prevent excessive infiltration and to protect against saturation of, and seepage through, the berm.

L. For dams:

1. Have minimum top of embankment as follows:

a. Class A dams

1. With a drainage area less than 320 acres, the top of embankment shall be 1 foot above the maximum water surface elevation for the emergency spillway storm.

2. With a drainage area greater than 320 acres, the top of embankment shall be 2 feet above the maximum water surface elevation for the emergency spillway storm.

b. Class B dams

1. With a drainage area less than 150 acres, the top of embankment shall be 1 foot above the maximum water surface elevation for the emergency spillway storm.

2. With a drainage area greater than 150 acres, the top of embankment shall be 2 feet above the maximum water surface elevation for the emergency spillway storm.

c. Class C dams

1. With a drainage area less than 150 acres, the top of embankment shall be 2 feet above the maximum water surface elevation for the emergency spillway storm.

2. With a drainage area greater than 150 acres, the top of embankment criteria shall be established for each individual case.

2. The classification of dams shall be in accordance with the Soil Conservation Service's criteria as found in Technical Release 60, as amended.

M. The primary outflow structure for all SWM Facilities shall be designed to pass all design storms (up to and including the one-hundred-year event) without discharging through the emergency spillway.

N. Maximum water depth in any open SWM Facility shall be no greater than 5 feet when functioning through the primary outlet structure.

O. When deemed a public safety hazard at the sole discretion of the Township, any SWM facility may be required to be fenced with a minimum 4-foot high fence of material and design acceptable to the Township. The fence shall not have an opening or gap larger than 2 inches, and shall be provided with a self-closing and self-latching gate with a minimum opening of 10 feet.

P. The length between the inflow and outflow points of SWM Facilities shall be maximized to prevent short circuiting of the runoff flowing through the facility.

Q. Floodplains:

1. Facilities and their points of discharge shall not be located within the 100-year floodplain and floodplain soils as determined by FEMA, HEC-RAS, or similar analysis. If no floodplain is defined, the floodplain is assumed to extend 50' from the top of stream bank in both directions.

2. Facility bottom elevations must be greater than the 100-year floodplain elevations. If no floodplain is defined, the floodplain is assumed to extend 50' from the top of streambank in both directions.

3. Novel approaches to stormwater management that require placement within the floodplain, including but not limited to, floodplain restorations, may be exempted from the requirements in Sections 304.Q.1 and 304.Q.2 above at the sole discretion of the Township Engineer.

R. SWM Facilities shall not be placed within 10 feet of a property line, public right-of-way, or structure as measured from the nearest point of the facility that may provide water storage.

S. All infiltration facilities shall be set back at least 10 feet from all buildings and features with sub-grade elements (e.g., basements, foundation walls, etc.). If the infiltration facilities collect runoff from the buildings or features with sub-grade elements, the bottom elevation of the infiltration facility shall be set below the elevation of the sub-grade element, where practicable.

T. All infiltration practice components shall be protected from compaction due to heavy equipment operation or storage of fill or construction material during construction. Infiltration areas shall also be

protected from sedimentation. Areas that are accidentally compacted or graded shall be remediated to restore soil composition and porosity. Adequate documentation to this effect shall be submitted to the Township Engineer for review.

U. The bottom elevation of all SWM Facilities shall be located a minimum of 2 feet above the seasonal high groundwater table or other soil limiting zone.

V. Where sediment transport in the stormwater runoff is anticipated to reach an infiltration system, appropriate permanent measures to prevent or collect sediment shall be installed prior to discharge to the infiltration system. Typical measures include sediment forebays within SWM Facilities and inlets with sumps for sediment collection. Compliance with this ordinance section is at the sole discretion of the Township Engineer.

W. Infiltration BMPs shall not receive runoff until the entire contributory drainage area to the infiltration BMP has received final stabilization.

X. Where roof drains are designed to discharge to infiltration practices, whether directly or indirectly, they shall have appropriate measures to prevent clogging by unwanted debris (i.e., silt, leaves, and vegetation). Such measures shall include, but are not limited to, leaf traps, gutter guards, and cleanouts.

Y. Stormwater management facilities excavated to rock must either be fitted with an impervious clay liner or over-excavated four feet and refilled with a suitable material mix. Suitable backfill material is subject to approval from the Township Engineer.

Z. All stormwater collection and management systems within the Historic District as defined in the Zoning Ordinance shall be designed to be underground, such as porous pavement with infiltration bed, underground tank or pipe storage, cisterns, all of which shall be subject to approval by the Township Engineer.

AA. All SWM facilities providing volume management functions must be protected from hydraulic overloading and excessive pollutant loading. The applicant must design SWM facilities providing volume management in a manner that protects these facilities from storm events that exceed their design capacities by diverting higher flows to peak rate management SWM facilities, unless the applicant can demonstrate that the SWM facility can receive higher flows without the need for increased maintenance, repair, or replacement.

BB. Underdrains may be proposed and installed beneath infiltration-based SWM facilities; however, where the design infiltration rate is at least 0.4 inch/hour, the underdrain must terminate at a structure that does not have a connected outflow pipe.

Section 305. Conveyance Facilities Standards and Methodologies

Conveyance Facilities shall:

A. Have the design discharge from drainage areas contributing to Conveyance Facilities be determined by use of the Rational Equation when the total drainage area does not exceed 100 acres.

B. Safely convey the 25-year design storm utilizing Manning's equation for one-dimensional, gradually varied, open channel flow, or pipes with gravity flow.

C. Be prohibited from connecting to or discharging into existing downstream conveyance or storage systems, whether manmade or natural, without verification of the adequacy of downstream hydraulic capacity. The downstream hydraulic capacity analysis shall either assume all peak flows are conveyed at the same time or complete a watershed analysis to the downstream system that includes time of concentration as a factor.

D. Be designed in accordance with Chapter 105 and will require a permit from DEP for any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures). Any facility of the like that does not require a permit from DEP must be able to convey, without damage to the drainage structure or roadway, runoff from the 100-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of the roadway. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of the roadway.

E. In the case of stormsewer:

   1. Be designed as a culvert for a 100-year storm frequency where storm drainage is received by means of a headwall or inlet structure, a hydraulic inlet or outlet conditions control.

2. Be sized for the design storm of the SWM Facility (i.e., stormwater basin designed for the 100-year storm shall have a tributary stormsewer system designed for the 100-year storm) for stormsewer systems that discharge directly into a SWM Facility. The conveyance calculations shall assume the downstream SWM Facility is 25% full. If site constraints do not allow for stormsewers to be sized for the SWM Facility design storm, an overflow system shall be provided to carry flow to the SWM Facility. The overflow system capacity shall be of sufficient capacity to carry the difference between the SWM Facility and stormsewer design storm.
3. Utilize design storms with increased rainfall intensities and runoff coefficients by a factor of 1.2.
4. Completely contain flows with a headwater depth one foot below the top of an inlet grate or manhole cover, and at no point cause surface discharge.
5. Be constructed with watertight joints. If Conveyance Facilities are proposed that require watertight joints, provide a note as listed in Section 401.DD.6.
6. Be designed and constructed without “knocking out” any inlet or structure corners. If inlets or structures are proposed, provide a note as listed in Section 401.DD.7.
7. Have inlets, manholes, or similar structures at all horizontal and/or vertical directional changes. Tee joints, elbows, wyes, and similar structures are prohibited.
8. Have a minimum diameter of 15 inches or an equivalent thereto. Where headroom is restricted, equivalent pipe arches may be used in lieu of circular pipe.
9. Have incremental size changes of 3 inches in diameter or greater.
10. Have the elevation of the crown (obvert) be the same, or the smaller pipe shall be higher, when there is a change in pipe size in a structure. The lowest inlet pipe invert elevation shall not be greater than the outlet pipe invert elevation.
11. Have flow velocities greater than or equal to 2.5 feet per second. If the velocity is below 2.5 feet per second at the most upstream pipe in a stormsewer system, relief may be granted from this requirement without the need for a waiver at the sole discretion of the Township Engineer.
12. Have slopes greater than or equal to 0.5%.
13. Have a minimum top of pipe depth of at least 6” below roadway sub-grade elevations or per the manufacturer’s specifications, whichever is greater, and at all locations have a minimum depth of at least 2 feet.
14. Not have inlets, manholes, or similar structures spaces more than 300 feet apart on pipe sizes up to 24 inches nor more than 450 feet apart on greater pipe sizes.
15. Have inlets designed and located in accordance with the following standards:
    a. At street intersections, inlets shall be placed in the tangent portion rather than the curved portion of the curbing.
    b. If the capacity of the shoulder, swale, curb section or depressed median section exceeds the assumed inlet capacities, the inlet capacities shall govern the spacing of inlets.
    c. If the capacity of the shoulder, swale, curb section or depressed median section is less than the inlet capacities, then the shoulder, swale, curb section or depressed section capacity shall govern the spacing of inlets.
    d. Type C inlets:
        1. Type C inlets shall be installed in curbed locations.
        2. In order to achieve greater efficiency, Type C inlets shall be spaced so as to permit 5% of the gutter flow to bypass the inlet.
        3. The capacity of a Type C inlet at a low point of a street's vertical curve may be designed to accept 4 cubic feet per second (cfs) from each direction or a maximum of 8 cfs.
        4. Inlet capacities shall be based on PennDOT Publication 13M[7], Chapter 10.
    e. Type M and Type S inlets:
        1. Type S inlets shall be installed in shoulder swale areas with back slopes of 6 horizontal to 1 vertical and steeper.

2. Type M inlets shall be installed in swale areas where the back slope is flatter than 6 horizontal to 1 vertical.
3. Inlet capacities shall be based on PennDOT Publication 13M, Chapter 10.
4. Where a drainage dike is used, the side slope of the dike shall be 8 horizontal to 1 vertical or flatter.
5. The capacity of an inlet at a low point in a swale (sump condition) shall be 16 cfs maximum.

16. Be constructed to PennDOT specifications.

F. In the case of gutters:

1. Not allow flow to encroach into adjacent roadway lanes more than one-half of the lane width.
2. Not exceed 2 inches in depth.
3. Not allow flow to cross intersections or street centerlines.

G. In the case of swales:

1. Provide 6 inches of freeboard to the top of the swale.
2. Have side slopes no steeper than 5:1 if the swale is to be mowed, and in no cases shall have side slopes steeper than 3:1.
3. Be designed for erosion prevention and stability using velocity (slopes less than 10%) or shear (all slopes) criteria in both stabilized and unstabilized condition.
4. Multiple velocities or shear stresses by the following factors when swale bends occur:
   a. 1.75: when the bend is 30 to 60 degrees.
   b. 2.00: when the bend is 60 to 90 degrees.
   c. 2.50: when the bend is 90 degrees or greater.
5. Be designed for both temporary and permanent conditions.
6. Have a minimum slope of 2%, unless specifically designed for stormwater infiltration, then have a minimum slope of 1%.
7. Swales adjacent to roadway shoulders shall be designed to prevent the passage of water onto the cartway during a 25-year frequency storm of 5-minute duration.

Section 306. General Calculation Methodologies

A. Design storm values should be obtained from the following sources depending on methodology:

1. TR-20/TR-55 precipitation frequency estimates: latest version of the Precipitation-Frequency Atlas of the United States[8], National Oceanic and Atmospheric Administration (NOAA), National Weather Service, for the 24-hour storm. If the source is replaced in full, the latest version of the replacement source shall be utilized.
2. Rational Method design intensity values: the latest version of PennDOT Publication 584[9], Chapter 7A, for the 1- through 100-year Storm (U.S. Customary).

B. Time of concentration (Tc) shall be calculated utilizing the TR-55 segmental method and the following standards:

1. The maximum sheet flow length shall be 100 feet.
   a. For predevelopment conditions, the maximum sheet flow length shall be utilized unless the applicant can demonstrate, through site-specific analysis and documentation, that the actual on-site existing or proposed conditions do not support a maximum sheet flow length.
2. Predevelopment Tc values may not be assumed; predevelopment Tc values must be calculated.
3. The minimum Tc for any watershed or sub-watershed shall be 5 minutes.
4. Postdevelopment conditions may assume a 5-minute Tc, but may never be greater than the predevelopment Tc for any watershed or sub-watershed.
5. The time of concentration for all inlets shall be the minimum Tc of 5 minutes.
6. The time of concentration for channels and pipe flow shall be computed using Manning's equation.

C. Runoff coefficients and curve numbers are listed in Appendix B.

D. Existing (predevelopment) non-forested pervious areas must be considered meadow in good condition, unless the natural ground cover generates a lower curve number or runoff coefficient.

E. Wooded areas shall be considered woods in good condition. An area is classified as wooded if a continuous canopy of trees exists over a 1/4 acre.

F. 20% of existing impervious area within the limit of disturbance, when present, shall be considered meadow in good condition in the model for existing conditions for Minor SWM Permits and Major SWM Permits with less than 5,001 SF of existing impervious area.

G. For regulated activities and redevelopment sites requiring a Major SWM Permit due to taking place on sites: 1. With greater than or equal to 5,001 SF of existing impervious area within the limit of disturbance; 2. That are not controlling the peak rate and volume of runoff from the existing impervious area in a manner consistent with this Ordinance; and 3. Whose activities do not qualify for the exemptions listed in Section 302, 100% of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions. This requirement replaces the requirement in Section 306.F above.

H. Meadow may not be used to model proposed (postdevelopment) non-forested pervious areas unless the area being modeled is specifically designed to be and is designated/delineated on the plan to remain as a bona fide meadow that may not be removed or altered by the property owner. Specified native plantings and O&M, including but not limited to routine weeding of invasive species, should be included on the plan and in any agreements if this option is chosen.

I. Runoff from proposed sites graded to the subsoil will not have the same runoff conditions as the site under existing conditions due to soil compaction, even after topsoiling or seeding. The proposed curve number or runoff coefficient shall increase by a minimum of 5% to better reflect proposed soil conditions.

J. Average antecedent moisture conditions and a Type-II distribution storm shall be utilized for runoff calculations.

K. Alternative methods of modeling volume and rate controls may be accepted on a case-by-case basis as approved by the Township Board of Supervisors.

Section 307. Volume Control Standards and Methodologies

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 2-year 24-hour storm event. Volume controls shall be implemented using the Design Storm Method in Section 307.B below.

A. Volume controls shall be required for all regulated activities. The green infrastructure and LID practices provided in the BMP Manual shall be utilized for all regulated activities wherever possible.

B. Water volume controls shall be implemented using the *Design Storm Method* (CG-1 in the BMP Manual): This method required detailed modeling based on site conditions.

1. Postdevelopment total runoff shall not be increased from predevelopment total runoff for all storms equal to or less than the NOAA partial duration 90% Upper Confidence Interval 2-year 24-hour rainfall depth with appropriate NRCS distribution.

2. The following applies in order to estimate the increased volume of runoff for the 2-year 24-hour duration precipitation event:

a. To calculate the runoff volume (cubic feet) for existing site conditions (predevelopment) and for the proposed development site conditions (postdevelopment), applicant shall use the NRCS Type-II Curve Number runoff method (SCS) as shown following this subsection. Table B-2 in Ordinance Appendix B is available to guide a qualified professional and/or an applicant to calculate the stormwater runoff volume.

NRCS Type-II Curve Number runoff method (SCS)
Step 1: Runoff (in) = $Q = (P - 02S)^2/(P + 0.8S)$ where
P = 2-year 24-hour rainfall depth (in)
S = (1,000/CN) – 10, the potential maximum retention
Step 2: Runoff Volume (Cubic Feet) = Q x Area x 1/12
Q = Runoff (in)

Area = Drainage Area (sq ft)

3. For all regulated activities, an additional 20% of water volume shall be captured and added to the required volume control.

4. Runoff volumes shall be computed separately for each soil-cover complex of a drainage area and then combined. The use of a weighted CN value for volume calculations is not acceptable.

5. The entirety of the calculated volume control shall be either reused, evapotranspired, or infiltrated through structural or nonstructural means.

C. The applicant must demonstrate how the required volume is controlled through SWM Facilities or Best Management Practices (BMPs) which shall provide the means necessary to capture and reuse, evaporate, transpire, or infiltrate the total runoff volume.

1. If natural resources exist on the site, the applicant is required to submit a SWM Site Plan which shall determine the total acreage of protected area where no disturbance is proposed.

   a. 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.

   SWM Site Area = Total Site Area (for both pre and postdevelopment conditions) – Protected Area

   b. Natural resource areas shall be calculated based upon the Natural Resource Protection Requirements within the Township's Zoning Ordinance. See table B-1 in Appendix B for guidance to assess the total protected area. For additional reference, see Chapter 5, Section 5.4.2, of the PA BMP Manual.

   c. Natural resources shall be protected to their maximum extent possible but in no case shall be less than the requirements identified in the Township's Zoning Ordinance.

2. Calculate the volume controls provided through nonstructural BMPs. Table B-4 in Ordinance Appendix B is recommended as guidance.

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

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

4. Calculate the volume controls provided through structural SWM Facilities and BMPs. Table B-5 in Ordinance Appendix B is recommended as guidance. See PA BMP Manual, Chapter 6, for description of the BMPs.

5. Infiltration SWM Facilities and BMPs intended to receive runoff from developed areas shall be selected based on the suitability of soils and site conditions (See Table B-5 in Ordinance Appendix B for a list of Infiltration BMPs). Infiltration BMPs shall be constructed on soils that have the following characteristics:

   a. A minimum soil depth of 24 inches between the bottom of the infiltration BMPs and the top of bedrock, seasonally high groundwater table, or other soil limiting zones.

   b. An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by double-ring infiltrometer tests as described in Section 403.A. The minimum infiltration to be utilized shall be a rate of 0.25 inch/hour and for acceptable rates a safety factor of 50% should be applied for design purposes (e.g., for soil which measured 0.5 inch/hour, the BMP design should use 0.25 inch/hour to ensure safe infiltration rates after construction).

   c. All infiltration facilities shall be designed to completely infiltrate runoff volume not less than 1 day (24 hours) and not more than 3 days (72 hours) from the end of the facility's inflow hydrograph.

6. A soils evaluation of the project site shall be required to determine the suitability of infiltration facilities in accordance with Section 403.A. All regulated activities are required to perform a detailed soils evaluation by a qualified design professional which at minimum addresses soil permeability, depth to bedrock, depth to seasonally high water table, or other soil limiting zone, and subgrade suitability in accordance with Section 403.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. Perform a subsurface investigation in accordance with the methodology and frequency identified in Section 403.A.

c. Provide field tests (such as double ring infiltrometer tests) at the level of the proposed infiltration surface of SWM Facilities and BMPs to determine the appropriate infiltration rate. Percolation shall not be utilized for stormwater design purposes.

d. Design the infiltration SWM Facility and BMP based on field determined capacity at the level of the proposed infiltration surface and based on the safety factor of 2 (50%). If the infiltration rates vary significantly across the subject site, a higher factor of safety may be required at the discretion of the Township Engineer.

e. The applicant shall utilize on-lot infiltration structures to the maximum extent practicable. The applicant must demonstrate that the soils are conducive for infiltration on the lots identified.

f. All runoff to an infiltration SWM Facility or BMP must either be pretreated or the volume control requirements must be increased to account for the loss of volume in the facility due to sediment accumulation. This loss should be based on the expected life of the facility. The pretreatment must remove 50% of the total suspended solids in the runoff from the facility's tributary area maximum design storm.

g. Groundwater mounding may occur beneath stormwater management structures designed to infiltrate stormwater runoff. Concentrating recharge in a small area can cause groundwater mounding that affects the basements of nearby homes and other structures. A groundwater mounding analysis must be performed to determine whether or not the underlying aquifer will be able to manage the infiltration loading proposed without raising the groundwater to within two feet of the infiltration surface or affecting nearby structures. A simplified spreadsheet was developed by USGS to solve the Hantush Analytical Equation, which can be used to calculate groundwater mounding. The documentation and spreadsheet can be found in the USGS publication *Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basin*, also available at http://pubs.usgs.gov/sir/2010/5102/.

h. If the regulated activity is not considered land development and requires a Minor SWM Permit, other information – such as soil survey data – supporting the use of infiltration SWM Facilities may be utilized in lieu of Section 307.C.6.a-g.

D. For redevelopment sites, one of the following minimum design parameters shall be accomplished, whichever is most appropriate for the given site conditions as determined by the Township Board of Supervisors:

1. All existing and proposed onsite impervious areas shall meet the full requirements specified by Section 307.A-C.

2. Reduce the predevelopment onsite impervious area by at least 20% in postdevelopment conditions.

E. For sites which the applicant has adequately demonstrated are not conducive for infiltration (< 0.25 inch/hour infiltration rate), alternative volume control methods may be utilized including, but not limited to, PADEP *Managed Release Concept*[10] (MRC). Adequate demonstration and alternative methodology shall be approved by the Township Board of Supervisors.

Section 308. Peak Rate Control Standards and Methodologies

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 and Delaware River South Watersheds.

A. Rate controls shall be required only for regulated activities required a Major SWM Permit; regulated activities that require a Minor SWM Permit are not required to provide rate controls.

B. For regulated activities under 1 acre in size, Rational Method for peak rate determination and Modified Rational for routing design storms, or TR-55, may be used for the calculations of rate controls; this Ordinance shows no preference for either method. For regulated activities greater than or equal to 10 acres, utilize the TR-55 method.

C. Standards for managing runoff for the 2-, 5-, 10-, 25-, 50-, and 100-year 24-hour design storms are shown in the Tables below. Development sites located in each of the management districts must control proposed development conditions runoff rates to existing conditions runoff rates for the design storms in accordance with Section 308.D.

