

STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO. - 196

MUNICIPALITY OF

UPPER NAZARETH TOWNSHIP

NORTHAMPTON COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on

August 21, 2024

**TOWNSHIP OF UPPER NAZARETH
NORTHAMPTON COUNTY, PENNSYLVANIA**

ORDINANCE NO. 2024-_____

AN ORDINANCE

AMENDING THE CODE OF ORDINANCES OF UPPER NAZARETH TOWNSHIP REGULATING STORMWATER MANAGEMENT AND PROVIDING FOR GENERAL PROVISIONS, DEFINITIONS, STORMWATER MANAGEMENT REQUIREMENTS, DRAINAGE PLAN REQUIREMENTS, FEES AND EXPENSES, STORMWATER OPERATIONS & MAINTENANCE PLAN REQUIREMENTS, PROHIBITIONS, RIGHT OF ENTRY, NOTIFICATION AND ENFORCEMENT, WITH ATTACHMENTS INCORPORATING THE MODEL STORMWATER OPERATION & MAINTENANCE AGREEMENT, PRELIMINARY SITE INVESTIGATION AND TESTING REQUIREMENTS, MUNICIPAL STORMWATER MANAGEMENT DISTRICTS AND STORM DRAINAGE PROBLEM AREAS, BUSHKILL CREEK WATERSHED TECHNICAL REQUIREMENTS, MONOCACY CREEK WATERSHED TECHNICAL REQUIREMENTS, LOW IMPACT DEVELOPMENT PRACTICES, AND DESIGN STANDARDS FOR STORMWATER MANAGEMENT INFRASTRUCTURE, EXCEPTIONS, ENFORCEMENT, PENALTIES, REPEALER, AND SEVERABILITY.

BE IT ENACTED AND ORDAINED by the Board of Supervisors of Upper Nazareth Township, Northampton County, Pennsylvania, and be it enacted and ordained by the authority of same, pursuant to the Pennsylvania Municipalities Planning Code, as amended, the Stormwater Management Act, as amended, and the Second Class Township Code, as amended, as follows:

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Part 1 GENERAL PROVISIONS

§ 101 Short Title.

This Ordinance shall be known and may be cited as the "Stormwater Management Ordinance" which satisfies regulatory requirements of the NPDES MS4 program as well as Act 167 requirements for the Bushkill Creek and the Monocacy Creek.

§ 102 Statement of Findings.

The governing body of the municipality finds that:

1. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases runoff volumes, flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.
2. 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 people of the Commonwealth, their resources, and the environment.
3. Stormwater is an important water resource that provides groundwater recharge for water supplies and supports the base flow of streams.
4. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.
5. 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.
6. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the municipality.

§ 103 Purpose.

The purpose of this Ordinance is to promote health, safety, and welfare within Upper Nazareth Township and the Watersheds by minimizing the harms and maximizing the benefits described in § 102 of this Ordinance, through provisions designed to:

1. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.
2. Preserve natural drainage systems.
3. Manage stormwater runoff close to the source, reduce runoff volumes and mimic predevelopment hydrology.
4. Provide procedures and performance standards for stormwater planning and management.
5. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
6. Prevent scour and erosion of stream banks and streambeds.
7. Provide proper operation and maintenance of all stormwater management facilities that are implemented within the municipality.
8. Provide standards to meet NPDES permit requirements.

§ 104 Statutory Authority.

The municipality 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, and/or the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, The Stormwater Management Act., and the Township Code, as amended.

§ 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 in accordance with provisions specific to one of the two specific Stormwater Management Districts the Township is partitioned into – the Bushkill Creek Watershed and the Monocacy Creek Watershed. A map illustrating the boundaries of each watershed is provided in Attachment 3. More detailed mapping of each watershed can be found in the respective Act 167 Stormwater Management Plans as prepared by the Lehigh Valley Planning Commission. (See References.)

Where necessary, NPDES Phase II regulations ensure that all of the ordinance provisions required to meet the MS4 NPDES requirements apply across the entire municipality. The following activities are defined as regulated activities and shall be governed by this Ordinance:

1. Land development.
2. Subdivision.
3. Construction of new or additional impervious surfaces (driveways, parking lots, swimming pools, etc.).
4. Construction of new buildings or additions to existing buildings.
5. Diversion or piping of any natural or man-made stream channel.
6. Installation of stormwater systems or appurtenances thereto.
7. Regulated earth disturbance activities.
8. Other than that included in Subsection 105.1 through 7, any earth disturbance activities or any activities that include the alteration or development of land in a manner that may affect stormwater runoff onto adjacent property.

§ 106 Exemptions.

1. Impervious cover. Any proposed regulated activity, except those defined in § 105.5. and § 105.8., which would create 10,000 square feet or less of additional impervious cover is exempt from the drainage plan preparation provisions of this Ordinance. All impervious cover added incrementally to a site above the initial 10,000 square feet shall be subject to the drainage plan preparation provisions of this Ordinance. If a site has previously received an exemption and is proposing additional development such that the total impervious cover on the site exceeds 10,000 square feet, the total impervious cover on the site proposed since the original ordinance date must meet the provisions of this Ordinance.
 - A. The date of the municipal ordinance adoption of the original Bushkill and Monocacy Creek Act 167 Stormwater Management Ordinance. March 1989 shall be the starting point from which to consider tracts as “parent tracts” in which future subdivisions and respective impervious area computations shall be cumulatively considered.
 - B. For development taking place in stages, the entire development plan must be used in determining conformance with these criteria.
 - C. Additional impervious cover shall include, but not be limited to,

additional indoor living spaces, decks, patios, garages, driveways, storage sheds and similar structures, any roof, parking or driveway areas and any new streets and sidewalks constructed as part of or for the proposed regulated activity.

- D. Any additional areas proposed to initially be gravel, crushed stone, porous pavement, etc., shall be assumed to be impervious for the purposes of comparison to the exemption criteria. Any existing gravel, crushed stone or hard packed soil areas on a site shall be considered as pervious cover for the purpose of exemption evaluation.

If a drainage plan is required, the pre- and post-development calculations should be based on actual cover conditions regardless of any assumptions made for purposes of exemption evaluation.

2. Prior drainage plan approval. Any regulated activity for which a drainage plan was previously prepared as part of a subdivision or land development proposal that received preliminary plan approval from the municipality prior to the effective date of this Ordinance is exempt from the drainage plan preparation provisions of this Ordinance, except as cited in § 23-106.C., provided that the approved drainage plan included design of stormwater facilities to control runoff from the site currently proposed for regulated activities consistent with ordinance provisions in effect at the time of approval and the approval has not lapsed under the Municipalities Planning Code. If significant revisions are made to the drainage plan after both the preliminary plan approval and the effective date of this Ordinance, preparation of a new drainage plan, subject to the provisions of this Ordinance, shall be required. Significant revisions would include a change in control methods or techniques, relocation or redesign of control measures or changes necessary because soil or other conditions are not as stated on the original drainage plan.
3. These exemptions shall not relieve the applicant from implementing such measures as are necessary to protect health, safety, property, and state water quality requirements. These measures include adequate and safe conveyance of stormwater on the site and as it leaves the site. These exemptions do not relieve the applicant from the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance.
4. No exemptions shall be provided for regulated activities as defined in § 105.5. and 105.7.
5. Agricultural plowing or tilling activity is exempt from the rate control and drainage plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code 102.

6. Timber harvesting activities are exempt from the rate control and drainage plan preparation requirements of this Ordinance provided activities are performed according to the requirements of 25 Pa. Code 102.
7. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in § 301.4. through 11.
8. The municipality may deny or revoke any exemption pursuant to this Section at any time for any project that the municipality believes may pose a threat to public health, safety, property, or the environment.

§ 107 Repealer.

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

§ 108 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.

§ 109 Compatibility with Other Ordinance 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, law, regulation or ordinance.

§ 110 Duty of Persons Engaged in Development of Land.