Peak Rate Runoff Control standards by Stormwater Management Districts in the Neshaminy Creek Watershed		
District	**Design Storm Postdevelopment (Proposed Conditions)**	**Design Storm Predevelopment (Existing Conditions)**
A	2-year	1-year
	5-year	5-year
	10-year	10-year
	25-year	25-year
	50-year	50-year
	100-year	100-year
B	2-year	1-year
	5-year	2-year
	10-year	5-year
	25-year	10-year
	50-year	25-year
	100-year	50-year
C	2-year	1-year
	5-year	5-year
	10-year	10-year
	25-year	25-year
	50-year	50-year
	100-year	100-year

Peak Rate Runoff Control standards by Stormwater Management Districts in the Delaware River South Watershed		
District	**Design Storm Postdevelopment (Proposed Conditions)**	**Design Storm Predevelopment (Existing Conditions)**
A	2-year	1-year
	5-year	5-year
	10-year	10-year
	25-year	25-year
	50-year	50-year
	100-year	100-year
B	2-year	1-year
	5-year	2-year
	10-year	5-year
	25-year	10-year
	50-year	50-year
	100-year	100-year
C*	2-year	1-year
	5-year	2-year

*In District C, development sites which can discharge directly to the Delaware River South main channel or major tributaries or indirectly to the main channel through an existing stormwater drainage system (i.e., storm sewer or tributary) may do so without control of postdevelopment peak rate of runoff greater than the five-year storm. Sites in District C will still have to comply with the volume control requirements, the water quality requirements, and stream bank erosion criteria. If the postdevelopment runoff is intended to be conveyed by an existing stormwater drainage system to the main channel, assurance must be provided that such system has adequate capacity to convey the flow greater than the two-year predevelopment peak flow or will be provided with improvements to furnish the required capacity. When adequate capacity in the downstream system does not exist and will not be provided through improvements, the postdevelopment peak rate of runoff must be controlled to the predevelopment peak rate as required in District A provisions (i.e., ten-year postdevelopment flows to ten-year predevelopment flows) for the specified design storms.

D. Proposed conditions rates of runoff from any regulated activity shall not exceed eighty percent (80%) of the peak release rates of runoff from existing conditions for at any point in time during the design storms specified in the Tables above and the Stormwater Management District Watershed Map (Appendix D). The runoff rate control standards shall be applied at the site's boundary to each abutting lot, roadway, watercourse, or receiving storm sewer system.

E. If there is any increase in postdevelopment peak rate timing of runoff, a downstream analysis shall be performed to confirm downstream properties are not flooded, damaged, or adversely affected.

F. The boundaries of the stormwater management districts are shown on official maps and are available for inspection at the Township office and County planning offices. A copy of the maps at a reduced scale are included in Appendix D. The exact location of the stormwater management district boundaries as they apply to a given development site shall be determined by mapping the boundaries using the contours provided as part of the SWM Site Plan.

G. For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall meet the management district criteria for the district in which the discharge is located.

H. When calculating the allowable peak runoff rates, off-site tributary drainage areas to the subject development site do not have to be accounted for. However, the applicant shall demonstrate that on-site SWM Facilities and BMPs are capable of safely conveying off-site tributary drainage areas through the development site without causing erosion or negative downstream impacts.

I. The stormwater management site area is the only area subject to the management district criteria. Nonimpacted areas or nonregulated activities bypassing the stormwater management facilities would not be subject to the management district criteria.

J. For redevelopment sites, one of the following minimum design parameters shall be accomplished, whichever is most appropriate for the given site conditions as determined by the Township Board of Supervisors:

    1. All existing and proposed onsite impervious areas shall meet the full requirements specified by Section 308.A-I.

    2. Reduce the predevelopment onsite impervious area by at least 20% in postdevelopment conditions.

Section 309. Water Quality Standards and Methodologies

SWM Facilities and BMPs shall be provided onsite to control post-construction stormwater impacts from regulated activities and meet state water quality requirements.

A. Water Quality controls shall be required for all regulated activities requiring a Minor or Major SWM Permit.

B. SWM facilities must include pretreatment appropriate to the type of SWM facility and anticipated pollutant loading.

C. Applicants must manage the net change in pollutant loads for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN) up to and including the 2-year 24-hour storm event when compared to preconstruction pollutant loads (i.e. postdevelopment pollutant loads shall not be greater than predevelopment).

    1. The DEP PCSM Spreadsheet or similar worksheet shall be utilized to calculate the net change in pollutant loads.

D. If the applicant infiltrates, evapotranspires, or reuses the entirety of the volume control requirements in Section 307, it is assumed the water quality standards of this Section are met and Section 309.B is not required.

E. SWM Facilities and BMPs that moderate the temperature of stormwater shall be used to protect the temperature of receiving waters.

Section 310. Stream Channel Protection Requirements

For regulated requiring a Major SWM Permit, the applicant shall comply with the following stream channel protection requirements to minimize stream channel erosion and associated water quality impacts to the receiving waters.

A. The peak flow rate of the postconstruction 2-year, 24-hour design storm shall be reduced to 80% of the predevelopment peak flow rate of the 1-year, 24-hour duration precipitation.

B. The minimum orifice size in the outlet structure to the SWM Facility shall be 3 inches in diameter, and a trash rack shall be installed to prevent clogging. For sites with small drainage areas contributing to the SWM Facility that do not provide enough runoff volume to allow a 24-hour attenuation with the 3-inch orifice, the calculations shall be submitted showing this condition.

C. When the calculated orifice size is below 3 inches, gravel filters (or other methods) are recommended to discharge low-flow rates. When filters are utilized, maintenance provisions shall be provided to ensure filters meet the design function.

Section 311. Hotspot Uses

A. All hotspot uses, as identified in Appendix G of this Ordinance, shall include a Stormwater Pollution and Prevention Plan (SWPP) as part of the O&M Plan. The SWPP shall implement regular pavement sweeping, practice proper salt storage, maintain a spill prevention and response plan with on-site spill kit with oil booms, perform regular visual inspection of the site and SWM Facilities, and report to the Township every 3 years on the implementation and use of this plan.

   1. Infiltration of runoff from hotspot uses will only be allowed after the runoff has been pre-treated by one or more SWM BMPs designed to treat the quality of stormwater runoff based upon the pollutants expected at the hotspot use. The SWPP shall include routine maintenance and cleaning of the pre-treatment BMPs.

B. All hotspot uses shall utilize a “treatment train” that treats any and all required stormwater management volumes in a series of at least 2 water quality SWM BMPs.

Section 312. Erosion and Sediment Control and Grading Requirements

A. General provision and compliance.

   1. No changes shall be made in the contour of the land and no grading excavation, removal nor destruction of the topsoil, trees or other vegetative cover of the land shall be commenced until such time that a plan for minimizing erosion and sedimentation has been:

      a. Processed and reviewed by the Township Engineer for all regulated activities;

      b. Processed and reviewed by the Bucks County Conservation district for all land development and regulative activities requiring an NPDES Permits; and

      c. Approved by the Board of Supervisors for all land development.

   2. The Board of Supervisors, in its consideration of all preliminary subdivision and land development plans, shall condition its approval upon the execution of erosion and sediment control measures as contained in the standards and specification of the Bucks County Conservation District, the local designee for the Pennsylvania Department of Environmental Protection, Bureau of Soil and Water Conservation.

   3. Final approval of plans and specifications for the control of erosion and sedimentation shall be concurrent with the approval of the SWM permit or final subdivision or land development plans and become a part thereof.

   4. Final plans for minimizing erosion and sedimentation as approved will be incorporated into the agreement and bond requirements as required by the Township.

   5. No subdivision or land development plan shall be approved unless:

      a. There has been an erosion and sedimentation plan approved by the Township Engineer and the Bucks County Conservation District hat provides for minimizing erosion and sedimentation and an improvement bond or other acceptable security is deposited with the Township in the form of an escrow guaranty which will ensure installation and completion of the required improvements; or

      b. There has been a determination by the Board of Supervisors that a plan for minimizing erosion and sedimentation is not necessary. The Board of Supervisors may waive the above requirement for minor subdivisions.

   6. At the time a building permit is applied for, a review shall be conducted by the Township Engineer to ensure conformance with the plan or permit as approved. During the construction, further consultative technical assistance will be furnished, if necessary, by the Township Engineer and the Bucks County Conservation District. The Township Engineer shall inspect the development site and enforce compliance with the approved plans or permit.

   7. Permission for clearing and grading prior to recording of land development plans may be requested under temporary easements or other conditions satisfactory to the Township and Township Engineer.

8. In the event that the developer proceeds to clear and grade prior to plan or permit approval and recordation without satisfying conditions specified under Section 312.A.6, the Township shall revoke its approval of the plan or permit.

B. General erosion control standards.

1. Measures used to control erosion and reduce sedimentation shall, as a minimum, meet the standards and specifications of the Bucks County Conservation District and PADEP.

2. In cases where the Bucks County Conservation District does not have standards and specifications for erosion and sedimentation control, other known and commonly accepted standards and specifications may be used as approved by the Township Engineer.

3. The following standards to minimize erosion and sedimentation shall be followed:

a. Stripping of vegetation, regrading or other development shall be undertaken in a manner that will minimize erosion.

b. Preserve salient natural features, keep fill operations to a minimum and ensure conformity with topography so as to create the least erosion potential and adequately handle the volume and velocity of surface water run-off.

c. Whenever feasible, natural vegetation shall be retained, protected and supplemented.

d. The disturbed area and the duration of exposure shall be kept to a practical minimum.

e. Temporary vegetation and/or mulching shall be used to protect exposed areas during development.

f. The permanent (final) vegetation and mechanical erosion control and drainage facilities shall be installed as soon as practical.

g. Provisions shall be made to effectively accommodate the increased run-off caused by changed soil and surface conditions during and after development. Where necessary, the rate of surface water run-off shall be mechanically retarded.

h. Sediment in the water run-off shall be trapped until the disturbed area is stabilized by the use of debris basins, sediment basins, silt traps or similar measures.

i. Swales shall be sodded, utilize jute matting or other similar measures to ensure proper growth of ground cover.

j. Tire cleaning areas shall be provided and properly maintained at each point of egress from the development site.

C. Temporary Stabilization

1. Upon temporary cessation of an earth disturbance activity or any stage or phase of an activity where a cessation of earth disturbance activities will exceed four days, the site must be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities.

2. For an earth disturbance activity or any stage or phase of an activity to be considered temporarily stabilized, the disturbed areas must be covered with one of the following: (i) a minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation; or (ii) an acceptable BMP which temporarily minimizes accelerated erosion and sedimentation.

D. Permanent Stabilization

1. Upon final completion of an earth disturbance activity, or any stage or phase of an earth disturbance activity, the site must immediately have topsoil restored, replaced, or amended, seeded, mulched or otherwise permanently stabilized and protected from accelerated erosion and sedimentation. Acceptable soil restoration practices are identified by DEP.

2. E&S BMPs must be implemented and maintained until the permanent stabilization is completed. Once permanent stabilization has been established and approved by the Township, the temporary E&S BMPs must be removed and, if an NPDES permit or E&S permit was obtained for the project, an NOT must be submitted to DEP or the District. Any areas disturbed in the act of removing temporary E&S BMPs must be permanently stabilized.

3. For an earth disturbance activity, or any stage or phase of an earth disturbance activity, to be considered permanently stabilized, the disturbed areas must be covered with one of the following: (i) a minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation; or (ii) an acceptable BMP which permanently minimizes accelerated erosion and sedimentation.

E. Protection of Site Infiltration Properties During Earth Disturbance:

3. Where a SWM Site Plan will be implemented to manage post-construction stormwater in whole or part through on-stie infiltration, the permittee must protect areas proposed for infiltration stormwater facilities from sedimentation and compaction during earth disturbance activities to maintain the infiltration capacity of soils.

4. Site access must be limited to designated access roads that are identified on an approved E&S Plan. As part of the permanent stabilization process, all post-construction pervious surfaces associated with access roads and other locations on-site that have been subjected to soil compaction must be restored using methods identified in DEP's guidance or other approved methods.

5. Conversion of E&S BMPs to infiltration stormwater facilities may be completed when the drainage area to be treated by infiltration stormwater facilities is permanently stabilized.

   a. The applicant must remove accumulated sediment and soils from E&S BMPs to the design infiltration depth during conversion to infiltration stormwater facilities. Excavation to remove sediment must be performed to a depth where the underlying soils are dry.

   b. The applicant must perform construction confirmation testing for infiltration capacity in accordance with Section 410.C.2.d

F. Discharges to Special Protection and Impaired Waters

1. For stormwater discharges to surface waters with designated or existing uses of HQ or EV under 25 Pa. Code Chapter 93 and for stormwater discharges to surface waters impaired for sediment and/or nutrient-related causes, the applicant must design and implement non-discharge alternatives or ABACT BMPs for all earth disturbance activities.

G. Erosion Potential Analysis

1. For earth disturbance activities requiring an NPDES permit or E&S permit from DEP or the District that includes an overland discharge of stormwater, an erosion potential analysis is required to demonstrate that stormwater discharges from the project site during and following construction will not cause accelerated erosion up to the 10-year/24-hour storm event for the entire flow path to the surface water when stormwater flows are concentrated, such as outflows from BMPs and SCMs, and will be directed to areas on the project site and/or off-site that are not surface waters or conveyances that discharge directly to surface waters. A discharge point (DP) must be identified on E&S Plans and/or SWM Site Plans at the outflow of the BMP or SWM Facility to denote a location where an analysis has been performed. Non-surface waters include swales, ditches, channels, open areas, fields, forests, and riparian buffers.

2. An erosion potential analysis is not required when a new channel will be designed and constructed to convey stormwater runoff in accordance with DEP's E&S Manual.

H. General Grading Standards:

1. All lots, tracts or parcels shall be graded to provide proper drainage away from buildings and dispose of it without ponding.

2. All land within a development shall be graded to drain and dispose of surface water without ponding, except where ponding in SWM Facilities is part of the SWM Plan for the site.

3. Concentration of surface water run-off shall be permitted only in swales, watercourses, natural drainage channels, or SWM Facilities.

4. Edges of slopes shall be a minimum of 5 feet from property lines or right-of-way lines in order to permit the normal rounding of the edge without encroaching on the abutting property.

5. During grading operations, necessary measures for dust control shall be exercised.

6. In general, proposed lot slope shall not be flatter than 2%

7. Finished floor elevations for all proposed buildings shall be shown on the grading plan.

8. Where practical, the ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than 5% for a minimum distance of 10 feet measured perpendicular to the face of the wall, except as permitted by International Building Code Section 1804.4.
9. Perimeter grades at the corners of buildings shall be shown on the grading plan.
10. Proposed spot elevations for swale high points and at lot corners shall be shown on the grading plan.
11. Where inlets are proposed at low points in streets or lot grading, adequate relief shall be provided to prevent excessive ponding in the event of inlet clogging.
12. The grading plan shall not allow concentrated runoff on adjoining properties.
13. Drainage swales necessary to control surface drainage between lots shall be centered about the common property lines.
14. On-lot drainage swales shall be designed to provide positive conveyance of surface water from the individual lot. Each individual lot shall convey stormwater from the individual lot. Each individual lot shall convey stormwater from the lot to a storm sewer system, street or major drainageway without crossing or combining with stormwater from more than the adjacent lot.
15. Drainageways for major surface runoff (swales) shall be confined to open areas or along property lines. Drainageways on or adjoining private property may require drainage easements for maintenance purposes.

I. Excavations and fills.

1. No excavation or fill shall be made with a face or surface slope steeper than four horizontal to one vertical unless a retaining wall, constructed in accordance with approved standards, is provided to support the face or surface slope of said excavation or fill.
2. Adequate provisions shall be made to prevent surface water from damaging the cut face of excavations and the sloping surface of fills.
3. Cut and fill shall not endanger adjoining property.
4. Fill shall be placed and compacted so as to minimize sliding or erosion of the soil.
5. Fills shall not encroach in floodplain areas or wetlands.
6. Fills placed adjacent to floodplains shall have suitable protection against erosion during flooding.

J. Responsibility.

1. Each person, corporation or other entity which makes any surface changes shall be required to:
    a. Collect on-site surface run-off and control it to a point of discharge into the natural watercourse of the drainage area having adequate capacity.
    b. Adequately handle existing off-site run-off through the development.
    c. Provide and install all temporary and permanent drainage and erosion control improvements, as required by the approved sedimentation and erosion control plan.
2. Whenever sedimentation is caused by stripping of vegetation, regrading, or other development, it shall be the responsibility of the person causing such sedimentation to remove it from all affected surfaces, drainage systems, and watercourses on-site and off-site and to repair any damage at the developer’s expense as quickly as possible following a storm event.
3. Maintenance of all drainage facilities and watercourses, both existing and proposed, within any proposed subdivision or land development shall be the responsibility of the developer until such time as one of the following is accomplished:
    a. A right-of-way for these facilities is offered for dedication by the developer and is accepted by the Township; it shall then be the responsibility of the Township.
    b. An easement acceptable to the Township is established. In the case of a subdivision, the maintenance shall then be the responsibility of the individual lot owners over whose property the easement passes. For land developments, the maintenance shall then be the responsibly of the owner.

c. A homeowners' association, approved by the Township, assumes responsibility for the maintenance of the development, including the maintenance of the watercourses and/or drainage facilities.

4. It is the responsibility of any person, corporation, or other entity doing any work on or across a watercourse, swale, floodplain or right-of-way to return such areas to their original or equal condition after such activity is completed.

5. No person, corporation or other entity shall block, impede the flow of, alter, construct any structure, deposit any material or thing, or perform any work which will affect normal or flood flow in any watercourse without having obtained prior approval from the Township and/or Pennsylvania Department of Environmental Protection, whichever is applicable.

K. All plans and permits shall include the preservation of topsoil on the site of the development. Topsoil from areas to be disturbed shall be stripped and piled on site and ultimately spread out on the stie as appropriate. The site area stripped of topsoil shall be kept to a minimum, and no topsoil shall be removed from the site unless otherwise approved in writing by the Township.

ARTICLE IV – SWM SITE PLAN AND REPORT SUBMISSION REQUIREMENTS

Section 401. SWM Site Plan Requirements

SWM Site Plan materials shall be submitted to the 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. Project Information:
   1. Project name
   2. Project address
   3. Name and address of applicant and, if separate from applicant, property owner
   4. Name and address of the qualified professional responsible for project design
   5. Applicable tax parcel ID number(s)

B. Project Description:
   1. General description of the project
   2. Existing and proposed land use(s)
   3. Expected project time schedule and estimated construction duration
   4. General description of proposed SWM techniques, SWM and Conveyance Facilities, and overall stormwater management concept for the project.
   5. General description of proposed ESC techniques and facilities and a note referencing a separate ESC Plan by title and date.
   6. A general description of nonpoint source pollution controls.
   7. 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.
   8. If methods other than LID and green infrastructure are proposed to achieve the stormwater controls required under this Ordinance, provide a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.

C. Date of submission, and the dates of all revisions

D. Graphical and written scale on all drawings, maps, details, profiles, and other items as necessary. The plan scale shall be one inch equals no more than 50 feet. For tracts of 20 acres or more, the scale shall be one inch equals no more than 100 feet

E. North arrow

F. Location map at a minimum scale of 1 inch equals 800 feet showing the relation of the tract to adjoining property and to all streets, roads, municipal boundaries, and other identifiable landmarks existing within 800 feet of any part of the subject property

G. Lot size in acres and square feet and metes and bounds of the entire tract perimeter marked to the nearest foot and bearings to the nearest degree

H. Existing and proposed contours at intervals of 1 or 2 feet

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

J. A determination of site conditions in accordance with the BMP Manual and this Ordinance. A detailed site evaluation shall be completed for projects proposed in environmentally sensitive areas such as brownfields

K. Soil names, depths, slopes, boundaries, hydrologic soul group classification, and limitations

L. Location of all existing and proposed on-site improvements, including but not limited to, structures, buildings, and impervious surfaces

M. The characteristics of the regulated activities, including the past, present and proposed land uses and vegetative covers and the proposed alteration to the project site

N. Location of improvements outside of the property boundary that may be affected by the project

O. Location of all existing and proposed utilities and utility easements on-site and within 50 feet of the property line, including but not limited to on-lot wastewater facilities, water supply wells, sanitary sewers, water lines, gas lines, electric lines, and communications lines. On-lot wastewater facilities and water supply wells shall not be installed within 100' of each other and SWM Facilities. This setback shall be identified on the plan.

P. An Existing Resource and Site Analysis Map (ERSAM) showing the location of all environmentally sensitive features including, but not limited to, woodlands, steep slopes, ponds, lakes, streams, wetlands, vernal pools, stream buffers, open channels, existing recharge areas, floodplains, and significant karst features (including but not limited to sinkholes, rock pinnacles, and closed depressions). If no sensitive natural features are present on the site, provide a note as listed in Section 401.DD.8 below, and provide evidence of their absence. See Section 403.B below for further requirements on the identification of wetlands.

    1. The area of each of the environmentally sensitive feature shall be calculated and identified on the plan in acres and square feet.

    2. The location of all surface waters of this Commonwealth that may receive runoff from the project site and their classification under 25 Pa. Code Chapter 93 shall be included in the ERSAM.

Q. Location and clear identification of the type of permanent SWM and Conveyance Facilities and BMPs

R. Proposed limit of disturbance line(s), disturbed area, project stie boundary, areas protected from disturbance in acres and square feet, and site access.

S. Construction details and material schedules including data necessary for proper construction

T. Plan and profile drawings of all ESC, SWM and Conveyance Facilities, and BMPs including but limited to basins, drainage structures, pipes, open channels, sediment traps, and swales

    1. Plan and profiles for the same facilities shall be displayed together on the same sheet

    2. All facilities shall be clearly labeled, with labels matching calculations and designations within the SWM Report

    3. All plans and profiles shall provide clear labels of applicable data necessary for proper construction, including but not limited to inverts, top of grate elevations, pipe slopes, materials, spillway elevations and widths, outlet structure elevations, orifice sizes and elevations, basin bottom elevations, etc.

    4. Plans and profile drawings may take the place of, supplement, or be combined with construction details where desired as long as the above standards and overall design clarity are maintained.

U. A landscape plan including the type, location, and number of landscaping plantings specification for all temporary and permanent ground covers and for all stormwater management facilities. The specification shall be specified for each type of SWM Facility.

V. Pre- and post-drainage area maps as described in Section 402.D

W. Location and results of all on-site infiltration testing and soil characterization for SWM Facilities and percolation tests for on-lot wastewater facilities.

X. An erosion and sediment control (ESC) plan. Note that further review by the county conservation district/reviewing authority may be required per Section 301.L. The ESC Plan shall include the following:

    1. All SWM Site Plan requirements.

    2. A narrative description of the location and type of perimeter and on-site BMPs used before, during and after the earth disturbance activity.

    3. A sequence of BMP installation and removal in relation to the scheduling of earth disturbance activities, prior to, during and after earth disturbance activities that ensure the proper functioning of all BMPs. This schedule shall include a schedule of inspections for critical states of stormwater facility installation.

    4. A maintenance program which provides for the operation and maintenance of BMPs and the inspection of BMPs on a weekly basis and after each stormwater event, including repair or

replacement of BMPs to ensure effective and efficient operation. The program must provide for completion of a written report document each inspection and all BMP repair, or replacement and maintenance activities.

5. Procedures which ensure that the proper measures for the recycling or disposal of materials associated with or from the project site will be undertaken in accordance with conservation district and DEP requirements.

6. Identification of potential thermal impacts to surface waters of this Commonwealth from the earth disturbance activity including BMPs to avoid, minimize or mitigate potential pollution from thermal impacts.

7. Identification of naturally occurring geologic formations or soil conditions that may have the potential to cause pollution after each disturbance activities are completed and SWM facilities are operation and development of a management plan to avoid or minimize potential pollution and its impacts, including but not limited to sinkholes and other karst features.

Y. An O&M Plan for all existing and proposed physical stormwater management facilities in accordance with Section 503. This plan shall address short-term and long-term responsibilities for O&M which includes inspection of SWM facilities and includes the repair, replacement, and routine maintenance of the SWM facilities to ensure proper long-term function and operation. The plan must 1) include schedules for inspections and routine maintenance; 2) provide for completion of a written report documenting each inspection and all SWM repair and maintenance activities; and 3) describe access to the SWM facilities. The O&M Plan must stipulate that all documentation must be retained by the entity responsible and be made available for inspection upon request. The O&M procedures identified by DEP must be used unless alternative procedures are approved by the Township.

Z. SWM Conservation Easements for all structural and non-structural SWM Facilities, Conveyance Facilities, BMPs, and designated meadows. When present, provisions for permanent access to SWM Conservation Easements shall also be granted to the Township via a note as listed in Section 401.DD.9 below.

1. Easements shall be a minimum of 30’ in width, and must extend at least 5’ beyond the edge or top of bank of any SWM facility.

2. Where possible, easements should be centered on the facilities within the easements.

3. Easements located adjacent to a structure do not need to be a minimum of 30’ in width and shall be adjusted to fit the site accordingly to the Township Engineer’s satisfaction.

4. Except for flatwork (i.e. asphalt, sidewalk, etc.) or lawn, nothing shall be placed, stored, erected, constructed over, planted, or otherwise located within an easement other than the SWM facilities within the easement. If SWM conservation easements are required on the site, provide a note stating such as listed in Section 401.DD.10 below.

5. Easements shall be identified with metes and bounds. In the case of conveyance facilities such as pipes and swales, and if desired by the applicant, a note as listed in Section 401.DD.11 below may be added to the plan in lieu of metes and bounds stating that easements are to be located and offset from the center of the installed conveyance facility. Subterranean facilities utilizing this alternative easement identification method shall use metal marking tape – or other methods that provide simple identification from the surface as reviewed and accepted by the Township Engineer – in order to mark the location of said facilities; subsurface conveyance facilities shall add the identification method to the note required above, and the identification method shall be added to relevant construction details.

6. Roof leader manifolds and discharges shall also require SWM Conservation Easements, but may be sized less than 30’ in width, and are exempt from the requirement in section 401.Z.3 above as long as the items above the manifolds and/or discharges do not negatively affect their function.

AA. An assignment of impervious area to each individual lot that may not be exceeded at the time of construction and is accounted for in the SWM Report

BB. A list of any permits or authorizations related to stormwater management, erosion and sediment control, waterways and wetlands, or other relevant plan authorizations/permits other than those required by the Township, including but not limited to Conservation District adequacy letters; NPDES permits; PADEP/ACOE water obstruction and encroachments permits; FEMA CLOMR/LOMRs; PNDI clearances; PennDOT HOP approvals when the proposed project encroaches into or impacts a PennDOT right-of-way; and other appropriate permits as determined by the Township. The reviewing

authority for each permit shall also be included in this list. If no outside permits are required, provide a note as listed in Section 401.DD.12 below.

CC. Reasonable and appropriate plan and drafting requirements, design standards, and improvement requirements from the Township's Subdivision and Land Development Ordinance, Zoning Ordinance, and other applicable local Ordinances shall be followed in preparing the SWM Site Plan.

DD. Notes, signature blocks, and certifications:

1. "(Township Engineer or Township designee), on this date, (signature date), has reviewed and hereby certifies that the SWM Site Plan appears to meet all design standards and criteria of the stormwater management ordinance. Strict compliance with the stormwater management ordinance, however, is the responsibility of the applicant."
2. "(Applicant or owner), on this date, (signature date), acknowledges that SWM and Conveyance Facilities and BMPs are permanent fixtures and may note be modified, removed, filled, landscaped, or otherwise altered without written approval of Lower Makefield Township."
3. "(Qualified profession responsible for project design), on this date, (signature date), certified that this plan complies with the ordinances, provisions, and regulations of the Township and any other applicable entities." A seal and dated signature shall accompany this statement.
4. "Lower Makefield Township is not responsible for the maintenance of any area not dedicated to an accepted for public use."
5. "The Operation and Maintenance Agreement and Plan is part of the plan. If the Owner fails to adhere to the terms of the agreement and plan, the Township may perform the services required and charge the owner appropriate fees."
6. If Conveyance Facilities are proposed that require watertight joints, "All stormwater conveyance facilities shall be constructed with watertight joints."
7. If inlets or other structures are proposed, "The knocking out of inlet or other structure corners is prohibited."
8. If no sensitive natural features are present on the stie per Section 401.P above, "(Qualified professional responsible for project design), on this date, (signature date), certifies that there are no environmentally sensitive features on the project site including, but not limited to, woodlands, steep slopes, ponds, lakes, streams, wetlands, vernal pools, stream buffers, open channels, existing recharge areas, floodplains, and significant karst features."
9. If SWM Conservation Easements and/or Riparian Buffer Easements are required on the site per Section 303.C and/or Section 401.Z above, "The Landowner hereby grants permission to the Township, its authorized agents, and employees access to any and all SWM Conservation Easements and Riparian Buffer Easements on the property."
10. If SWM Conservation Easement are required on the site per Section 401.Z above, "Except for flatwork or lawn, nothing shall be placed, stored, erected, constructed over, planted, or otherwise located within an easement other than the SWM Facilities within the easement. SWM Facilities must be protected and maintained to function as designed. If the entity identified in this easement as responsible for maintenance fails to properly address deficiencies identified in writing by the Township, the District, DEP, or other government agency within 180 days of receiving written notice of the deficiency, the Township, the District, DEP, or other government agency may cause the maintenance to be performed. The full cost of the maintenance may be billed to the entity identified as responsible for maintenance." Additionally a not must be placed on the Plan identifying the party responsible for assuring the continued functionality and performing required maintenance of any easement.
11. If any easements on the stie are to be located based upon the location of conveyance facilities per Section 401.Z.5 above, "SWM conservation easements for conveyance facilities shall be located and offset from the center of the respective conveyance facility as installed." If the conveyance facilities are subterranean, also add, "Underground conveyance facilities can be identified from the surface via (identification method)."
12. If no outside permits are required per Section 401.BB above, "(Qualified professional responsible for project design), on this date, (signature date), certifies that no stormwater management, erosion and sediment control, waterways and wetlands, and/or other relevant plan authorizations/permits are required other than those of the Township."

13. “The SWM Report is part of the plan.”
14. If an as-built plan is required per Section 410 below, “A copy of the recorded As-Built Plan will be provided to the Township prior to occupancy and/or the release of financial security.”

Section 402. SWM Report Requirements

SWM Report materials shall be submitted to the Township in a format that is clear, concise, legible, neat, and well organized; otherwise, the SWM Report shall not be accepted for review and shall be returned to the applicant

The following items shall be included in the SWM Report:

A. Project information:
   1. Project name
   2. Project address
   3. Name and address of applicant and, if separate from applicant, property owner
   4. Name and address of the qualified professional responsible for project design

B. A project narrative including:
   1. General description of the project
   2. Existing and proposed land use(s)
   3. Expected project time schedule
   4. Description of pre and postdevelopment conditions
   5. General description of proposed SWM techniques, SWM and Conveyance Facilities, and overall stormwater management concept for the project
   6. General description of proposed ESC techniques and facilities and a note referencing a separate ESC Plan by title and date.
   7. A general description of nonpoint source pollution controls.
   8. 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

C. Stormwater runoff design computations and documentation demonstrating that the requirements of this Ordinance have been met for all watersheds and sub-watersheds, including but not limited to the recommendations, standards, and calculation methodologies specified in Article III. This information shall also include but not be limited to the following:
   1. Summary tables of existing and proposed peak rates, and, where required, relevant Act 167 stormwater release rate reductions
   2. Summary tables of the runoff volume control requirements
   3. For applicable SWM Facilities, a plotting and tabulation of the storage volumes and discharge curves with corresponding water surface elevations, inflow hydrographs, and outflow hydrographs
   4. DEP Post-Construction Stormwater Management (PCSM) Spreadsheet
   5. All applicable design worksheets and calculations for SWM and Conveyance facilities and BMPs
   6. For applicable Conveyance Facilities, a tabulation of open or closed channel flow data, including but not limited to shear stress, erosion, provided freeboard, Manning’s N values, etc. (open channel conveyance), and hydraulic grade lines, top of grate elevations, pipe sizes, crown and invert elevations, materials, etc. (closed channel flow).
   7. Breakouts of Tc calculation segments and input data for each segment, including but not limited to slope, length, Manning’s N values, etc.
   8. Summary tables of curve number (CN) and runoff coefficient (C) calculation averages for all watershed and/or sub-watersheds
   9. A plotting or tabulation of the rainfall depths or intensities used in modeling
   10. Supporting calculations as necessary for all ESC Facilities

11. For all hotspot uses, a narrative description of the required treatment train shall be provided within the SWM Report, and shall detail the total area of runoff received, total volume treated, the total pollutants removed by the SWM BMPs, and the location of the SWM BMPs within the treatment train.

12. The Township has the authority to require that any calculations or modeling be reconciled with field observations, conditions, and site history.

D. Watershed/sub-watershed maps, which shall include:

1. All points of interests being used in modeling

2. Existing and proposed watersheds and sub-watersheds, including labeling that matches calculations and designations within the SWM Report

3. Time of concentration (Tc) paths

4. Inlet and conveyance drainage areas with labels corresponding to receiving inlets and conveyances

5. Facility labeling that matches calculations and designations within the SWM Site Plan and SWM Report

6. Total extent of the drainage area upstream from the site and all downgradient receiving channels, swales, and waters to which stormwater runoff or drainage will be discharged

Section 403. Special SWM Site Plan and Report Submission Requirements

A. Subsurface Investigation and Infiltration Testing

1. For land development activities proposing to use infiltration SWM Facilities, subsurface investigations and infiltration testing shall be required.

2. For regulated activities that are not considered land development requiring Major SWM Permits proposing to use infiltration SWM Facilities, infiltration testing shall be required.

3. For regulated activities that are not considered land development requiring Minor SWM Permits proposing to use infiltration SWM Facilities, other information – such as soil survey data – supporting the use of infiltration SWM Facilities shall be required as part of the SWM Report

4. All subsurface investigations shall be conducted in accordance with the following standards:

a. As required, the applicant will conduct a subsurface investigation prior to completing a layout of a development plan. The objective of the preliminary investigation is to obtain data that would allow for the development of a conceptual model of surface runoff and subsurface recharge on a development site. With regard to groundwater recharge, it is important that the applicant, during the site design phase of the project, understand how groundwater recharges at a site. An understanding of these elements will provide the applicant with a guide for infiltration BMPs at the site (i.e. shallow or deep infiltration surfaces) and an understanding of the requirement to maintain the hydrogeologic characteristics of a site. All investigations shall be conducted in accordance with the most recent revision of the BMP Manual and with the criteria listed below. All investigations shall be witnessed by a representative of the Township.

b. Method of investigation.

1. A subsurface investigation comprised of supervised test pits shall be undertaken to characterize the underlying hydrogeologic characteristics of a development site. The frequency of test pits shall be as follows: For a project site size of 5 acres and below, 1 test pit shall be provided per acre with a minimum of 2 test pits. For a project site size greater than 5 acres and up to 20 acres, 5 test pits shall be provided plus 1 per every 2 acres beyond the initial 5 acres. For a project site size greater than 20 acres, 13 test pits shall be provided plus 1 per every 5 acres beyond the initial 20 acres.

2. All test pits shall be progressed to a minimum depth of 10 feet or to bedrock refusal, whichever is less. The test pits shall be prepared in accordance with USDA National Cooperative Soil Survey (NCSS) standards, and identify all soil horizons and substratums, as well as limiting horizons, evidence of seasonal high groundwater (mottling) and observed groundwater seepage. This field investigation shall be conducted by an ARCPACS or PAPSS certified soil scientist.

3. Utilizing the data obtained through the preliminary subsurface investigation, a Pennsylvania licensed geologist or, ARCPACS or PAPSS certified soil scientist shall create

a conceptual model of the surface and subsurface drainage patterns of the site for use by the design engineer in developing drainage system layout and infiltration BMPs. The conceptual model shall include estimates of predevelopment recharge of groundwater and a determination of the primary routes for subsurface drainage, either through recharge of on-site or off-site streams or wetlands, or through deeper recharge of regional aquifers. The conceptual model shall also discuss the impacts of the proposed development on adjacent wetlands and streams, and provide schematics or conceptual cross sections of the proposed method of maintaining the existing drainage and recharge patterns. The design engineer, in developing a concept and ultimately designing the site must match both the predevelopment recharge rates and patterns.

5. All infiltration testing shall be conducted in accordance with the following standards:

    a. The purpose of BMP specific infiltration testing is to determine the recharge characteristics and ability of soils and the underlying aquifer to infiltrate the required volume of groundwater. All structural infiltration BMP designs shall be supported by an individual soil log and infiltration test to determine the infiltration rate at each BMP. The soils logs at each BMP will be conducted in the identical manner as in the subsurface investigation, identifying the soil profile, limiting horizons, seasonal high groundwater and observed seepage. A groundwater mounding analysis must be performed in addition to the tests below to determine whether or not the underlying aquifer will be able to manage the infiltration loading proposed without raising the groundwater to within two feet of the infiltration surface or affecting nearby structures. The mounding analysis shall be progressed utilizing at least three groundwater monitoring wells per BMP, and one seventy-two-hour aquifer pumping stress test. The field testing procedure for a mounding analysis shall be submitted to the Township Engineer for review and approval prior to performing the work

    b. At the level of infiltration, testing shall conform to the following frequency:

        1. Detention/retention BMPs (i.e. infiltration basins, dry wells/seepage pits, open bottom bioretention, sand filters, rain gardens, infiltration beds, etc.): one test per 5,000 square feet or fraction thereof of infiltrative surface; minimum of one test for up to 400 square feet, and two tests for infiltrative surfaces of 400 square feet and greater.

        2. Linear infiltration BMPs (i.e. swales, trenches and strips, etc.): one test per 100 feet or fraction thereof; minimum two tests

    c. Testing procedures:

        1. All infiltration testing methods shall be conducted in accordance with the most recent revision of the Manual, as amended from time to time. Double-ring infiltrometer tests alone shall be utilized.

        2. There may be instances where the rock content is sufficient enough to limit the use of either the double-ring infiltrometer. In this instance, the following infiltration test may be conducted after approval of the Township:

            a. Procedure for a pilot infiltration test (P.I.T.):

                1. The following equipment is required for a P.I.T.:

                    a. Excavating equipment capable of producing a test basin as prescribed in Section 403.A.5.c.2.a.2 below; and

                    b. A water supply; and

                    c. A means for accurately measuring the water level within the basin as required in Section 403.A.5.c.2.a.3 below. It is recommended that a calibrated PVC pipe or rod be used to measure the drop.

                2. A pit meeting the following requirements shall be excavated within or immediately adjacent to the proposed infiltration BMP.

                    a. The bottom of the test basin shall be at the depth of the proposed level of BMP infiltration.

                    b. The bottom area of the basin shall be a minimum of 50 square feet.

c. A soil profile pit excavated for the purpose of logging the subsurface may be utilized for this test, provided that the requirements of Section 403.A.5.c.2.a.2 above are satisfied.

d. The bottom of the basin should be made as level as possible so that high areas of rock do not project above the water level when the basin is flooded as prescribed in Section 403.A.5.c.2.a.3 below. Within the depth of the pit where water will be filled, the side slopes should be as close to vertical and consistent in dimension as possible.

e. If groundwater is observed within the test basin, the basin flooding test shall not be used.

3. The following test procedure shall be used for the P.I.T.:

a. Step One: Fill the excavated pit with the approximate depth of water expected to be stored within the specific infiltration BMP (water depths shall be a minimum of 12 inches and no greater than 48 inches) and record the time. Allow the basin to drain for a period of 24 hours. When designing the P.I.T. for a BMP, the designer should be aware that infiltration BMPs must completely drain within a period of 24 to 72 hours after the facility's inflow hydrograph.

b. Step Two: If the basin drains completely within 24 hours after the first flooding, immediately refill the basin to the water depths as described in Section 403.A.5.c.2.a.3.a above and start recording the rate of drop. If the basin has not emptied within 24 hours and the water level has dropped less than 6 inches, then the soil stratum being tested cannot be used for infiltration. If the water level has dropped 6 inches or greater, then fill the pit back to the water depth as described in Section 403.A.5.c.2.a.3.a above and start recording the rate of drop every 5 minutes to 4 hours depending on the rate of drop until the pit is empty. If the rate of drop slows to less than 0.25 inches per hour over 2 consecutive hours, then the tested soil stratum shall not be used for infiltration.

c. Step Three: Calculate the rate of infiltration by averaging the time weighted rate of drop from initial filling until the pit has emptied. This rate of infiltration will be used in calculating the drainage time required for the BMP. To account for bio-fouling and clogging with fines, the design rate shall be 50% of the field determined infiltration rate. This rate shall be used in designing the infiltration BMP.

4. Due to the potential safety hazards which are posed by the excavation of a P.I.T., adequate safety measures shall be taken including those required by OSHA to permit safe access to the excavation areas during the test procedure as well as the use of warning signs or a fence to limit access to the basin by the public during periods when the basin is left unattended, or both.

5. The basin flooding test shall not be conducted in rock strata which have been blasted with explosives.

B. Wetland Delineation Report

1. For regulated activities requiring Major SWM Permits, a wetland delineation report shall be required. National Wetlands Inventory searches or other similar database queries are not valid methods for determining the presence of wetlands. Wetland delineation shall be conducted in accordance with Lower Makefield Township's Subdivision and Land Development Ordinance.

2. For regulated activities requiring Minor SWM Permits, other information – such as the National Wetlands Inventory or soil survey data displaying no hydric soils are present on the project site – showing that no wetland impacts are expected shall be required as part of the SWM Report.

C. Carbonate Assessment Report

1. For all regulated activities proposing SWM Facilities or BMPs within or near carbonate geology or karst features, a carbonate assessment report shall be provided.

2. A carbonate assessment report shall be evaluated by a licensed professional Civil Engineer with expertise in geotechnical engineering or a licensed professional Geologist. Each of said experts will be licensed in their field of expertise by the Commonwealth of Pennsylvania. The Township reserves the right to reject any report that in its opinion was authored by an individual or firm which

does not possess the background to properly assess the site conditions as they relate to this Ordinance. The carbonate assessment report shall be signed and/or sealed by the licensed professional.

3. The format and content of the carbonate assessment report shall include, but not be limited to the following:
    a. A statement of purpose section that indicates the standards being addressed in the report and whether the applicant is attempting to demonstrate compliance or justify noncompliance with those specific standards.
    b. A description of existing conditions that describes the existing characteristics of the property with respect to geology, topography, ground and surface water hydrology, soils, vegetation, and existing improvements and uses of property.
    c. A map, at a scale no smaller than 1 inch equals 100 feet and a contour interval of 1 to 2 feet indicating the location of the property and all proposed improvements.
    d. The developer/applicant shall submit information for the effected properties indicating the presence of any of the following carbonate features: depressions, fissures, lineaments, faults, ghost lakes, bedrock, outcrops, sinkholes, seasonal high-water levels, soil mottling, springs, surface drainage entering the ground, disappearing lakes or stream, and caverns.
    e. The professional shall prepare a map of the site showing all karst features or feature indicators. The mapping shall indicate, but shall not be limited to, the following features: closed depressions, open sinkholes, seasonal high-water table indicators, outcrops of bedrock, unplowed areas in plowed fields, surface drainage into ground, and ghost lakes after rainfall.
    f. A recommended plan for the repair or remediation of surface or subsurface features that may impact the proposed development as well as the adjacent improved or unimproved properties. Additionally, a plan to address potential adverse environmental impacts on groundwater quality and stormwater management resulting from the development.
    g. The information requested above shall be based upon previously published data and field surveys which may include test boring, excavation of test pits, air-track probes, and geophysical methods.
4. If the applicant can provide evidence that the site is not underlain by carbonate geology or karst features, then a carbonate assessment report shall not be required.