Notwithstanding any provisions of this Ordinance, including exemption and waiver provisions, any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required to manage the rate, volume, direction and quality of resulting stormwater runoff in a manner which otherwise adequately protects health and property from possible injury.

§ 111 Erroneous Permit.

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

§ 112 Waivers.

1. If the Municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the Municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to § 112.2 and § 23-112.3.
2. Waivers or modifications of the requirements of this Ordinance may be approved by the Municipality if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification.
3. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Municipality unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

Part 2 DEFINITIONS

§ 201 Definitions.

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

1. 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.
2. The word "includes" or "including" shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
3. The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

These definitions do not necessarily reflect the definitions contained in pertinent regulations or statutes and are intended for this Ordinance only.

ACCELERATED EROSION — The removal of the surface of the land through the combined action of human activities and natural processes, at a rate greater than would occur because of the natural processes alone.

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

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

BEST MANAGEMENT PRACTICE (BMP) — Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities listed in § 105, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: "structural" or "non-structural." In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands to small-scale underground treatment

systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site. The terms “Best Management Practice” and “BMP” shall, for purposes of this Ordinance, be synonymous with “Stormwater Control Measure” and “SCM”.

BEST MANAGEMENT PRACTICE OPERATIONS AND MAINTENANCE PLAN — See **STORMWATER MANAGEMENT FACILITIES OPERATIONS AND MAINTENANCE PLAN**.

BIORETENTION — Densely vegetated, depressed features that store stormwater and filter it through vegetation, mulch, planting soil, etc. Ultimately stormwater is evapotranspired, infiltrated, or discharged. Optimal bioretention areas mimic natural ecosystems in terms of species diversity, density, distribution, use of native plants, etc.

BUFFER —

- A. **STREAMSIDE BUFFER** — A zone of variable width located along a stream that is vegetated and is designed to filter pollutants from runoff.
- B. **SPECIAL GEOLOGIC FEATURE BUFFER** — A required isolation distance from a special geologic feature to a proposed BMP needed to reduce the risk of sinkhole formation due to stormwater management activities.

CAPTURE/REUSE — Stormwater management techniques such as cisterns and rain barrels which direct runoff into storage devices, surface or subsurface, for later reuse, such as for irrigation of gardens and other planted areas. Because this stormwater is utilized and no pollutant discharge results, water quality performance is superior to other non-infiltration BMPs.

CARBONATE BEDROCK — Rock consisting chiefly of carbonate minerals, such as limestone and dolomite; specifically, a sedimentary rock composed of more than 50% by weight of carbonate minerals that underlies soil or other unconsolidated, superficial material.

CISTERN — An underground reservoir or tank for storing rainwater.

CLOSED DEPRESSION — A distinctive bowl-shaped depression in the land surface. It is characterized by internal drainage, varying magnitude, and an unbroken ground surface.

CONSERVATION DISTRICT — The Northampton County Conservation District, as applicable and as defined in Section 3(c) of the Conservation District Law (3 P. S. Section 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.

CONCENTRATED DRAINAGE DISCHARGE — Stormwater runoff leaving a property via a point source.

CONSTRUCTED WETLANDS — Constructed wetlands are similar to wet ponds (see below) and consist of a basin which provides for necessary stormwater storage as well as a permanent pool or water level, planted with wetland vegetation. To be successful, constructed wetlands must have adequate natural hydrology (both runoff inputs as well as soils and water table which allow for maintenance of a permanent pool of water). In these cases, the permanent pool must be designed carefully, usually with shallow edge benches, so that water levels are appropriate to support carefully selected wetland vegetation.

CULVERT — A pipe, conduit or similar structure including appurtenant works which carries surface water.

DAM — An artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or semifluid.

DEP — The Pennsylvania Department of Environmental Protection.

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 — A basin designed to retard stormwater runoff by temporarily storing the runoff and releasing it at the appropriate release rate.

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

DEVELOPER — A person, partnership, association, corporation, limited liability company or partnership, or other entity, or any responsible person therein or agent thereof, that undertakes any regulated activity of this Ordinance.

DEVELOPMENT SITE (SITE) — The specific tract of land for which a regulated activity is proposed. See Project Site.