Section 404. Submission

A. Copies of the SWM Site Plan and Report (“Submission”) shall be submitted to the following agencies:
    1. One digital copy to the Township
    2. As required by the Bucks County Conservation District
    3. One digital copy and one physical copy to the Township Engineer

B. The Submission shall also include the following components:
    1. SWM Permit application with applicable review fees
    2. SWM Site Plan Checklist
    3. Operation and Maintenance (O&M) Plan and Agreement in accordance with Article V of this Ordinance
    4. For land development, financial security and guarantee for all improvements in accordance with the standards of the Subdivision and Land Development Ordinance
    5. As applicable, waiver requests in compliance with Section 110 of this Ordinance
    6. For land development, subsurface investigation results
    7. As applicable, infiltration testing results
    8. As applicable, wetland delineation report
    9. As applicable, Stormwater Pollution and Prevention Plan

10. As applicable, any permit or authorization copies related to stormwater management, erosion and sediment control, waterways and wetlands, or other relevant plan clearances other than those required by the Township, including but not limited to county conservation district adequacy letters, NPDES permits, PADEP/ACOE water obstruction and encroachments permits, FEMA CLOMR/LOMRs, PNDI clearances, PennDOT HOP approvals when the proposed project encroaches into or impact a PennDOT right-of-way, and other appropriate permits as determined by the Township.

SUBMISSION SUMMARY TABLE			
Submission Items	**Minor SWM Permit**	**Major SWM Permit**	**Major SWM Permit (5k)***
SWM Permit Application & Fees	✓	✓	✓
SWM Site Plan Checklist	✓	✓	✓
SWM Site Plan	✓	✓	✓
SWM Report (20% I=M)	✓	✓	
SWM Report (100% I=M)			✓
O&M Agreement and Plan	✓	✓	✓
Financial Security	LD	LD	LD
Waiver Requests	AA	AA	AA
Subsurface Investigation	LD	LD	LD
Infiltration Testing		✓	✓
Infiltration Soils Data	✓		
Wetland Delineation Report		✓	✓
Carbonate Assessment Report	AA	AA	AA
Wetland Data	✓		
SWPP	AA	AA	AA
External Permitting	AA	AA	AA

*Major SWM Permits with 5,000 SF of existing impervious area per Article II

✓ = Required / AA = As Applicable / LD = Land Development / "I=M" = "Existing Impervious = Meadow"

C. Any submissions 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.

D. Additional physical copies of the Submission shall be submitted as requested by the Township or other reviewing agency, or as required by the Subdivision and Land Development Ordinance, if applicable.

Section 405. Submission Review & SWM Site Plan Approval

A. The Submission shall be reviewed by the Township and the Township Engineer, on behalf of the Township, for consistency with the provisions of this Ordinance.

B. The Township shall notify the applicant in writing within 45 days whether the Submission is approved or disapproved. If the Submission involves a Subdivision and/or Land Development Plan, the notification shall occur within the time period allowed by the Municipalities Planning Code, and it shall further be coincident with any extensions, approvals, or other schedule changes with the Subdivision and/or Land Development Plan.

C. For any SWM Site Plan that proposes to use any SWM Facilities or BMPs other than green infrastructure and LID practices to achieve the volume and rate controls required under this Ordinance, the Township will not approve the SWM Site Plan unless it determines that green infrastructure and LID practices are not acceptable.

D. The Township shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance or has not received all other permits/authorizations. At its sole discretion, when a Submission is found to be deficient, the Township may either disapprove the SWM Site Plan and require a resubmission per Section 407 below, or in the case of minor deficiencies, the Township may accept submission of modifications per Section 406 below.

E. If the Township disapproves the SWM Site Plan, the Township will state the reasons for the disapproval in writing. The Township may also approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing.

F. If the Township approves the SWM Site Plan, or all the conditions of an approval per Section 405.D above are met, the Township shall promptly issue a SWM Permit to the applicant.

Section 406. Modification of Submissions with Minor Deficiencies

A modification to a Submission with minor deficiencies shall require a resubmission of the modified SWM Site Plan and Report in full in accordance with this Article. If modifications require updates to other components of the Submission as determined by the Township, including but not limited to the O&M Agreement and Plan or further waiver requests, said components shall also be submitted. Any modifications shall renew the 45-day notification timeline as listed in Section 405.B above.

Section 407. Resubmission of Disapproved SWM Site Plans

A disapproved SWM Site Plan may be resubmitted to the Township, with the revisions addressing the Township's concerns, in accordance with this Article. A resubmitted SWM Site Plan shall include all other Submission components in full, including applicable review fees.

Section 408. Modification of Approved SWM Site Plans

A request for modification to a SWM Site Plan that has already been approved shall be in writing. The written request shall provide specific details on what portions of the SWM Site Plan are being proposed for modification, and shall be accompanied by Submission components showing the proposed modifications as required by the Township. Any modifications within the updated Submission not matching the written request are considered void.

Requests for modification shall follow the Submission review process per Section 405 above, including the payment of applicable fees. Modifications may not significantly alter SWM Facilities or calculation methodologies and techniques. "Significant modification" of a SWM Facility for the purpose of this Section includes, but is not limited to, a change of type, size, and location of a SWM Facility. Modifications may not alter stormwater management facilities in a manner which significantly affects the discharge of stormwater to an adjacent property. Requests for modifications as described in this paragraph shall be treated as a new Submission in accordance with this Article.

The Township reserves the sole right to deny requests for modification and require new Submission in accordance with this Article upon review of the extent of the requested modifications.

Section 409. Authorization to Construction and Term of Validity

The Township's approval of a SWM Site Plan and issuance of a SWM Permit authorizes the regulated activities contained in the SWM Site Plan for a maximum term of validity of 5 years following the date of approval. The Township may specify a term of validity shorter than 5 years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Township issues the SWM Permit. If an approved SWM Site Plan is not completed according to Section 410 within the term of validity, then the Township may consider the SWM Site Plan disapproved and may revoke any and all permits without the necessity of any proceedings for revocation. SWM Site Plans that are considered disapproved by the Township shall be resubmitted in accordance with Section 407 of this Ordinance.

Section 410. Project Closeout

A. After completing the improvements listed in the SWM Site Plan, confirming the site has achieved permanent stabilization, and removing or retrofitting any ESC Facilities, the applicant shall notify the Township in writing that the work is complete.

B. In the case of Minor SWM Permits:

   1. After receipt of the written notification of completion, the Township shall conduct a final inspection for the purposes of determining the extent of project completion, confirming compliance with the approved SWM Site Plan, and the amount of release of financial security.

   2. If any deficiencies are noted by the Township, they shall be delivered to the Applicant in writing.

   3. Upon the correction of any deficiencies and determination of final completion, the Township shall notify the applicant of said determination in writing and release to the Applicant any remaining financial security.

C. In the case of Major SWM Permits:

1. The Applicant shall submit an As-Built Plan for review with the written notification of completion. The As-Built Plan shall include the following items:

   a. Depiction of all items required in the original SWM Site Plan per Section 401, including but not limited to profiles and construction details of improvements

   b. Clear identification of all discrepancies alongside their original design criteria, dimensions, specifications, etc.

   c. A narrative explanation of any discrepancies with the approved SWM Site Plan

   d. Latitude and longitude coordinates at the central location of all permanent SWM BMPs

   e. A note stating, "(Qualified professional responsible for as-built plan composition), on this date, (signature date), certifies that all SWM and Conveyance Facilities and BMPs have been constructed according to the approved plans and specifications." A seal and dated signature shall accompany this statement

   f. A note stating, "(Qualified professional responsible for as-built plan composition), on this date, (signature date), certifies that all survey, plan, and general data displayed herein are correct and true." A seal and dated signature shall accompany this statement

2. The Applicant shall submit an As-Built SWM Report for review with the written notification of completion. The As-Built SWM Report shall include the following items:

   a. Inclusion of all items required in the original SWM Report per Section 402, including but not limited to stormwater runoff design computations and design documentation.

   b. Clear identification of all discrepancies alongside their original design criteria, calculations, documentation, etc.

   c. A narrative explanation of any discrepancies with the approved SWM Report

   d. Post-Construction infiltration testing

      1. Double-ring infiltrometer tests shall be conducted in accordance with Section 403.A.5 at the bottom of all surface infiltration BMPs at a rate of one test per 5,000 square feet or fraction thereof of infiltrative surface with a minimum of one test for up to 400 square feet, and two tests for infiltrative surfaces of 400 square feet and greater. Tests for linear infiltration BMPs shall be conducted at a rate of one test per 100 feet or fraction thereof; minimum two tests.

      2. Double-ring infiltrometer tests shall be conducted in accordance with Section 403.A.5 at the bottom of all sub-surface infiltration BMPs, either during or after construction, at the rate identified in Section 410.C.2.d.1.

      3. All calculations that utilized a design infiltration rate within the approved SWM Report shall be corrected during the As-Built SWM Report submission to utilize the post-construction infiltration testing results.

      4. Alternative methods of confirming infiltration capacity (i.e. simulated runoff test or inspection during and after a large storm event) may be accepted on a case-by-case basis at the sole discretion of the Township Engineer.

   e. If the As-Built SWM Report identifies the As-Built SWM Facilities are deficient and do not meet the requirements of this ordinance, remedial actions will be required to be performed by the applicant to ensure compliance.

3. After receipt of the written notification of completion and As-Built Plan and Report, the Township shall: 1. conduct a final inspection for the purposes of determining the extent of project completion and the amount of release of financial security; and 2. review the As-Built Plan for acceptability and accuracy.

4. If any deficiencies with either the work or the As-Built Plan and Report are noted by the Township, they shall be delivered to the Applicant in writing.

5. After the correction of any deficiencies and determination of final completion, the Township shall notify the applicant of said determination in writing.

6. After receipt of the written notification of determination of final completion, the Applicant shall record the As-Built Plan and Report in full within 90 days of receipt of said determination. Evidence of recording and a copy of the recorded As-Built Plan shall be provided by the Applicant to the Township.

7. After receipt of the evidence of recording of the As-Built Plan and Report and a copy of the recorded As-Built Plan and Report itself, the Township shall release to the Applicant any remaining financial security. Occupancy and/or the release of financial security are prohibited until receipt of a copy of the recorded As-Built Plan and Report is received, and a note per Section 401.DD.14 shall be provided on the plan stating such.

D. If the SWM Site Plan was submitted as part of a Subdivision and Land Development Plan, project closeout shall follow the process and requirements in the Subdivision and Land Development Ordinance. The entirety of the SWM Site Plan and Report including but not limited to grading plan, profiles, details, and calculations shall be recorded with the Subdivision and Land Development Plan.

1. For Major SWM Permits, an As-Built Plan and Report as required above shall still be required or incorporated with the Subdivision and Land Development Plan's closeout process, and shall be recorded in full or incorporated in full with the Subdivision and Land Development As-Built Plan.

ARTICLE V – OPERATION AND MAINTENANCE

Section 501. Performance Guarantee

A. For SWM Site Plans that involve subdivision and Land Development activities, or involve redevelopment, the applicant shall provide a financial security and guarantee to the Township for the timely installation and proper construction of all SWM and E&S improvements as required by the approved SWM Site Plan and this Ordinance in accordance with the provisions of Sections 509, 510, and 511 of the Pennsylvania Municipalities Planning Code and the provisions of the Township's Subdivision and Land Development Ordinance.

B. The guarantee must be equal to or greater than the full construction cost of the required SWM and E&S improvements except the applicant may not be required to provide financial security for the costs of any improvements for which financial security is required to the Pennsylvania Department of Transportation in connection with the issuance of a highway occupancy permit pursuant to Section 420 of Act of June 1, 1945 (P.L. 1242, No. 428), known as the "State Highway Law."

C. The financial guarantee for SWM and E&S improvements may not be released until 1) the improvement is accepted in writing for long-term maintenance by the entity identified in the operation and maintenance (O&M) plan; 2) DEP or the District approved the Chapter 102 Notice of Termination (NOT) for the project; and 3) the improvement is inspected and approved by the Township.

Section 502. Responsibilities of Developers and Landowners

A. The Township shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The Township may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the Township will accept the facilities. The Township reserves the right to accept or reject the ownership and operation responsibility for any portion of the stormwater management controls.

B. SWM and Conveyance Facilities and BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions and conservation easements that run with the land.

C. The O&M Plan and Agreement shall be recorded as a restrictive deed covenant that runs with the land.

D. The Township may take enforcement actions against an owner or revoke any approvals granted for the project site for any failure to satisfy the provisions of this Article.

Section 503. Operation and Maintenance (O&M) Plans and Agreements

A. Prior to final approval of the SWM Site Plan, the property owner shall sign and record as a restrictive deed covenant that runs with the land an Operation and Maintenance Agreement (see Appendix A) and an Operation and Maintenance Plan covering all SWM Control and Conveyance Facilities and BMPs which are to be privately owned.

   1. Prior to recording, the O&M Agreement and Plan shall be submitted to the Township for review and approval.

   2. Other items may be included in the O&M Agreement and Plan where determined necessary to guarantee the satisfactory O&M of all SWM and Conveyance Facilities and BMPs.

   3. The owner, successor and assigns shall maintain all facilities in accordance with the approved maintenance schedule in the O&M Agreement and Plan.

   4. The owner shall obtain all necessary real estate rights to install, operate, and maintain all stormwater facilities in the SWM Site Plan.

   5. The owner shall convey to the Township SWM Conservation Easements to assure access for periodic inspections by the Township and maintenance, as necessary, for the preservation of SWM and Conveyance Facilities and BMPs.

   6. The owner shall keep on file with the Township the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Township within ten (10) working days of the change. The O&M Plan and Agreement shall be transferred with transfer of ownership.

   7. The Township shall notify the applicant in writing whether the O&M Plan and Agreement is approved.

B. The following items shall be included in the 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 by 36-inch sheets. The contents of the map(s) shall include, but not be limited to:
    a. Clear identification of the location and nature of the SWM and Conveyance 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 1 or 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, steep slopes, and areas of natural vegetation to be preserved;
    f. The locations of all existing and proposed utilities, sanitary sewers, and waterlines 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. Location of all SWM Conservation Easements.
2. A description and schedule of how each Stormwater and Conveyance Facility and BMP will be operated and maintained, and the identity, address, phone number, and email address associated with the person(s) responsible for O&M. The plan shall address short-term and long-term responsibilities for O&M.
3. The name of the project site, the name, address, telephone number, and email address of the property owner and the firm or individual preparing the plan.
4. A statement, as listed in Section 401.DD, signed by the SWM and Conveyance Facility and BMP owner.

C. The O&M Plan for the project site shall establish responsibilities for the continuing O&M of all SWM and Conveyance Facilities and BMPs, as follows:
1. If a plan includes structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the Township, SWM and Conveyance Facilities and BMPs may also be offered for dedication to and maintained by the 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 SWM and Conveyance Facilities and BMPs shall be the responsibility of the owner or private management entity.

D. The owner is responsible for operation and maintenance of the SWM and Conveyance Facilities and BMPs. If the owner fails to adhere to the O&M Agreement and Plan, the Township may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

Section 504. SWM Facility Ownership and Maintenance Fund

A. SWM facilities shall be owned and maintained by one of the following entities:
1. The Township.
2. A property or homeowner's association.
3. A conservancy or land trust.
4. An individual or other legal entity which is the owner of all or part of the lot or tract which is served by the SWM facility.

D. The determination as to which of the foregoing will own and maintain the stormwater facilities shall be made by the Township based on the following requirements:
1. SWM facilities in single-family, detached residential developments shall be proposed for dedication to the Township, unless otherwise determined by the Township governing body.

2. In industrial, commercial, and residential developments other than single-family detached, SWM facilities shall be owned and maintained by an approved entity other than the Township, unless the Township, at its option, elects to accept dedication of such stormwater facilities.

3. Where SWM facilities are not to be dedicated to the Township, the following are prerequisites for conveyance to an entity other than the Township

    a. The conveyance must be to an entity approved by the Township prior to final SWM Site Plan approval.

    b. The instrument of conveyance must include provisions suitable to the Township to assure the perpetual maintenance and use of the stormwater facilities for that purpose. Such assurance shall include, but not be limited to, establishing to the reasonable satisfaction of the Township that the entity responsible for ownership and maintenance of the stormwater facilities has the financial ability to meet its obligations for perpetual ownership and maintenance.

    c. The right of the Township to enter upon and maintain the SWM facilities at the expense of the association, trust or property owner in the event of a failure to maintain the SWM facilities.

    d. Such other covenants and/or easements necessary to fulfill the purposes and intent of this section of Ordinance.

4. Where the Township agrees to accept dedication and conveyance of SWM facilities, such acceptance shall be by acceptance of a deed of dedication from the developer.

5. All regulated activities requiring a SWM Permit shall contribute to the Township a sum of money, to be determined by the Township and updated annually per the Township's discretion, per acre of SWM Conservation Easement, Riparian Buffer Easement, and/or land dedicated to the Township for the cost of maintenance of such facilities located within the easemented or dedicated area. These fees shall be used by the Township to maintain the land and SWM facilities. The fees shall be paid upon SWM Permit approval or acceptance of the deed of dedication.

ARTICLE VI – FEES AND EXPENSES

Section 601. Site Plan Review and Inspection Fee

Fees shall be established by the Township to cover plan review and construction inspection costs incurred by the Township. All fees shall be paid by the applicant at the time of the SWM Site Plan submission. A review and inspection fee schedule shall be established by resolution of the Township governing body based on the size of the regulated activity and based on the Township's costs for reviewing SWM Site Plans and conducting inspections pursuant to Section 802. The Township shall periodically update the review and inspection fee schedule to ensure that review costs are adequately reimbursed. If costs exceed the review fee, the Township may charge the owner appropriate fees for the balance.

Section 602. Expenses Covered by Fees

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

A. Administrative/clerical costs

B. Review of the SWM and ESC Site Plan

C. Review of the As-built Drawings

D. Site Inspections

E. Inspection of SWM and ESC facilities and drainage improvements during construction

F. Final inspection at the completion of the construction of the SWM facilities and drainage improvements presented in the SWM site plan

G. Attendance at meetings

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

ARTICLE VII – PROHIBITIONS

Section 701. Prohibited Discharges and Connections

A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, wash water, grass clippings, refuse, compost, and leaves to enter a regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.

B. Illicit Discharges

1. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in paragraph C below and (2) discharges authorized under a state or federal permit.

2. Any person or entity that causes an unauthorized non-stormwater discharge or discharge into or from the MS4 that results in or contributes to a violation of the Township's MS4 NPDES permit is subject to the enforcement provisions of Article VIII.

3. Any drain or conveyance connected from a commercial or industrial land use to a storm sewer, which has not been approved by the Township, is prohibited.

C. The following discharges are authorized unless they are determined to be significant contributors of pollution to a regulated small MS4 or to the waters of this Commonwealth:

1. Discharges or flows from fire-fighting activities

2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC)

3. Non-contaminated irrigation water, water from lawn maintenance, landscaping drainage, and flows from riparian habitats and wetlands

4. Diverted stream flows and springs

5. Non-contaminated pumped groundwater and water from foundation footing drains and crawl space pumps

6. Non-contaminated HVAC condensation and water from geothermal systems

7. Residential (i.e., not commercial) vehicle and external building wash water where cleaning agents are not utilized

8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC

9. Dechlorinated swimming pool discharge that is completely infiltrated or used as irrigation without entering a storm sewer system

D. In the event that the Township or DEP determines that any of the discharges identified in Section 701.C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the Township or DEP will notify the responsible person(s) to cease the discharge.

E. In the event that the Township or DEP discovers an illicitly connected drain or conveyance to a storm sewer which was not previously approved, the illicit connection must be eliminated if unauthorized non-stormwater discharges could enter the storm sewer.

Section 702. Roof Drains and Sump Pumps

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

Section 703. Dumping

"Dumping" and/or unregulated disposal of waste, including but not limited to yard waste, construction refuse, paint, petrochemicals, domestic solid waste, etc., is prohibited. The activity of dumping does not need to directly drain into a concentrated discharge or collection system to be prohibited. Dumping prohibitions do not include incidental, short-term, temporary storage of soon-to-be-used materials that pose a low risk for stormwater runoff pollution (e.g., mulch piles for domestic gardening, stone piles for driveway sub-base, brick pallets for home construction, etc.), nor agricultural activity or forest management and timber operations provided that the activities are performed according to the requirements of 25 Pa. Code

Chapter 102.

Section 704. Open Storage

Open storage of pollutants, including but not limited to uncapped barrels, leaking containers, chemical tank drainage, etc., is prohibited. The activity of openly storing pollutants does not need to directly drain into a concentrated discharge or collection system to be prohibited. Open storage prohibitions do not include agricultural activity or forest management and timber operations provided that the activities are performed according to the requirements of 25 Pa. Code Chapter 102.

Section 705. Notification of Pollution

If, because of an accident or other activity or incident, a toxic substance or another substance which would endanger downstream users of the waters of this Commonwealth, would otherwise result in pollution or create a danger of pollution of the waters, or would damage property, is discharged into these waters, including sewers, drains, ditches or other channels of conveyance into the waters, or is placed so that it might discharge, flow, be washed or fall into them, it is the responsibility of the person at the time in charge of the substance or owning or in possession of the premises, facility, vehicle or vessel from or on which the substance is discharged or placed to immediately notify the Township and DEP by telephone of the location and nature of the danger and, if reasonably possible to do so, to notify known downstream users of the waters.

Section 706. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape, or otherwise alter any SWM or Conveyance Facilities, best management practices (BMPs), areas, or structures that were installed as a requirement of this Ordinance or previous Stormwater Management Ordinances without the written approval of the Township, unless it is part of an approved maintenance program.

ARTICLE VIII – ENFORCEMENT AND PENALTIES

Section 801. Right-of-Entry

A. Upon presentation of proper credentials, the Township or its designated agent may enter at reasonable times upon any property within the Township to inspect the implementation, condition, or operation and maintenance of items required by this Ordinance in regard to any aspect regulated by this Ordinance.

B. Landowners with SWM and Conveyance Facilities or BMPs on their property shall allow the Township or its designated agent ready access to all parts of the premises for the purposes of determining compliance with this Ordinance.

C. The Township or its designated agent shall have the right to temporarily locate on any SWM or Conveyance Facility or BMP in the Township such devices as are necessary to conduct monitoring and/or sampling of the discharges from such Facility or BMP.

Section 802. Inspection

The Township shall inspect all phases of the installation of the SWM or Conveyance Facilities or BMPs as deemed appropriate by the Township. During any stage of the work, if the Township determines that the SWM or Conveyance Facilities or BMPs are not being installed in accordance with the approved SWM Site Plan, the Township shall revoke any existing permits or other approvals and issue a cease and desist order until a revised SWM Site Plan is submitted and approved, as specified in this Ordinance, and until the deficiencies are corrected.

Upon final project closeout, the landowner or the owner's designee (including the Township for dedicated and owned facilities) shall inspect SWM and Conveyance Facilities and BMPs installed under this Ordinance according to the following frequencies, at a minimum, to ensure the Facilities continue to function as intended:

1. Annually for NPDES permittees (even if terminated), and for the first 5 years for all others;
2. Once every 3 years thereafter;
3. During or immediately after the cessation of a precipitation event; and/or
4. As specified in the Operations and Maintenance (O&M) agreement.

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the SWM BMP, facility, or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Township within 30 days following completion of the inspection. A template inspection report is available from the Township and is attached in Appendix J. If regulatory agencies require inspections as a condition of permit approval (e.g. NPDES Visual Site Inspection Reports), the inspection reports shall also be sent to the Township. If repairs are needed, the report must also include a timeframe for completing the repairs. All inspection records must be maintained by the land owner for not less than five (5) years and must be made available to the Township within five (5) calendar days of receipt of written request from the Township.

The Township may elect to conduct post-construction inspections in addition to routine inspections that must be conducted by the landowner or other responsible party.

Section 803. Notification

A. In the event that a person fails to comply with the requirements of this Ordinance, or fails to conform to the requirements of any permit issued hereunder, the Township shall provide written notification to the responsible person of the violation and order compliance to the Ordinance or permit. Such notification 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 discharge, 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 SWM and Conveyance facilities and BMPs; and

7. Operation and Maintenance (O&M) of stormwater facilities and BMPs.

B. Such notification shall set for the nature of the violation(s) and establish a time limit for correction of these violation(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work will be done by the Township 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 the Township from pursuing any and all other remedies available in law or equity. It shall be the responsibility of the Owner of the real property on with any items required by this Ordinance in regard to any aspect regulated by this Ordinance is occurring, to comply with the terms and conditions of this Ordinance.

Section 804. Enforcement

A. The Township may take enforcement action against a permittee, landowner, or other responsible party for any failure to satisfy the provisions of this Ordinance.

B. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 302 of this Ordinance.

C. It shall be unlawful to violate Article VII of this Ordinance.

D. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Township and therefore may not be unreasonably denied.

E. The Township Engineer or other designee is hereby authorized and directed to enforce all the provisions of this Ordinance. The Township Governing Body may delegate enforcement duties to such other officers or agents as the Township deems qualified for that purpose.

F. It is the responsibility of the landowner of the real property on which any regulated activity is proposed to occur, is occurring, or has occurred to comply with the applicable terms and conditions of this Ordinance.

Section 805. Suspension and Revocation

A. Any approval or permit used by the Township pursuant to this Ordinance may be suspended or revoked, in whole or in part, for:

1. Non-compliance with or failure to implement any provision of the permit, approved SWM Site Plan, or O&M Agreement;

2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the regulated activity; or

3. The creation of any condition or the commission of any act during the regulated activity which constitutes or creates a hazard or nuisance, pollution, or endangers the life, health, or property of others.

B. A suspended approval or permit may be reinstated by the Township when:

1. The Township has inspected and approved the correction to the violations that caused the suspension; and

2. The Township is satisfied that the violation has been corrected.

C. An approval or permit that has been revoked by the Township cannot be reinstated. The applicant may apply for a new permit under the provisions of this Ordinance.

Section 806. Penalties

A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than $1,000.00 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.

B. In addition, the Township may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 807. Appeals

A. Any person aggrieved by any action of the Township or its designee, relevant to the provisions of this Ordinance, may appeal to the Township within 30 days of that action.

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

ARTICLE IX – REFERENCES

1. Bucks County, Pennsylvania (BCPA). (August 18, 2010), as amended, updated, and/or replaced. *Neshaminy Creek Watershed Stormwater Management Plan*. Doylestown, PA. Available from BPA at: https://www.buckscounty.gov/415/Act-167-Stormwater-Management-Plans

2. Bucks County, Pennsylvania (BCPA). (June 17, 2004), as amended, updated, and/or replaced. *Delaware River South Watershed Act 167 Stormwater Management Plan.* Doylestown, PA. Available from BPA at: https://www.buckscounty.gov/415/Act-167-Stormwater-Management-Plans

3. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). *National Engineering Handbook.* Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available from the NRCS online at: http://www.nrcs.usda.gov/.

4. U.S. Department of Agriculture, Natural Resources Conservation Service. (1986) *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.

5. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended, updated, and/or replaced. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.

6. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended, updated, and/or replaced. *Erosion and Sediment Pollution Control Program Manual.* Harrisburg, PA.

7. Pennsylvania Department of Transportation. Publication 13M, Chapter 10 (2015), as amended, updated, and/or replaced. *Drainage Design and Related Features.* Harrisburg, PA. Available from PennDOT online at: https://www.dot.state.pa.us/public/Bureaus/design/PUB13M/Chapters/Chap10.pdf

8. U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). *NOAA Atlas 14 Point Precipitation Frequency Estimates: PA*, as amended, updated, and/or replaced. Silver Spring, Maryland. Available from NOAA online at: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

9. Pennsylvania Department of Transportation. Publication 584, Chapter 7A (2010), as amended, updated, and/or replaced. *Field Manual for Pennsylvania Design Rainfall Intensity Charts*. Harrisburg, PA. Available from PennDOT online at: https://www.dot.state.pa.us/public/bureaus/design/PUB584/PDMChapter07A.pdf

10. Pennsylvania Department of Environmental Protection. (December 13, 2018), as amended, updated, and/or replaced. *Managed Release Concept*. Harrisburg, PA. Available from PADEP online at: https://files.dep.state.pa.us/water/bpnpsm/StormwaterManagement/ConstructionStormwater/Managed_Release_Concept.pdf

(Ordinance Name)

(Ordinance Number)

ENACTED and **ORDAINED** at a regular meeting of the

_____

on this _____ day of _____, 20_____.

This Ordinance shall take effect immediately.

(Name)	(Title)
(Name)	(Title)
(Name)	(Title)

ATTEST:

_____

Secretary

APPENDIX A

OPERATION AND MAINTENANCE (O&M) AGREEMENT
STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES (BMPs)

THIS AGREEMENT, made and entered into this day of_____, 20_____, by and between_____(hereinafter the "Landowner"), and Lower Makefield Township, Bucks County, Pennsylvania (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of Bucks County, Pennsylvania, Deed Book_____at page_____, (hereinafter"Property").

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

WHEREAS, the Landowner is proceeding to build and develop the property; and

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

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

WHEREAS, for the purposes of this agreement, the following definitions shall apply: BMP – "Best Management Practice;" activities, facilities, designs, measures or procedures used to manage stormwater impacts from regulated activities, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Municipal Stormwater Management Ordinance, including but not limited to infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grasses swales, forested buffers, sand filters and detention basins.

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

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

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMPs as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific operation and maintenance requirements noted on the approved Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality and designated representatives from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality. In the event that a claim is asserted against the Municipality, its designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgement or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgement or claim.
8. The Municipality intends to inspect the BMPs at a minimum of once every three years to ensure their continued functioning.
9. The individual or entity responsible for long-term O&M of BMPs on the real property is identified as follows:

   (Name), (Address), (Phone)

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

_____

For the Landowner:

_____

ATTEST:

_____(City, Borough, Township)

County of_____, Pennsylvania

I,_____, a Notary Public in and for the county and state aforesaid, whose commission expires on the _____day of_____, 20____, do hereby certify that_____whose name(s) is/are signed to the foregoing Agreement bearing date of the day__, 20_____, has acknowledged the same before me in my said county and state.

GIVEN UNDER MY HAND THIS _____day of_____, 20 .

_____ _____

NOTARY PUBLIC **(SEAL)**

APPENDIX B

STORMWATER MANAGEMENT DESIGN CRITERIA

Table B-1: Natural Resource Protection Stormwater Management Controls

Existing Natural Sensitive Resource	Mapped in the ERSAM? Yes/No/N/A	Total Area (ac)	Area to be Protected (ac)
Waterbodies			
Floodplains			
Riparian Areas/Buffers			
Wetlands			
Vernal Pools			
Woodlands			
Natural Drainage Ways			
Steep Slopes, 15-25%			
Steep Slopes, over 25%			
Other:			
Other:			
Total Existing:			

Table B-2: Guidance to Calculate the 2-Year, 24-Hour Volume Increase from Predevelopment to Postdevelopment Conditions

Existing Conditions: Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (ft^3)
Meadow (Good Condition)								
20% Impervious as Meadow (Minor SWM Permit)								
100% Impervious as Meadow (Major SWM Permit)*								
Impervious								
Woods (Good Condition)								
Total:								

*Major SWM Permits on sites 1. With greater than 5,000 SF of existing impervious area within the limit of disturbance; 2. That are not controlling the runoff from the existing impervious area in a manner consistent with this Ordinance; and 3. Whose activities do not qualify for the exemptions.

Developed Conditions: Cover Type/Condition*	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (ft^3)
Total:								

*Meadow may not be used in postdevelopment conditions unless the area is specifically designed and to remain as a bona fide meadow.

2-Year Volume Increase (ft^3): ☐

20% Volume Increase (ft^3): ☐

Total 2-Year Volume Increase (ft^3): ☐

Table B-3: TR-55 Runoff Coefficients (Curve Numbers)

Cover Type	Avg. Percent Impervious Area & Hydrologic Condition	Hydrologic Soil Classification			
		A	B	C	D
Open Space (Lawns, parks, golf courses, cemeteries, etc.):					
Grass cover <50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	49	69	79	84
Grass cover > 75%	Good	39	61	74	80
Impervious areas:					
Paved Parking lots, roofs, driveways, etc.		98	98	98	98
Streets and roads:					
Paved; curbs and stormsewer (excl. right-of-way)		98	98	98	98
Paved: open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Urban District:					
Commercial and business	85%	89	92	94	95
Industrial	72%	81	88	91	93
Institutional	50%	71	82	88	90
Residential areas by lot size:					
1/8 acre or less (includes town houses & multi-family)	95%	77	85	90	92
1/4 acre	38%	61	75	83	87
1/3 acre	30%	57	72	81	86
1/2 acre	25%	54	70	80	85
1 acre	20%	51	68	79	84
2 acre	12%	46	65	77	82
Pasture, grassland, or range					
Poor (<50%)	Poor	68	79	86	89
Fair (50-75%)	Fair	49	69	79	84
Good (>75%)	Good	39	61	74	80
Meadow		30	58	71	78
Brush (brush-weed-grass mixture with brush as majority)					
Poor (<50%)	Poor	48	67	77	83
Fair (50-75%)	Fair	35	56	70	77
Good (>75%)	Good	30	48	65	73
Wood-grass combination (orchard or tree farm)					
Poor (<50%)	Poor	57	73	82	86
Fair (50-75%)	Fair	43	65	76	82
Good (>75%)	Good	32	58	72	79
Woods					
Poor (<50%)	Poor	45	66	77	83
Fair (50-75%)	Fair	36	60	73	79
Good (>75%)	Good	30	55	70	77
Fallow Bare Soil (crop residue cover, CR)					
Poor	Poor	76	85	90	93
Good	Good	74	83	88	90
Smooth surfaces (concrete, asphalt, gravel, or compacted soil)		98	98	98	98
Water		98	98	98	98
Mining/newly graded areas (pervious areas only)		77	86	91	94

Poor – forest litter, small trees, and brush are destroyed by heavy grazing or regular burning
Fair – woods are grazed but not burned, and some forest litter covers the soil
Good – Woods are protected from grazing, and litter and brush adequately cover the soil
For additional cover types not listed, see appropriate table in TR-55.

Table B-4: Volume Control Calculation Guidance for Nonstructural BMPs

Type of Nonstructural BMP	Area (ft^2)	*	Runoff Volume (in)	*	1/12	=	Volume Reduction (ft^3)
Use of Natural Drainage Feature							
Utilize natural flow pathways	_____ ft^2	*	1/4”	*	1/12	=	_____ ft^3
Minimum Soil Compaction							
Lawn	_____ ft^2	*	1/3”	*	1/12	=	_____ ft^3
Meadow	_____ ft^2	*	1/3”	*	1/12	=	_____ ft^3
Protecting existing trees (not located in protected area)							
For trees within 20 feet of impervious cover:							
Tree Canopy	_____ ft^2	*	1”	*	1/12	=	_____ ft^3
For trees within 20 – 100 feet of impervious cover:							
Tree Canopy	_____ ft^2	*	1/2”	*	1/12	=	_____ ft^3
Rooftop Disconnection							
For runoff directed to pervious and/or vegetative areas where infiltration occurs:							
Roof area	_____ ft^2	*	1/4”	*	1/12	=	_____ ft^3
Impervious Disconnection							
For runoff from impervious surfaces such as streets and concrete directed to pervious and/or vegetative areas where infiltration occurs:							
Impervious Area	_____ ft^2	*	1/4”	*	1/12	=	_____ ft^3
Total Volume Reduction							_____ ft^3

* represents multiply
^The applicant shall prove to the satisfaction of the Township Engineer that all nonstructural BMPs meet or exceed the required design guidelines as identified in the *Pennsylvania Stormwater Best Management Practices Manual*.

Table B-5: Volume Control Calculation Guidance for Structural BMPs

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

Type	Proposed Structural BMP	Section in BMP Manual	Area (ft^2)	Storage Volume (ft^3)
Infiltration and / or Evapotranspiration	Porous Pavement	6.4.1		
	Infiltration Basin	6.4.2		
	Infiltration Bed	6.4.3		
	Infiltration Trench	6.4.4		
	Rain Garden / Bioretention	6.4.5		
	Dry Well / Seepage Pit	6.4.6		
	Constructed Filter	6.4.7		
	Vegetative Swale	6.4.8		
	Vegetative Filter Strip	6.4.9		
	Infiltration Berm	6.4.10		
Evaporation and / or Reuse	Vegetative Roof	6.5.1		
	Capture and Reuse	6.5.2		
Runoff Quality	Constructed Wetlands	6.6.1		
	Wet Pond / Retention Basin	6.6.2		
	Dry Extended Detention Basin	6.6.3		
	Water Quality Filters	6.6.4		
Restoration	Riparian Buffer Restoration	6.7.1		
	Landscape Restoration / Reforestation	6.7.2		
	Soil Amendment	6.7.3		
Other	Level Spreader	6.8.1		
	Special Storage Areas	6.8.2		
	Other			

Total Volume Control from Structural BMPs: _____

Table B-6: Rational Runoff Coefficients

Land Use	By Hydrologic Soils Group and Overland Slope (%)											
	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	0.35	0.30	0.33	0.38	0.33	0.36	0.42
	0.33	0.37	0.40	0.35	0.30	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	0.39	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	0.56	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

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

Table B-7: Manning's Roughness Coefficients

DESCRIPTION	Manning's n-value
Smooth-wall Plastic Pipe	0.011
Concrete Pipe	0.012
Smooth-lined Corrugated Metal Pipe	0.012
Corrugated Plastic Pipe	0.024
Annular Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated) 68 mm × 13 mm (2 2/3 in × 1/2 in) Corrugations 75 mm × 25 mm (3 in × 1 in) Corrugations 125 mm × 25 mm (5 in × 1 in) Corrugations 150 mm × 50 mm (6 in × 2 in) Corrugations	 0.024 0.027 0.025 0.033
Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated) 75 mm x 25 mm (3 in x 1 in), 125 mm x 25 mm (5 in x 1 in), or 150 mm x 40 mm (6 in x 2 in) Corrugations	 0.024
Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated) 68 mm × 13 mm (2 2/3 in × 1/2 in) Corrugations a. Lower Coefficients* 450 mm (18 in) Diameter 600 mm (24 in) Diameter 900 mm (36 in) Diameter 1200 mm (48 in) Diameter 1500 mm (60 in) Diameter or larger b. Higher Coefficients**	 0.014 0.016 0.019 0.020 0.021 0.024
Annular or Helically Corrugated Steel or Aluminum Alloy Pipe Arches or Other Non-Circular Metal Conduit (Plain or Polymer coated)	0.024
Vitrified Clay Pipe	0.012
Ductile Iron Pipe	0.013
Asphalt Pavement	0.015
Concrete Pavement	0.014
Grass Medians	0.050
Grass – Residential	0.30
Earth	0.020
Gravel	0.030
Rock	0.035
Cultivated Areas	0.030 - 0.050
Dense Brush	0.070 - 0.140
Heavy Timber (Little undergrowth)	0.100 - 0.150
Heavy Timber (w/underbrush)	0.40
Streams: a. Some Grass And Weeds (Little or no brush) b. Dense Growth of Weeds c. Some Weeds (Heavy brush on banks)	 0.030 – 0.035 0.035 – 0.050 0.050 – 0.070

Notes:

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

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

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

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

APPENDIX C

SWM SITE PLAN APPLCIATION

Application and related data as submitted herewith are hereby made for review in accordance with the Lower Makefield Township Stormwater Management Ordinance.

This application is a sample of the information that is to be provided in the online application required to be submitted through Lower Makefield Township's Online Permitting & Citizen Requests portal.

_____ Final Plan _____ Preliminary Plan _____Sketch Plan

Date of Submission _____ Submission No. _____

6. Name of Subdivision or Development _____

7. Name of Applicant _____

   Address_____

   E-mail _____ Telephone No. _____

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

   _____ Officer 1

   _____ Officer 2

8. Name of Property Owner(s) (if other than applicant) _____

   Address _____

   E-mail _____ Telephone No. _____

9. Name of Engineer or Surveyor _____

   Address _____

   E-mail _____ Telephone No. _____

10. Type of subdivision or development proposed:

_____ Single-family lots	_____ Townhouses	_____ Commercial (multi-lot)
_____ Two-family lots	_____ Garden apartments	_____Commercial (one-lot)
_____ Multi-family lots	_____ Mobile-home park	_____ Industrial (multi-lot)
_____ Cluster type lots	_____ Campground	_____ Industrial (one-lot)
_____ Planned residential development	_____ Other (_____)	

11. Linear feet of new road proposed _____ L.F.

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

    a. Existing _____ S.F. _____ % of property
    b. Proposed _____ S.F. _____ % of property

13. Stormwater

    a. Does the submission meet the peak rate control requirements of the Stormwater Management Ordinance? _____

    b. Does the submission meet the criteria for the applicable Management District? _____

    c. Watershed Name _____

d. Watershed Subarea _____

e. Does the submission meet the volume control requirements of the Stormwater Management Ordinance? _____

f. Type of stormwater management controls _____

g. Do the proposed stormwater management controls meet the requirements/guidelines of the Stormwater Management Ordinance? _____

If not, what waivers are requested? _____

_____

Reasons _____

h. Does the SWM Plan meet the requirements of Article IV of the Stormwater Management Ordinance? _____

i. Does the SWM Report meet the requirements of Article IV of the Stormwater Management Ordinance? _____

j. Is a construction and staging schedule attached to this application? _____

k. Is a recommended maintenance program attached to this application? _____

14. Erosion and Sediment Pollution Control (E&S)

a. Has the stormwater management and E&S plan, supporting documentation, and narrative been submitted to the Bucks County Conservation District? _____

b. Total area of earth disturbance _____ ft^2

15. Wetlands

a. Have the wetlands been delineated by someone trained in wetland delineation? _____

b. Have the wetland lines been verified by a state or federal permitting authority? _____

c. Have the wetland lines been surveyed? _____

d. Total acreage of wetland within the property _____ ac.

e. Total acreage of wetland disturbed _____ ac.

f. Supporting documentation _____

16. Filing

a. Has the required fee been submitted? _____

Amount _____

b. Has the proposed construction inspection schedule to be performed by the Applicant's engineer been submitted?

_____

c. Name of individual who will be making the inspection _____

d. General comments about stormwater management at the development _____

_____

_____

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGEMENT OF APPLICATION

COMMONWEATLH OF PENNSYLVANIA
COUNTY OF BUCKS

On this the _____ day of _____, 20 _____, before me, the undersigned officer, personally appeared _____ who being duly sworn, according to law, deposes and says that _____ owners of the property described in this application and that the application was made with _____ knowledge and/or direction and does hereby agree with the said application and to the submission of the same.

_____ Property Owner

My commission Expires _____ 20 _____

Notary Public _____

THE UNDERSIGNED HEREBY CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF THE INFORMATION AND STATEMENTS GIVEN ABOVE ARE TRUE AND CORRECT.

SIGNATURE OF APPLICANT _____

(Information Below Line To Be Completed By The Township of Lower Makefield)

The Township of Lower Makefield official submission receipt:

Date complete application received _____ Plan number _____

Fees_____Date fees paid _____ Received by _____

Official submission receipt date _____

Received by _____

Signature _____

Township of Lower Makefield

SWM SITE PLAN CHECKLIST

Project: _____

Municipality: _____

Engineer: _____

Submittal No.: _____

Date: _____

Type of Permit: ☐ Minor ☐ Major

Project ID: _____(for Municipal use ONLY)

SECTION I: REGULATED ACTIVITIES

Reference: Section 174-5

1. Does the Proposed Project meet the definition of a "Regulated Activity"? ☐ Yes ☐ No

STOP – If you have checked "No" for the above question, you are not required to submit a Stormwater Management Permit under the Stormwater Management Ordinance.

SECTION II: EXEMPTION

Reference: Section 302

1. Does the regulated activity result in the alteration or development of 1,000 SF or less of land in a manner that may affect stormwater runoff (e.g. diverting a natural stormwater flow path)? ☐ Yes ☐ No
2. Does the regulated activity result in an earth disturbance of 5,000 SF or less? ☐ Yes ☐ No
3. Does the regulated activity result in a cumulative increase of impervious area of 1,000 SF or less since the first regulated instance under this Ordinance or the preceding versions of the Ordinance? ☐ Yes ☐ No

STOP – If you have checked "Yes" for questions 1 through 3, you are exempt from the requirements in Section 303 to 306, 308 to 312, and Article IV.