DIFFUSED DRAINAGE — See "sheet flow."

DIRECT RECHARGE/SUBSURFACE BMP — A BMP designed to direct runoff to groundwater recharge without providing for vegetative uptake. Examples include infiltration trenches, seepage beds, drywells and stormwater drainage wells such that nearly all runoff becomes recharge to groundwater.

DISTURBED AREA — An unstabilized land area where an earth disturbance activity is occurring or has occurred.

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

DRAINAGE PLAN — The documentation of the proposed stormwater quantity and quality management controls to be used for a given development site, including a BMP operations and maintenance plan, the contents of which are established in § 403.

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, building construction and the moving, depositing, stockpiling or storing of soil, rock or earth materials.

EROSION — The natural process by which the surface of the land is worn away by water, wind, or chemical action.

EXISTING USES — Those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards (25 Pa. Code Section 93.1).

FEMA — Federal Emergency Management Agency.

FILL — Man-made deposits of natural soils or rock products and waste materials.

FILTER STRIPS — See "vegetated buffers."

FLOODPLAIN — Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a Special Flood Hazard Area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by DEP).

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 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 — The incremental depth in a stormwater management structure, provided as a safety factor of design, above that required to convey the design runoff event.

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 RECHARGE — Replenishment of existing natural underground water supplies.

HARDSHIP WAIVER REQUEST — A written request for a waiver alleging that the provisions of this Ordinance inflict unnecessary hardship upon the applicant. A hardship waiver does not apply to and is not available from the water quality provisions of this Ordinance and should not be granted.

HOT SPOT LAND USES — A land use or activity that generates higher concentrations of hydrocarbons, trace metals or other toxic substances than typically found in stormwater runoff. These land uses are listed in § 4101.17 for the Bushkill Creek Watershed District and Monocacy Creek Act 167 Stormwater Management Plan (2017) Appendix H.

HYDROLOGIC ENGINEERING CENTER-HYDROLOGIC MODELING SYSTEM (HEC-HMS) — The computer-based hydrologic modeling technique developed by the U.S. Army Corps of Engineers and adapted to the Monocacy Creek Watershed for the Act 167 Plan Update. The model was “calibrated” to reflect actual flow values by adjusting key model input parameters.

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 (NRCS1,2). The soils in the area of the development site may be identified from a web soil survey report that can be accessed at www.websoilsurvey.sc.egov.usda.gov/app/HomePage.htm.

IMPERVIOUS SURFACE (IMPERVIOUS COVER) — A surface that prevents the infiltration of water into the ground.

INFILTRATION PRACTICE — A practice designed to direct runoff into the ground, e.g., French drain, seepage pit, seepage trench or bioretention area.

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) — Inclusive of any or all of the following meanings: (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more buildings or (b) the

division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code, including any of the following activities:

- A. The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving:
 - (1) A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or
 - (2) The division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features.
- B. A subdivision of land.
- C. Development in accordance with Section 503(1.1) of the Pennsylvania Municipalities Planning Code. (see 53 P.S. Section 10503(1.1).)

LOADING RATE — The ratio of the land area draining to the system, as modified by the weighting factors in § 4105.2. for the Bushkill Creek Watershed District & § 6105.5. for the Monocacy Creek Watershed District, compared to the base area of the infiltration system.

LOCAL RUNOFF CONVEYANCE FACILITIES — Any natural channel or man-made conveyance system which has the purpose of transporting runoff from the site to the mainstem.

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.

MAINSTEM (MAIN CHANNEL) — Any stream segment or other conveyance used as a reach in the Bushkill and Monocacy Creek hydrologic model.

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

MARYLAND STORMWATER DESIGN MANUAL — A stormwater design manual written by the Maryland Department of the Environment and the Center for Watershed Protection. As of January 2004, the Manual can be obtained through the following website: www.mde.state.md.us.