4. Is the regulated activity an agricultural activity? ☐ Yes ☐ No
5. Is the regulated activity a forest management or timber operation? ☐ Yes ☐ No

STOP – If you have checked "Yes" for either question 4 or 5, you are exempt from the requirements in Section 308 and Article IV.

6. Is the regulated activity any aspect of SWM Facility or BMP maintenance to an existing stormwater management system made in accordance with the plans, specifications, and operations and maintenance agreement and plan approved by Lower Makefield Township? ☐ Yes ☐ No
7. Is the regulated activity for gardening for home consumption? ☐ Yes ☐ No

STOP – If you have checked "yes" for either question 6 or 7, you are exempt from the requirements of the Ordinance.

***PLEASE NOTE** – Exemptions from any provision of the Stormwater Management Ordinance shall not relieve the applicant from the requirements in Section 301 and 307. Complete Section IV and XI of this application.

SECTION III: MINOR SWM PERMIT

Reference: Section 302

1. Does the regulated activity result in the alteration or development of 1,001 – 5,000 SF of land in a manner that may affect stormwater runoff (e.g. diverting a natural stormwater flow path)? ☐ Yes ☐ No
2. Does the regulated activity result in an earth disturbance of 5,001 – 43,559 SF? ☐ Yes ☐ No
3. Does the regulated activity result in a cumulative, including incremental and phased, increase of impervious area of 1,001 – 5,000 SF since the first regulated instance under this Ordinance or the preceding versions of the Ordinance? ☐ Yes ☐ No

STOP – If you have checked "Yes" for questions 1 through 3, you shall require a Minor SWM Permit and are exempt from the requirements in Section 308.

4. Have you completed and provided a Site Design Worksheet for the design of volume controls (Appendix I)? ☐ Yes ☐ No

STOP – If you have checked "Yes" for question 4, you are exempt from Section 303 to 312 and Article IV (except Section 410: Closeout, for Minor SWM Permits) of this ordinance and may skip to Section XI of this application.

***PLEASE NOTE** – All permits that do not quality for an exemption or a Minor SWM Permit are classified as Major SWM Permits.

SECTION IV: VOLUME CONTROLS

Reference: Section 307

A. Site Disturbance Minimization

1. Has an Existing Resource and Site Analysis Map (ERSAM) been prepared? ☐ Yes ☐ No
2. Are any of the following environmentally sensitive areas identified on site?

Steep Slopes	☐ Yes ☐ No ☐ Unknown
Ponds / Lakes / Vernal Pools	☐ Yes ☐ No ☐ Unknown
Streams	☐ Yes ☐ No ☐ Unknown
Wetlands	☐ Yes ☐ No ☐ Unknown
Hydric Soils	☐ Yes ☐ No ☐ Unknown
Flood Plains	☐ Yes ☐ No ☐ Unknown
Stream Buffer Zones	☐ Yes ☐ No ☐ Unknown
Hydrologic Soil Groups A or B	☐ Yes ☐ No ☐ Unknown
Recharge Areas	☐ Yes ☐ No ☐ Unknown
Others:_____	☐ Yes ☐ No ☐ Unknown

3. Does the site layout plan avoid environmentally sensitive areas identified on site? ☐ Yes ☐ No
4. If no to the above questions, explain: _____

_____

_____

B. Runoff Volume Control

1. What is the predevelopment runoff volume? _____ ft^3
2. What is the postdevelopment runoff volume? _____ ft^3
3. What is the difference in postdevelopment to predevelopment runoff volume? _____ ft^3

4. What is 20% of the difference? _____ ft^3
5. What is the total runoff volume control (difference + 20%)? _____ ft^3

C. Stormwater Runoff Control Measures

1. What is the runoff volume controlled through nonstructural BMPs? _____ ft^3
2. What is the runoff volume controlled through structural BMPs? _____ ft^3
3. Has the entirety of the runoff volume either been reused, evapotranspired, or infiltrated? ☐ Yes ☐ No

   If no, explain: _____

   _____

D. Soils Evaluation

1. Has a soils evaluation been completed in accordance with Section 403.A? ☐ Yes ☐ No

   If no, explain: _____

   _____

SECTION V: PEAK RATE CONTROLS

Reference: Section 308

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

   Neshaminy Creek Watershed: ☐ A ☐ B ☐ C

   Delaware River South Watershed: ☐ A ☐ B ☐ C
2. Does the proposed conditions rates of runoff not exceed eighty percent (80%) of the peak release rates of runoff from existing conditions for at any point in time during the design storms specified in Section 308.C and the Stormwater Management District Watershed Map (Appendix D) for the 2-, 5-, 10-, 25-, and 100-year 24-hour design storms?

   ☐ Yes ☐ No

SECTION VI: WATER QUALITY STANDARDS

Reference: Section 309

1. Is the entirety of the volume control requirements either infiltrated, evapotranspired, or reused? ☐ Yes ☐ No
2. If no, is the net change in pollutant loads for Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN) up to and including the 2-year 24-hour storm when compared to preconstruction pollutant loads managed?

   ☐ Yes ☐ No

   If no, explain: _____

   _____

SECTION VII: CALCULATION METHODOLOGY

Reference: Section 306

1. How were design storm values obtained?

   TR-20/TR-55 - Precipitation-Frequency Atlas of the United States, NOAA, National Weather Service: ☐

   Rational Method - PennDOT Publication 584, Chapter 7A: ☐
2. Has TR-55 segmental method been utilized to calculate time of concentration (Tc)? ☐ Yes ☐ No

3. Were runoff coefficients and curve numbers derived from Appendix B? ☐ Yes ☐ No
4. Are existing (predevelopment) non-forested pervious areas considered meadow in good condition? ☐ Yes ☐ No
5. Are wooded areas considered woods in good condition? ☐ Yes ☐ No
6. Is 20% of existing impervious area within the limit of disturbance considered meadow in good condition in the model for existing conditions for Minor SWM Permits and Major SWM Permits with less than 5,001 SF of existing impervious area? ☐ Yes ☐ No ☐ N/A
7. Is 100% of existing impervious area within the limit of disturbance considered meadow in good condition in the model for existing conditions for Major SWM Permits that do not satisfy the requirements of Section 306.G? ☐ Yes ☐ No ☐ N/A

   If no to any of the above, explain: _____

   _____

   _____

SECTION VIII: OTHER REQUIREMENTS

Reference: Sections 303, 304, 305, 310, 311, 312

1. Are Riparian Buffer Easements provided in accordance with Section 303? ☐ Yes ☐ No ☐ N/A
2. Are all SWM Facilities designed to meet the requirements of Section 304? ☐ Yes ☐ No ☐ N/A
3. Are all Conveyance Facilities designed to meet the requirements of Section 305? ☐ Yes ☐ No ☐ N/A
4. Are all SWM Facilities designed to meet the requirements of Section 310? ☐ Yes ☐ No ☐ N/A
5. Is the proposed activity considered a “Hotspot Use” in accordance with Section 311 and Appendix G? ☐ Yes ☐ No

   If yes, explain proposed pre-treatment BMPs and “treatment train”: _____

   _____
6. Are all erosion and sediment control BMPs designed in accordance with Section 312? ☐ Yes ☐ No

---

SECTION IX: ALTERNATIVE BMPS

Reference: Sections 307 and 308

1. A redevelopment site has reduced the predevelopment onsite impervious area by at least 20% in post development conditions? ☐ Yes ☐ No ☐ N/A
2. The site is not conducive for infiltration and alternative volume control methods are utilized? ☐ Yes ☐ No ☐ N/A

   PADEP Managed Release Concept (MRC) is utilized: ☐ Yes ☐ No ☐ N/A

   Other SWM Facility and BMP is utilized: ☐ Yes ☐ No ☐ N/A

   If other, explain: _____

   _____

SECTION X: SWM SITE PLAN AND REPORT SUBMISSION REQUIREMENTS

Refence: Article IV

1. The applicant has submitted the following:

SWM Permit Application & Fees:	☐ Yes ☐ No ☐ N/A
SWM Site Plan Checklist:	☐ Yes ☐ No ☐ N/A
SWM Site Plan:	☐ Yes ☐ No ☐ N/A
SWM Report (20% I=M):	☐ Yes ☐ No ☐ N/A
SWM Report (100% I=M):	☐ Yes ☐ No ☐ N/A
O&M Agreement & Plan:	☐ Yes ☐ No ☐ N/A
Financial Security:	☐ Yes ☐ No ☐ N/A
Waiver Requests:	☐ Yes ☐ No ☐ N/A
Subsurface Investigation:	☐ Yes ☐ No ☐ N/A
Infiltration Testing:	☐ Yes ☐ No ☐ N/A
Infiltration Soils Data:	☐ Yes ☐ No ☐ N/A
Wetland Delineation Report:	☐ Yes ☐ No ☐ N/A
Carbonate Assessment Report:	☐ Yes ☐ No ☐ N/A
Wetland Data:	☐ Yes ☐ No ☐ N/A
SWPP:	☐ Yes ☐ No ☐ N/A
External Permitting:	☐ Yes ☐ No ☐ N/A

2. The applicant agrees to fulfill all Project Closeout requirements per Section 410: ☐ Yes ☐ No

---

SECTION XI: OPERATION AND MAINTENANCE

Reference: Article V

1. Has an Operation and Maintenance Plan and Agreement been approved by the Municipality? ☐ Yes ☐ No

   If no, explain: _____

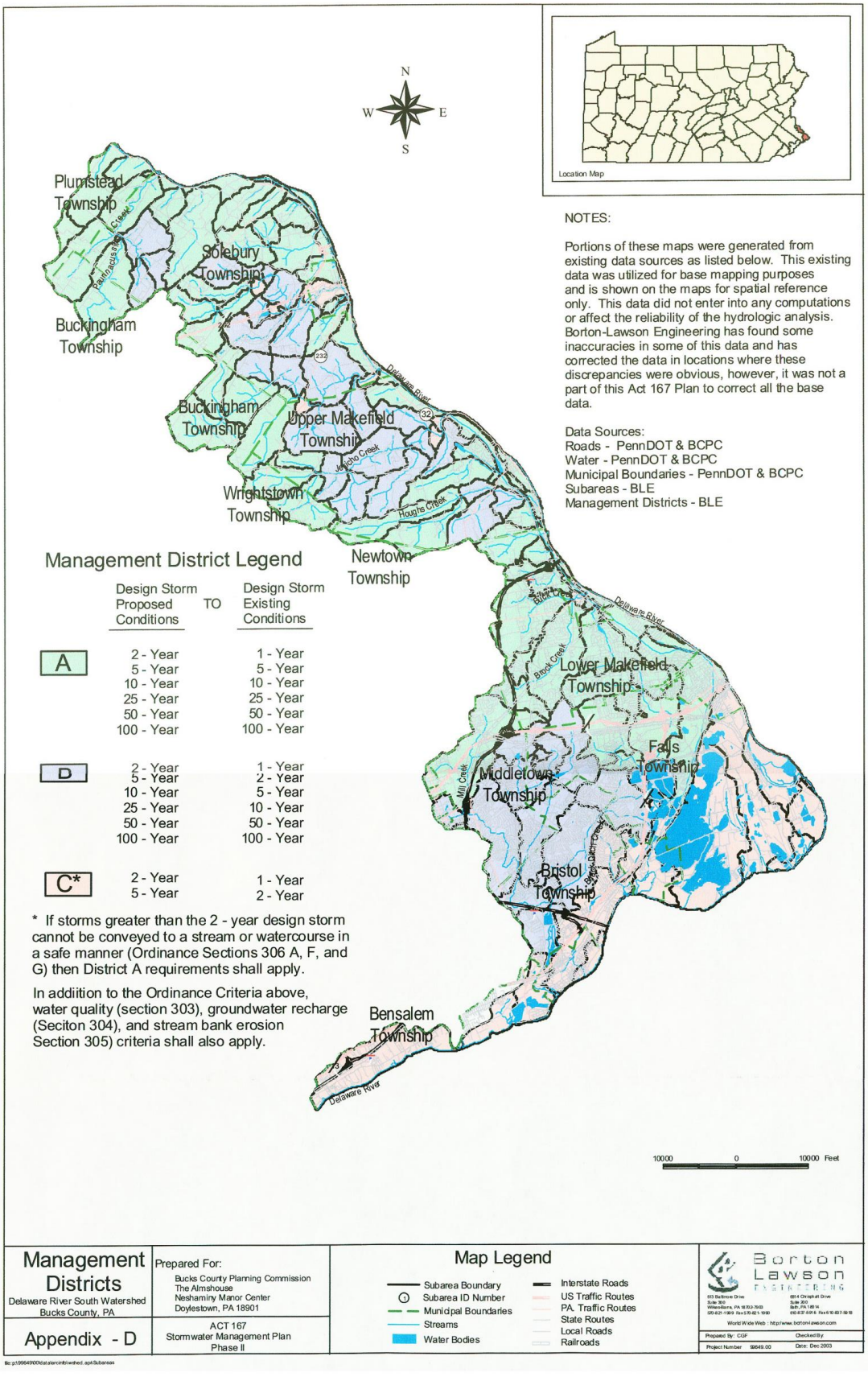
   _____

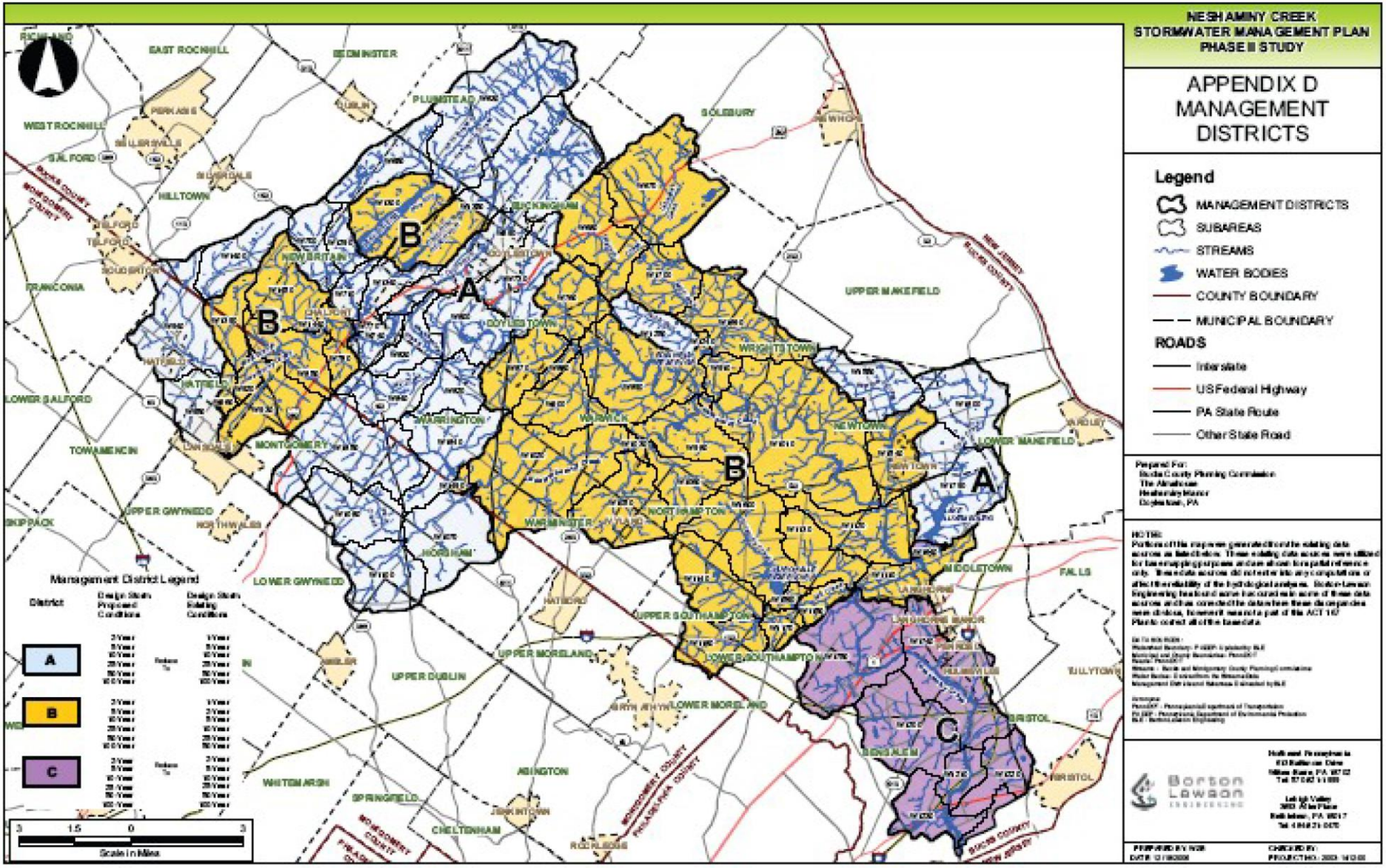
2. Who shall assume responsibility for implementing the Operation and Maintenance Plan?

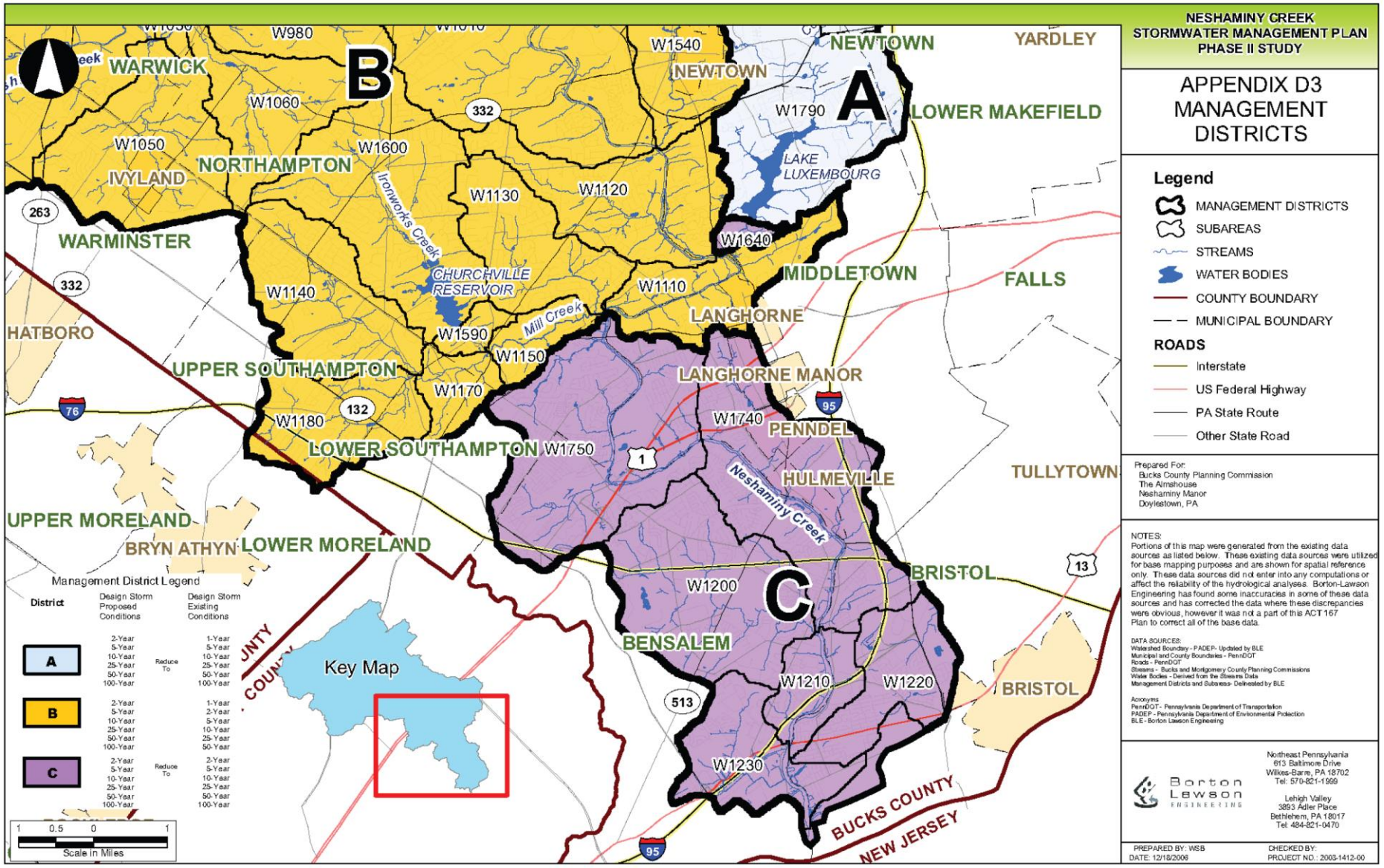
Municipality:	☐	Homeowner Association	☐
Homeowner Association:	☐	Other: _____	☐

APPENDIX D

MAPS OF MANAGEMENT DISTRICTS




NESHAMINY CREEK
STORMWATER MANAGEMENT PLAN
PHASE II STUDY
APPENDIX D
MANAGEMENT
DISTRICTS
Legend
MANAGEMENT DISTRICTS
SUBAREAS
STREAMS
WATER BODIES
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
ROADS
Interstate
US Federal Highway
PA State Route
Other State Road
Prepared For:
Bucks County Planning Commission
The Almshouse
Neshaminy Manor
Doylestown, PA
NOTES:
Portions of this map were generated from existing data sources as listed below. These existing data sources were utilized for base mapping purposes and are shown here for spatial reference only. These data sources did not enter into any computations or affect the reliability of the hydrological analyses. Boston Lawson Engineering has not made any warranties as to the accuracy of these data sources and has corrected the data where these discrepancies were obvious, however, errors may exist as part of the ACT 167 Plan's content and the base data.
Management District Legend
District
Design Storm Proposed Conditions
Design Storm Existing Conditions
A
B
C
Reduce To
2 Year
5 Year
10 Year
25 Year
50 Year
100 Year
3 1.5 0 3
Scale in Miles
EAST ROCKHILL
PERKASIE
WEST ROCKHILL
SILVERDALE
HILLTOWN
TELFORD
SOUDERTON
FRANCONIA
LOWER SALFORD
TOWAMENCIN
SKIPPACK
UPPER GWYNEDD
NORTH WALES
LOWER GWYNEDD
UPPER DUBLIN
WHITEMARSH
SPRINGFIELD
CHELTENHAM
ABINGTON
JENKINTOWN
RICHLANDS
QUAKERTOWN
SELLERSVILLE
SALFORD
PLUMSTEAD
DOYLESTOWN
NEW BRITAIN
HATFIELD
WARRINGTON
WARWICK
WARMINSTER
NORTHAMPTON
UPPER SOUTHAMPTON
UPPER MORELAND
LOWER MORELAND
BENSALEM
BRISTOL
NEWTOWN
MIDDLETOWN
LOWER MAKEFIELD
UPPER MAKEFIELD
SOLEBURY
BUCKINGHAM
MONTGOMERY COUNTY
BUCKS COUNTY
PHILADELPHIA COUNTY
NEW JERSEY
Prepared By:
Boston Lawson Engineering
Hatboro, PA
Lehigh Valley
Bethlehem, PA
PREPARED BY: NGB
DATE: 12/18/2008
CHECKED BY:
PROJECT NO.: 2003.1403.00


NESHAMINY CREEK
STORMWATER MANAGEMENT PLAN
PHASE II STUDY
APPENDIX D3
MANAGEMENT
DISTRICTS
Legend
MANAGEMENT DISTRICTS
SUBAREAS
STREAMS
WATER BODIES
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
ROADS
Interstate
US Federal Highway
PA State Route
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Prepared For:
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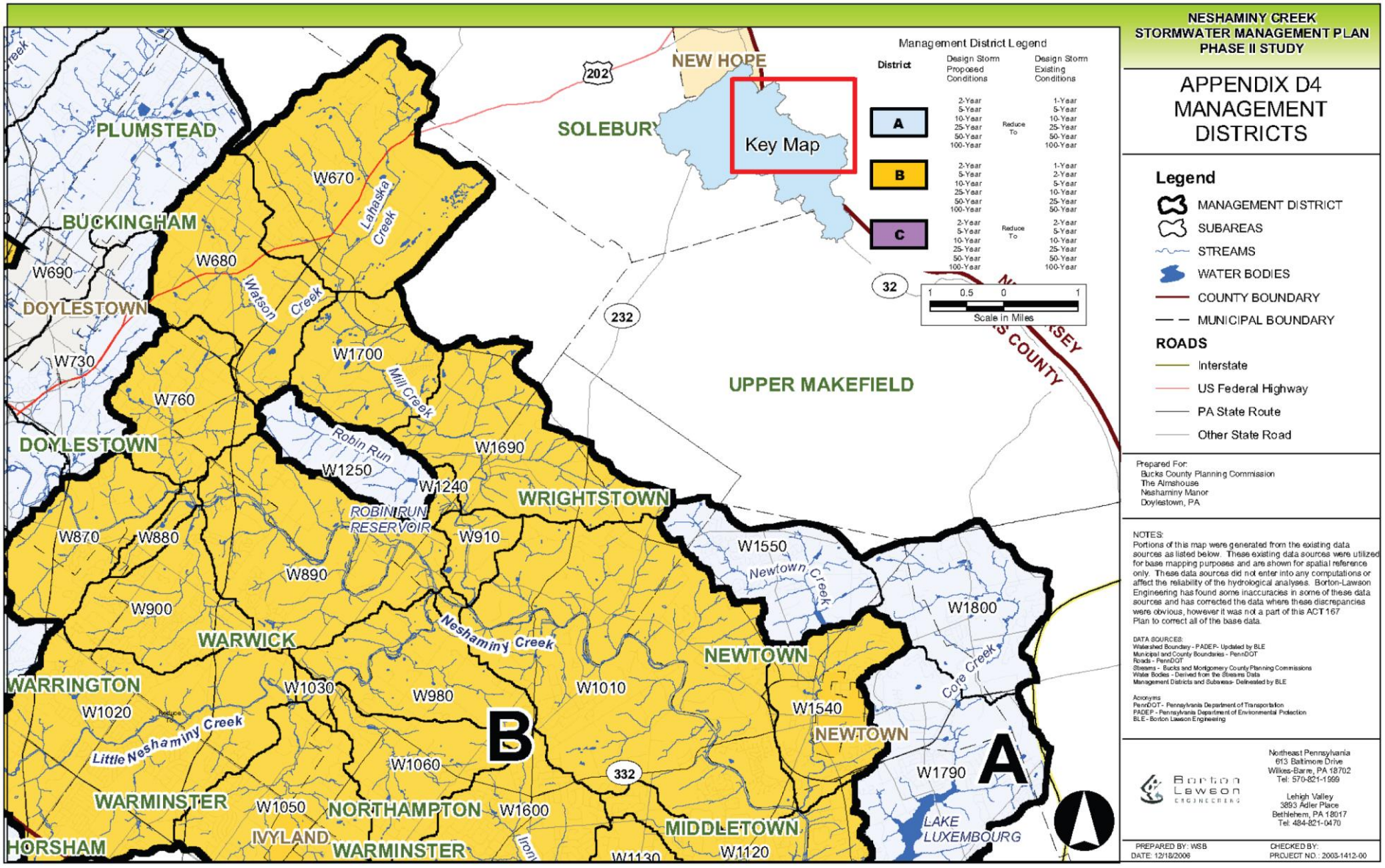
DATA SOURCES:
Watershed Boundary - PADEP- Updated by BLE
Municipal and County Boundaries - PennDOT
Roads - PennDOT
Streams - Bucks and Montgomery County Planning Commissions
Water Bodies - Derived from the Streams Data
Management Districts and Subareas- Delineated by BLE
Acronyms
PennDOT - Pennsylvania Department of Transportation
PADEP - Pennsylvania Department of Environmental Protection
BLE - Borton Lawson Engineering
Borton Lawson ENGINEERING
Northeast Pennsylvania
613 Baltimore Drive
Wilkes-Barre, PA 18702
Tel: 570-821-1999
Lehigh Valley
3893 Adler Place
Bethlehem, PA 18017
Tel: 484-821-0470
PREPARED BY: WSB
DATE: 12/18/2008
CHECKED BY:
PROJECT NO.: 2003-1412-00
WARWICK
NORTHAMPTON
IVYLAND
WARMINSTER
HATBORO
UPPER SOUTHAMPTON
LOWER SOUTHAMPTON
UPPER MORELAND
BRYN ATHYN
LOWER MORELAND
NEWTOWN
YARDLEY
LOWER MAKEFIELD
MIDDLETOWN
FALLS
LANGHORNE
LANGHORNE MANOR
PENNDEL
HULMEVILLE
TULLYTOWN
BRISTOL
BENSALEM
BUCKS COUNTY
NEW JERSEY
LAKE LUXEMBOURG
CHURCHVILLE RESERVOIR
Ironworks Creek
Mill Creek
Neshaminy Creek
W980
W1540
W1790
W1060
W1050
W1600
W1130
W1120
W1640
W1140
W1110
W1590
W1150
W1170
W1180
W1750
W1740
W1200
W1210
W1220
W1230
A
B
C
332
263
76
132
95
1
513
13
Management District Legend
District
Design Storm Proposed Conditions
Design Storm Existing Conditions
A
B
C
2-Year
5-Year
10-Year
25-Year
50-Year
100-Year
Reduce To
1-Year
2-Year
5-Year
10-Year
25-Year
50-Year
100-Year
Key Map
1 0.5 0 1
Scale in Miles



NESHAMINY CREEK STORMWATER MANAGEMENT PLAN PHASE II STUDY

APPENDIX D4 MANAGEMENT DISTRICTS

Legend

- MANAGEMENT DISTRICT
- SUBAREAS
- STREAMS
- WATER BODIES
- COUNTY BOUNDARY
- MUNICIPAL BOUNDARY

ROADS

- Interstate
- US Federal Highway
- PA State Route
- Other State Road

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

NOTES:
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Management Districts and Subareas- Delineated by BLE

Acronyms
PennDOT - Pennsylvania Department of Transportation
PADEP - Pennsylvania Department of Environmental Protection
BLE - Borton Lawson Engineering

Borton Lawson Engineering

Northeast Pennsylvania
613 Baltimore Drive
Wilkes-Barre, PA 18702
Tel: 570-821-1999

Lehigh Valley
3893 Adler Place
Bethlehem, PA 18017
Tel: 484-821-0470

PREPARED BY: WSB
DATE: 12/18/2008

CHECKED BY:
PROJECT NO.: 2003-1412-00

APPENDIX E

LOW-IMPACT DEVELOPMENT (LID) PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

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

The following describes various LID techniques:

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

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

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

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

    a. **Avoiding Introduction of Impervious Areas.** Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways, and other features producing impervious surfaces should be evaluated to minimize impacts of runoff.

    b. **Disconnecting Impervious Surfaces (DIA's):** Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff, and should help reduce concentration of runoff to a single point in the development. (See Ordinance Appendix F for additional description)

    c. **Reducing Street Widths.** Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. Municipal planners and traffic designers should encourage narrower neighborhood streets which ultimately could lower maintenance.

d. **Limiting Sidewalks to One Side of the Street.** A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines. Where appropriate, backyard trails should be constructed using pervious materials.

e. **Reducing Building Setbacks.** Reducing building setbacks reduces impervious cover associated with driveway and entry walks and is most readily accomplished along low- traffic streets where traffic noise is not a problem.

3. **Disconnect/Distribute/Decentralize:** See Section 5.8 of the Pennsylvania Stormwater Best Management Practices Manual, *Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006).*

   a. **Routing Roof Runoff Over Lawns.** Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connections of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.

   b. **Reducing the Use of Storm Sewers.** By reducing use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical for some development sites, especially if there are concerns for areas that do not drain in a “reasonable” time. The practice requires educating local citizens and public works officials, who expect runoff to disappear shortly after a rainfall event.

4. **Cluster and Concentrate:** See Section 5.5 of the Pennsylvania Stormwater Best Management Practices Manual, *Pennsylvania Department of Environmental Protection (PADEP) no. 363-0300-002 (2006)*. Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings occurs with street length, which also will reduce costs of the development. Cluster development “clusters” the construction activity onto less sensitive areas without substantially affecting the gross density of development.

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

APPENDIX F

DISCONNECTED IMPERVIOUS AREA (DIA)

ROOFTOP DISCONNECTION

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

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

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

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

Table F.1: Partial Rooftop Disconnection

Length of Pervious Flow Path *	**Roof Area Treated as Disconnected**
(feet)	(% of contributing area)
0 – 14	0
15 – 29	20
30 – 44	40
45 – 59	60
60 – 74	80
75 or more	100

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

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

APPENDIX G

HOT SPOTS

Hot spots are sites where the land use or activity produces a higher concentration of trace metals, hydrocarbons, or priority pollutants than normally found in urban runoff.

1. EXAMPLES OF STORMWATER HOT SPOTS

- Vehicle salvage yards and recycling facilities
- Vehicle fueling stations
- Vehicle service and maintenance facilities
- Vehicle and equipment cleaning facilities
- Fleet storage areas (bus, truck, etc.)
- Industrial sites (based on Standard Industrial Codes defined by the U.S. Department of Labor)
- Marinas (service and maintenance)
- Outdoor liquid container storage
- Outdoor loading/unloading facilities
- Public works storage areas
- Facilities that generate or store hazardous materials
- Commercial container nursery
- Other land uses and activities as designated by an appropriate review authority

2. LAND USE AND ACTIVITIES NOT NORMALLY CONSIDERED HOT SPOTS

- Residential streets and rural highways
- Residential development
- Institutional development
- Office developments
- Nonindustrial rooftops
- Pervious areas, except golf courses and nurseries (which may need an Integrated Pest Management (IPM) Plan).

3. RECOMMENDED PRE-TREATMENT METHODS FOR "HOT SPOT" LAND USES:

The following table recommends pre-treatment options for the listed land use. These methods are either a BMP or can be applied in conjunction with BMPs.

Hot Spot Land Use	**Pre-Treatment Method(s)**
Vehicle Maintenance and Repair Facilities Including Auto Parts Stores	• Water Quality Inlets • Use of Drip Pans and/or Dry Sweep Material Under Vehicles/Equipment • Use of Absorbent Devices to Reduce Liquid Releases • Spill Prevention and Response Program
Vehicle Fueling Stations	• Water Quality Inlets • Spill Prevention and Response Program
Storage Areas for Public Works	• Water Quality Inlets • Use of Drip Pans and/or Dry Sweep Material Under Vehicles/Equipment • Use of Absorbent Devices to Reduce Liquid Releases • Spill Prevention and Response Program • Diversion of Stormwater away from Potential Contamination Areas
Outdoor Storage of Liquids	• Spill Prevention and Response Program
Commercial Nursery Operations	• Vegetated Swales/Filter Strips • Constructed Wetlands • Stormwater Collection and Reuse
Uses Regulated Under the NPDES Stormwater Program	• BMPs that are a part of a Stormwater Pollution Prevention Plan under an NPDES Permit

APPENDIX H

WEST NILE VIRUS GUIDANCE

(This source is from the Monroe County, PA Conservation District, who researched the potential of West Nile Virus problems from BMPs due to a number of calls they were receiving.)

Monroe County Conservation District Guidance:
Stormwater Management and West Nile Virus

Source: Brodhead McMichaels Creeks Watershed Act 167
Stormwater Management Ordinance Final Draft 2/23/04

The Monroe County Conservation District recognizes the need to address the problem of nonpoint source pollution impacts caused by runoff from impervious surfaces. The new stormwater policy being integrated into Act 167 Stormwater Management regulations by the PA Department of Environmental Protection (PADEP) will make nonpoint pollution controls an important component of all future plans and updates to existing plans. In addition, to meet post-construction anti-degradation standards under the state National Pollution Discharge Elimination System (NPDES) permitting program, applicants will be required to employ Best Management Practices (BMPs) to address non-point pollution concerns.

Studies conducted throughout the United States have shown that wet basins and in particular constructed wetlands are effective in traditional stormwater management areas such as channel stability and flood control, and are one of the most effective ways to remove stormwater pollutants (United States Environmental Protection Agency 1991, Center for Watershed Protection 2000). From Maryland to Oregon, studies have shown that as urbanization and impervious surface increase in a watershed, the streams in those watersheds become degraded (CWP 2000). Although there is debate over the threshold of impervious cover when degradation becomes apparent (some studies show as little as 6% while others show closer to 20%), there is agreement that impervious surfaces cause non-point pollution in urban and urbanizing watersheds, and that degradation is ensured if stormwater BMPs are not implemented.

Although constructed wetlands and ponds are desirable from a water quality perspective there may be concerns about the possibility of these stormwater management structures becoming breeding grounds for mosquitoes. The Conservation District feels that although it may be a valid concern, **municipalities should not adopt ordinance provisions prohibiting wet basins for stormwater management.**

Mosquitoes

The questions surrounding mosquito production in wetlands and ponds have intensified in recent years by the outbreak of the mosquito-borne West Nile Virus. As is the case with all vector-borne maladies, the life cycle of West Nile Virus is complicated, traveling from mosquito to bird, back to mosquito and then to other animals including humans. Culex pipiens was identified as the vector species in the first documented cases from New York in 1999. This species is still considered the primary transmitter of the disease across its range. Today there are some 60 species of mosquitoes that inhabit Pennsylvania. Along with C. pipiens, three other species have been identified as vectors of West Nile Virus while four more have been identified as potential vectors.

The four known vectors in NE Pennsylvania are Culex pipiens, C. restuans, C. salinarius and Ochlerotatus japonicus. All four of these species prefer, and almost exclusively use, artificial containers (old tires, rain gutters, birdbaths, etc.) as larval habitats. In the case of C. pipiens, the most notorious of the vector mosquitoes, the dirtier the water the better they like it. The important factor is that these species do not thrive in functioning wetlands where competition for resources and predation by larger aquatic and terrestrial organisms is high.

The remaining four species, Aedes vexans, Ochlerotatus Canadensis, O. triseriatus and O. trivittatus are currently considered potential vectors due to laboratory tests (except the O. trivittatus, which did have one confirmed vector pool for West Nile Virus in PA during 2002). All four of these species prefer vernal habitats and ponded woodland areas following heavy summer rains. These species may be the greatest threat of disease transmission around stormwater basins that pond water for more than four days. This can be mitigated however by establishing ecologically functioning wetlands.

Stormwater Facilities

If a stormwater wetland or pond is constructed properly and a diverse ecological community develops, mosquitoes should not become a problem. Wet basins and wetlands constructed as stormwater management facilities, should be designed to attract a diverse wildlife community. If a wetland is planned, proper hydrologic soil conditions and the establishment of hydrophytic vegetation will promote the population of the wetland by amphibians and other mosquito predators. In natural wetlands, predatory insects and amphibians are effective at keeping mosquito populations in check during the larval stage of development while birds and bats prey on adult mosquitoes.

The design of a stormwater wetland must include the selection of hydrophytic plant species for their pollutant uptake capabilities and for not contributing to the potential for vector mosquito breeding. In particular, species of emergent vegetation with little submerged growth are preferable. By limiting the vegetation growing below the water surface, larvae lose protective cover and there is less chance of anaerobic conditions occurring in the water.

Stormwater ponds can be designed for multiple purposes. When incorporated into an open space design a pond can serve as a stormwater management facility and a community amenity. Aeration fountains and stocked fish should be added to keep larval mosquito populations in check.

Publications from the PA Department of Health and the Penn State Cooperative Extension concerning West Nile Virus identify aggressive public education about the risks posed by standing water in artificial containers (tires, trash cans, rain gutters, bird baths) as the most effective method to control vector mosquitoes.

Conclusion

The Conservation District understands the pressure faced by municipalities when dealing with multifaceted issues such as stormwater management and encourages the incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, groundwater recharge and constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed appropriately, the runoff mitigation benefits to the community from these design options will far out-weigh their potential to become breeding grounds for mosquitoes.

APPENDIX I

SITE DESIGN WORKSHEET

Draw a general site plan including the following: 1. The general layout of the property, including approximate lot lines and existing improvements; 2. Any existing or proposed onsite septic system and/or potable water wells; 3. All proposed improvements with approximate surface area in square feet; 4. Flow arrows showing the direction of runoff; 5. The location of the proposed stormwater facilities. An example site plan is available on the following page.

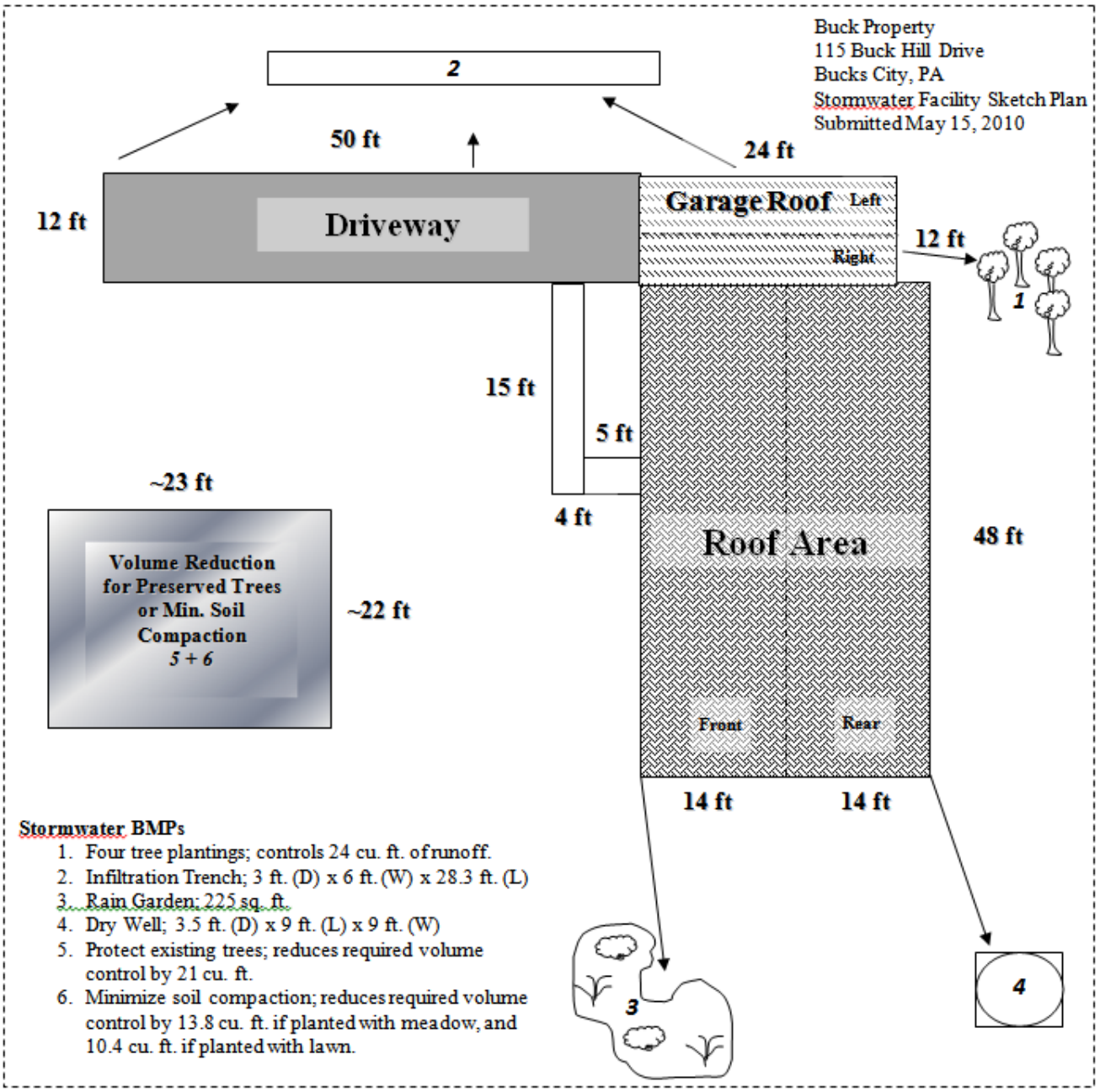
By submitting this worksheet, the applicant agrees:

1. To submit a Minor SWM Permit for Township approval with this Site Design Worksheet.
2. To direct **all** runoff from proposed impervious areas to the proposed stormwater facilities.
3. To construct the stormwater facilities in conformance with the details, specifications, and calculations within this worksheet.
4. That the proposed regulated activity conforms to the requirements of the Lower Makefield Township Stormwater Management Ordinance, including but not limited to the provision of a 10 foot setback for stormwater facilities and an O&M agreement.
5. That stormwater flows onto adjacent properties shall not be created, increased, relocated, significantly concentrated, or otherwise detrimentally altered without written approval from the affected property owner(s).
6. That stormwater management facilities are permanent fixtures and may not be modified, removed, filled, landscaped, have improvements placed within them, or otherwise be altered without written approval of Lower Makefield Township.
7. To provide Lower Makefield Township or its representatives access to the property for the purposes of inspecting SWM and ESC facilities.
8. That all construction shall follow the PADEP BMP Manual and E&S Manual, and that an E&S plan will be sent to the Bucks County Conservation District for review of adequacy if earth disturbance is equal to or greater than 5,000 square feet.
9. That identification of sensitive natural features, such as wetlands or karst features, is the applicant's responsibility, and that sensitive natural features on the site will not be encroached upon without proper permitting and/or Township approval.
10. That Lower Makefield Township and its representatives bear no design responsibility for the proposed improvements, including proposed SWM facilities. All design responsibility is borne by the applicant, and the applicant should consult with a professional if desired.
11. That the designs produced by utilizing this worksheet are likely conservative in nature.
12. To comply with all applicable local, state and federal laws and regulations.
13. To indemnify Lower Makefield Township and its representatives from any damage that may result from the proposed improvements and subsurface geology, including but not limited to stormwater management facilities.
14. That any false or misleading information provided in this worksheet will result in the rejection of the application. Failure to complete the worksheet may result in delays or rejection of the application in its entirety.