MINIMUM DISTURBANCE/MINIMUM MAINTENANCE PRACTICES (MD/MM) — Site design practices in which careful limits are placed on site clearance prior to development allowing for maximum retention of existing vegetation (woodlands and other), minimum disturbance and compaction of existing soil mantle and minimum site application of chemicals post-development. Typically, MD/MM includes disturbance setback criteria from buildings as well as related site improvements such as walkways, driveways, roadways, and any other improvements. These criteria may vary by community context as well as by type of development being proposed. Additionally, MD/MM also shall include provisions (e.g., deed restrictions, conservation easements) to protect these areas from future disturbance and from application of fertilizers, pesticides, and herbicides.

MUNICIPALITY — Upper Nazareth Township, Northampton County, Pennsylvania.

NO HARM OPTION — The option of using a less restrictive runoff quantity control if it can be shown that adequate and safe runoff conveyance exists and that the less restrictive control would not adversely affect health, safety and property.

NPDES — National Pollutant Discharge Elimination System.

NRCS or NATURAL RESOURCES CONSERVATION SERVICE — USDA Natural Resources Conservation Service (previously SCS).

OIL/WATER SEPARATOR — A structural mechanism designed to remove free oil and grease (and possibly solids) from stormwater runoff.

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

OWNER — One with an interest in and often dominion over a property.

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

PENN STATE RUNOFF MODEL (PSRM) — The computer-based hydrologic modeling technique adapted to each watershed for the Act 167 Plans. The model was calibrated to reflect actual flow values by adjusting key model input parameters.

PERSON — An individual, partnership, public or private association or corporation, firm, trust, estate, municipality, governmental unit, public utility or any other legal entity whatsoever which is recognized by law as the subject of rights and duties.

PERVIOUS AREA — Any area not defined as impervious.

PLAN — Any drawing depicting a subdivision, land development, grading, building permit, or drainage plan for a Project regulated under this Ordinance.

PROJECT — General name referring to any regulated activity as defined in this Ordinance.

PROJECT SITE — The specific area of land where any regulated activities in the municipality are planned, conducted, or maintained.

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 Section 92a.2.

PRELIMINARY SITE INVESTIGATION — The determination of the depth to bedrock, the depth to the seasonal high water table and the soil permeability for a possible infiltration location on a site through the use of published data and on-site surveys. In carbonate bedrock areas, the location of special geologic features must also be determined along with the associated buffer distance to the possible infiltration area. See Attachment 2.

PRE-TREATMENT — Measures implemented for hot spot land uses designed to reduce the concentration of hydrocarbons, trace metals and other toxic substances to levels typically found in stormwater runoff.

PUBLIC WATER SUPPLIER — A person who owns or operates a public water system.

PUBLIC WATER SYSTEM — A system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. (See 25 Pa. Code Ordinance 109.)

QUALIFIED GEOTECHNICAL PROFESSIONAL — A licensed professional geologist or a licensed professional engineer who has a background or expertise in geology or hydrogeology.

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

RATIONAL METHOD — A method of peak runoff calculation using a standardized runoff coefficient (rational 'c'), acreage of tract and rainfall intensity determined by return period and by the time necessary for the entire tract to contribute runoff. The rational method formula is stated as follows: $Q = ciA$, where "Q" is the calculated peak flow rate in cubic feet per second, "c" is the dimensionless runoff coefficient (for the Bushkill Creek Watershed, see Bushkill Creek Act 167 Stormwater Management Plan Appendix C-4; for the Monocacy Creek Watershed, see Monocacy Creek Act 167 Stormwater Management Plan Appendix C), "i" is the rainfall intensity in inches per hour, and "A" is the area of the tract in acres. The rational method formula for runoff volume calculation

is as follows: $V = cPA/12$ where “c” and “A” areas noted above, “P” is the total depth of precipitation for the design event in inches, and “V” is the total runoff volume in acre-feet.
REACH — Any of the natural or man-made runoff conveyance channels used for watershed runoff modeling purposes to connect the subareas and transport flows downstream.

RECHARGE VOLUME (REV) — The portion of the water quality volume (WQv) used to maintain groundwater recharge rates at development sites. (See § 4101.11. for the Bushkill Creek Watershed District and § 6101 through § 6102 for the Monocacy Creek Watershed District)

REGULATED ACTIVITIES — Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff, which are subject to regulation by this Ordinance. This includes any subdivision, land development or building/construction permit projects involving regulated earth disturbance activities.