.

Signature of Applicant:_____ Date: _____

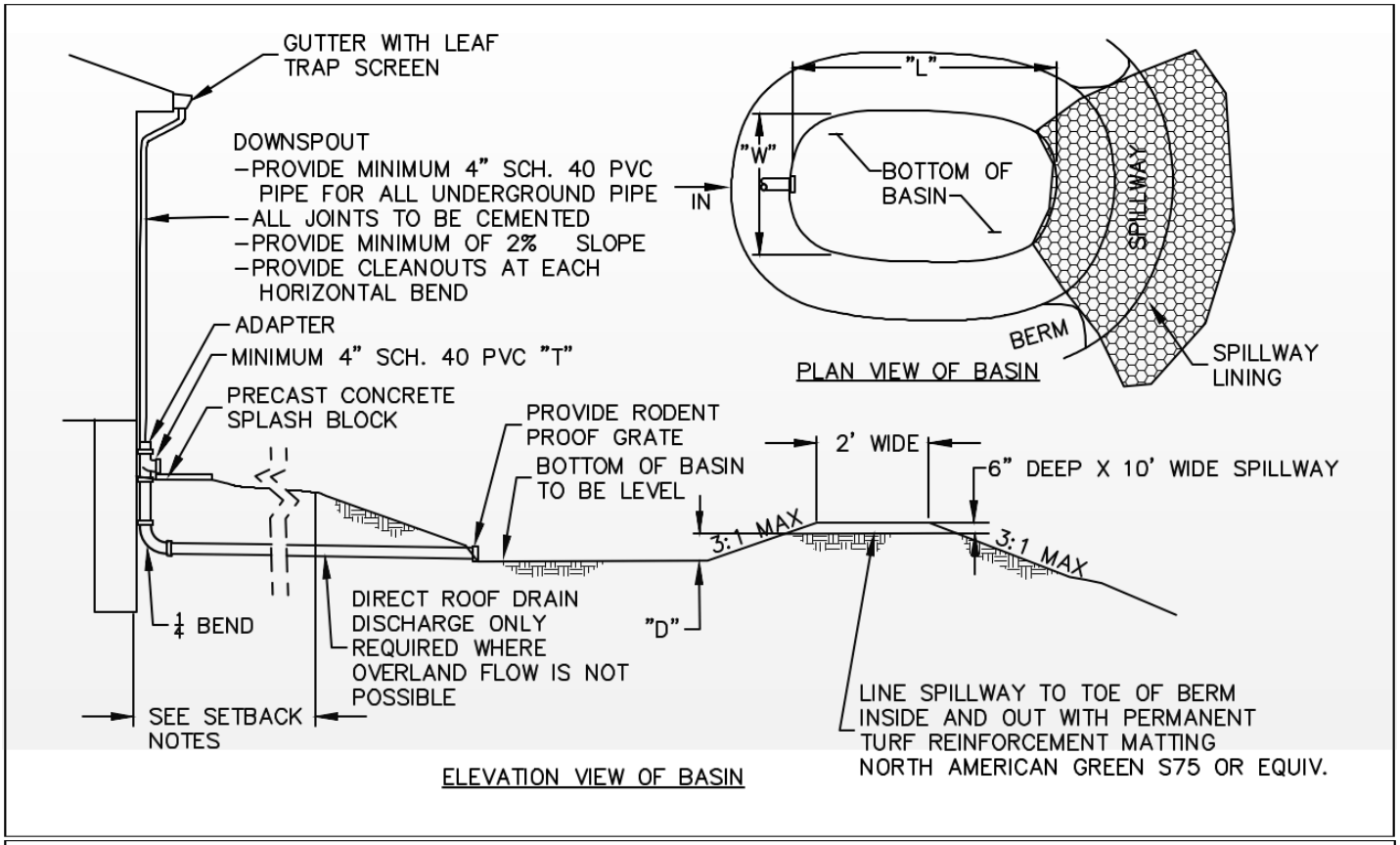
Example Site Plan

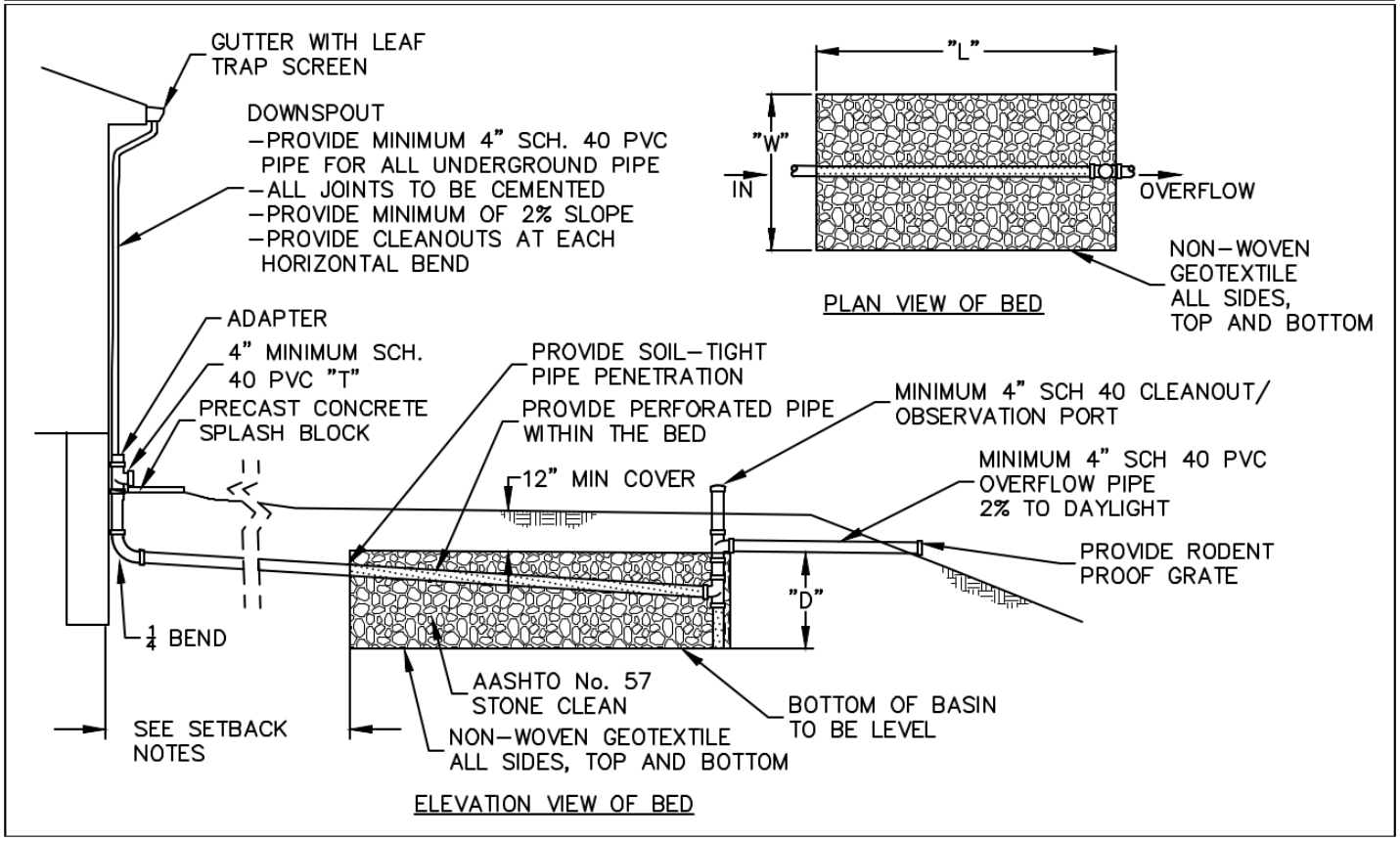


Stormwater BMPs

1. Four tree plantings; controls 24 cu. ft. of runoff.
2. Infiltration Trench; 3 ft. (D) x 6 ft. (W) x 28.3 ft. (L)
3. Rain Garden; 225 sq. ft.
4. Dry Well; 3.5 ft. (D) x 9 ft. (L) x 9 ft. (W)
5. Protect existing trees; reduces required volume control by 21 cu. ft.
6. Minimize soil compaction; reduces required volume control by 13.8 cu. ft. if planted with meadow, and 10.4 cu. ft. if planted with lawn.

Structural Stormwater Facility Details





NOTE 1: Infiltration trenches may only be used for structures; infiltration basins may be used for all surfaces, including structures.
NOTE 2: Infiltration basins deeper than 3 feet must be fences as per the Stormwater Management Ordinance.
NOTE 3: No stormwater facility may be deeper than 6 feet.
NOTE 4: All Infiltration Basins shall be planted with native meadow grasses and plants per the Township's Ordinance.

Nonstructural and Alternative Best Management Practices (BMPs) Specifications

Tree Plantings

To receive credit for planting trees, the following criteria must be met:

- Trees must be native species, minimum 2" caliper. Minimum tree height is 6 feet.
    - Native trees shall either be selected from the *Pennsylvania Stormwater Best Management Practices Manual* or as specified by the Pennsylvania Department of Conservation and Natural Resources. Native trees shall be approved by the Township prior to planting.
- Trees shall be adequately protected during construction.
- Trees credited for stormwater management shall be clearly labeled on the Site Design Worksheet and recorded on the Operation and Maintenance Plan and Record Plan for the project.
- Trees shall be maintained and protected for the life of the project or until redevelopment occurs (i.e. trees shall remain for the life of the proposed improvements).
- No more than 25% of the runoff volume can be mitigated nonstructural BMPs.
- Trees shall be located within 100' of the proposed improvements.
- Runoff from the proposed development shall be directed toward the trees.
- Trees shall be located on the development site.

Minimize Soil Compaction and Replant with Meadow

To receive credit for minimizing soil compaction and replanting with meadow, the following criteria must be met:

- Area shall not be stripped of existing topsoil.
- Vehicle movement, storage, or equipment/material laydown shall not be permitted in areas of minimized soil compaction and replanting.
- The limit of disturbance of the proposed improvements shall not encroach on the area.
- The use of soil amendments and additional topsoil is permitted. Light grading may be performed if compaction is prevented.
- Meadow shall be planted in area with native grasses.
    - Native grasses shall either be selected from the *Pennsylvania Stormwater Best Management Practices Manual* or as specified by the Pennsylvania Department of Conservation and Natural Resources. Native trees shall be approved by the Township prior to planting.
- Meadow credited for stormwater management shall be clearly labeled on the Site Design Worksheet and recorded on the Operation and Maintenance Plan and Record Plan for the project.
- Meadow shall be maintained and protected for the life of the project or until redevelopment occurs (i.e. meadow shall remain for the life of the proposed improvements).
- No more than 25% of the runoff volume can be mitigated through nonstructural BMPs.
- Meadow shall be located within 100' of the proposed improvements.
- Runoff from the proposed development shall be directed toward the meadow.
- Meadow shall be located on the development site.

Disconnection of Impervious Areas (DIA)

To receive credit for disconnection of Impervious Areas, the following criteria must be met:

- Disconnection of Impervious Areas shall meet the requirements as stated in Appendix G of the Stormwater Management Ordinance.
- The contributing area of a rooftop or impervious surface to each disconnected discharge is 500 square feet or less.
- The soil, in proximity of the water discharge area, is not designated as hydrologic soil group "C or D" or equivalent.
- The overland flow path has a positive slope of 5% or less.
- Flow paths are located on the development project site.
- Roof downspouts shall be at least 10 feet away from the nearest impervious surface to discourage "re-connections."
- Flow paths shall be planted with lawn or turf grass. Meadow is encouraged.
- Flow paths shall be protected from compaction or unintended disturbance during construction.
- DIA credited for stormwater management shall be clearly labeled on the Site Design Worksheet and recorded on the Operation and Maintenance Plan and Record Plan for the project.
- Downstream flow path of DIA shall be maintained and protected for the life of the project or until redevelopment occurs (i.e. flow path shall remain for the life of the proposed improvements).
- No more than 25% of the runoff volume can be mitigated through nonstructural BMPs.

Rain Barrels

To receive credit for rain barrels, the following criteria must be met:

- Rain barrels should be directly connected to the roof gutter/spout.
- There must be a means to release the water stored between storm events to provide the necessary storage volume for the next storm.
- When calculating rain barrel size, rain barrels are typically assumed to be 25% full because they are not always emptied before the next storm.
- Use screen to filter debris and cover lids to prevent mosquitos.
- An overflow outlet should be placed a few inches below the top with an overflow pipe to divert flow away from structures.
- Multiple rain barrels may be utilized consecutively.
- Rain barrels credited for stormwater management shall be clearly labeled on the Site Design Worksheet and recorded on the Operation and Maintenance Plan and Record Plan for the project.
- No more than 25% of the runoff volume can be mitigated through this alternative BMP.
- Rain barrels shall be located on the development site.

Stormwater Facility Calculations

How to calculate the size of your stormwater facility:

1. Determine the area of impervious surfaces you are proposing to construct that will discharge to your stormwater facilities and BMPs. For example, a 30 foot x 40 foot garage would be 1200 square feet. For surfaces that are not simple geometric shapes, you may need to get the area of impervious surfaces from your contractor.

2. Enter the total area of impervious surfaces into #1 in the table below and multiply this by 0.2. This will tell you the volume of stormwater runoff the impervious surfaces are generating (in cubic feet).

3. **If you are proposing to utilize nonstructural or alternative BMPs**, enter your volume of stormwater runoff the impervious surfaces are generating (#1) into #2 in the table below and multiply this by 0.25. This will tell you the maximum amount of stormwater a nonstructural or alternative BMP may capture. **If you are proposing to only use structural stormwater facilities, skip to step 6.**

4. Calculate the volume your proposed nonstructural or alternative BMPs capture by selecting the type of BMP that will be constructed on-site and follow the below instructions for each BMP:

    a. If you are proposing to plant native trees, multiply the number of proposed trees by either 6, for deciduous trees, or 10, for evergreen trees.
    b. If you are proposing to minimize compaction and replant with meadow, multiply the area where compaction is minimized and meadow is planted by 0.025.
    c. If you are proposing to disconnect impervious areas (DIA), multiply the impervious area contributing to the DIA by 0.02. If the length of pervious flow path of the DIA is less than 75 feet, multiply by the percent of contributing area as stated in Appendix F.
    d. If you are proposing to install rain barrels, multiply the impervious area contributing to the rain barrel by 0.2, then 7.48, and then 0.25.

5. Determine the volume of stormwater runoff your structural stormwater facility must capture (#3) by adding the total volume of each nonstructural or alternative BMP together (#2A + #2B + #2C + #2D) and subtracting it from the volume of stormwater runoff the impervious surfaces are generating (#1). Make sure the total of the nonstructural or alternative BMPs is not greater than 25% of the total volume of stormwater runoff (#2).

6. Determine the area of your property available for the installation of stormwater facilities in terms of length and width (in feet). If large areas of your property are available, determine how much you would like to dedicate to the installation of stormwater facilities in terms of length and width.

7. Enter the length and width chosen into #4 in the table below, and multiply them together. This will tell you the area (in square feet) that your stormwater facility will take up.

8. Enter the runoff volume (#3) and stormwater facility area (#4) into #5 in the table below. Divide #3 by #4. This will tell you how deep (in feet) your stormwater facility will need to be if it is an infiltration basin. **If you are proposing to construct an infiltration basin, skip step 9 and proceed to step 10.**

9. **If you are proposing to construct an infiltration trench**, enter the facility depth (#5 below) into #6 in the table below, and divide by 0.4. This will tell you how deep (in feet) your stormwater facility will need to be since it is using stone. Stone takes up approximately 60% of the volume within an infiltration trench, so only 40% of the volume of the infiltration trench is available to actually store stormwater. Dividing by 0.4 compensates for this loss of runoff storage.

10. If your stormwater facility depth is greater than 6 feet, you will need to expand the area for the stormwater facility determined in step 6 above, and repeat the above process until the depth is equal to or lesser than 6 feet.

Facility Name or #			
	1. Runoff Volume	_____(Imp. Area to Facilities) x 0.2	CF
	2. Nonstructural Runoff Volume	_____(#1) x 0.25	CF
	2A. Native Trees	_____(Deciduous) x 6 +_____(Evergreen) x 10	CF
	2B. Minimize Compaction & Meadow Planting	_____(Meadow Area) x 0.025	CF
	2C. Disconnect Impervious Areas (DIA)	_____(Imp. Area to DIA) x ____(% contributing) x 0.02	CF
	2D. Rain Barrels	_____(Imp. Area to Rain Barrel) x 0.2 x 7.48 x 0.25	GAL
	3. Structural Volume	_____(#2) – _____(#2A + #2B + #2C + #2D)	CF
	4. Facility Area	_____(L) x _____(W)	SF
	5. Facility Depth	_____(#3) x _____(#4)	F
	6. Depth w/ Stone	(TRENCHES ONLY) _____(#5) / 0.4	F

NOTE: Extra tables provided below for repeat calculations for extra facilities

Facility Name or #			
	1. Runoff Volume	_____(Imp. Area to Facilities) x 0.2	CF
	2. Nonstructural Runoff Volume	_____(#1) x 0.25	CF
	2A. Native Trees	_____(# of Trees) x 6 (Deciduous) or 10 (Evergreen)	CF
	2B. Minimize Compaction & Meadow Planting	_____(Meadow Area) x 0.025	CF
	2C. Disconnect Impervious Areas (DIA)	_____(Imp. Area to DIA) x ____(% contributing) x 0.02	CF
	2D. Rain Barrels	_____(Imp. Area to Rain Barrel) x 0.2 x 7.48 x 0.25	GAL
	3. Structural Volume	_____(#2) – _____(#2A + #2B + #2C + #2D)	CF
	4. Facility Area	_____(L) x _____(W)	SF
	5. Facility Depth	_____(#3) x _____(#4)	F
	6. Depth w/ Stone	(TRENCHES ONLY) _____(#5) / 0.4	F

Facility Name or #			
	7. Runoff Volume	_____(Imp. Area to Facilities) x 0.2	CF
	8. Nonstructural Runoff Volume	_____(#1) x 0.25	CF
	2A. Native Trees	_____(# of Trees) x 6 (Deciduous) or 10 (Evergreen)	CF
	2B. Minimize Compaction & Meadow Planting	_____(Meadow Area) x 0.025	CF
	2C. Disconnect Impervious Areas (DIA)	_____(Imp. Area to DIA) x ____(% contributing) x 0.02	CF
	2D. Rain Barrels	_____(Imp. Area to Rain Barrel) x 0.2 x 7.48 x 0.25	GAL
	9. Structural Volume	_____(#2) – _____(#2A + #2B + #2C + #2D)	CF
	10. Facility Area	_____(L) x _____(W)	SF
	11. Facility Depth	_____(#3) x _____(#4)	F
	12. Depth w/ Stone	(TRENCHES ONLY) _____(#5) / 0.4	F

APPENDIX J

POST-CONSTRUCTION BMP INSPECTION REPORT

LOWER MAKEFIELD TOWNSHIP
POST CONSTRUCTION BMP INSPECTION REPORT

Date: _____

Owner Information

1. Name: _____ 2. Account Number: _____
3. Email: _____ 4. Phone: _____
5. Address: _____

Inspector Information (If Different from Owner)

1. Name: _____ 2. Phone: _____
3. Email: _____
4. Address: _____

BMP Information

1. Address: _____
2. Property Type (Circle One): Residential Commercial Industrial Institutional Other
If Other, Please Describe: _____
3. Installation Date: _____
4. Type of BMP, If More Than One BMP Please Provide Information on All BMPs
_____
_____
_____
5. Is Maintenance Needed at This Time (Circle One)? Yes No
6. Comments/Notes: _____
_____
_____
7. Attach Maintenance Documentation and Photographs of BMP (Required)

FOLLOW-UP AND ENFORCEMENT ACTIONS (FOR INTERNAL USE ONLY)

1. Describe corrective actions needed: _____
_____
2. Describe Enforcement Action: _____
3. Follow-up required? o Yes o No
Comments: _____
4. Return inspection needed? o Yes o No
Comments: _____
5. Required Compliance Date: _____ 6. Date Corrected: _____

Representative: _____