REGULATED EARTH DISTURBANCE ACTIVITIES — 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 the predevelopment peak rate of runoff for a development site to which the post-development peak rate of runoff must be controlled to avoid peak flow increases throughout the watershed.

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; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e., a 4% chance).

RIPARIAN BUFFER — A permanent area of trees and shrubs located adjacent to streams, lakes, ponds and wetlands.

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

RUNOFF — Any part of precipitation that flows over the land.

RUNOFF BMP — A BMP designed for essentially the full volume of runoff entering the BMP to be discharged off-site.

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

SEDIMENT TRAPS/CATCH BASIN SUMPS — Chambers which provide storage below the outlet in a storm inlet to collect sediment, debris and associated pollutants, typically requiring periodic cleanout.

SEEPAGE PIT/SEEPAGE TRENCH — An area of excavated earth filled with loose stone or similar material and into which surface water is directed for infiltration into the ground.

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

SHEET FLOW — Stormwater runoff flowing in a thin layer over the ground surface.

SOIL-COVER-COMPLEX METHOD — A method of runoff computation developed by NRCS which is based upon relating soil type and land use/cover to a runoff parameter called a "curve number."

SPECIAL GEOLOGIC FEATURES — Carbonate bedrock features, including but not limited to closed depressions, existing sinkholes, fracture traces, lineaments, joints, faults, caves, pinnacles, and geologic contacts between carbonate and noncarbonate bedrock which may exist and must be identified on a site when stormwater management BMPs are being considered.

SPILL PREVENTION AND RESPONSE PROGRAM — A program that identifies procedures for preventing and as needed, cleaning up potential spills and makes such procedures known and the necessary equipment available to appropriate personnel.

STATE WATER QUALITY REQUIREMENTS — The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code (Chapters 93 and 96) and the Clean Streams Law, including:

- A. Each stream segment in Pennsylvania has a designated use, such as "cold water fishes" or "potable water supply," which is listed in Chapter 93. These uses must be protected and maintained, under state regulations.
- B. "Existing uses" are those attained as of November 1975, regardless of whether they have been designated in Chapter 93. Regulated earth disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.
- C. Water quality involves the chemical, biological and physical characteristics of surface water bodies. After regulated earth disturbance activities are complete, these characteristics can be impacted by addition of pollutants

such as sediment, and changes in habitat through increased flow volumes and/or rates as a result of changes in land surface area from those activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, streambed and structural integrity of the waterway, to prevent these impacts.

STORAGE INDICATION METHOD — A method of routing or moving an inflow hydrograph through a reservoir or detention structure. The method solves the mass conservation equation to determine an outflow hydrograph as it leaves the storage facility.

STORM DRAINAGE PROBLEM AREAS — Areas which lack adequate stormwater collection and/or conveyance facilities and which present a hazard to persons or property. These areas are either documented in Attachment 3 or identified by the municipality or Municipal Engineer.

STORM SEWER — A system of pipes or other conduits which carries intercepted surface runoff, street water and other wash waters, or drainage, but excludes domestic sewage and industrial wastes.

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

STORMWATER CONTROL MEASURE (SCM) — See “BEST MANAGEMENT PRACTICE (BMP)”

STORMWATER DRAINAGE WELLS — Wells for injection of stormwater to the subsurface that are regulated by the U.S. Environmental Protection Agency to protect underground sources of drinking water.

STORMWATER FILTERS — Any number of structural mechanisms such as multichambered catch basins, sand/peat filters, sand filters, and so forth which are installed to intercept stormwater flow and remove pollutants prior to discharge. Typically, these systems require periodic maintenance and cleanout.

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

STORMWATER MANAGEMENT FACILITIES OPERATIONS AND MAINTENANCE PLAN — Documentation, included as part of a drainage plan, detailing the proposed BMPs/SCMs, how they will be operated and maintained and who will be responsible.

STORMWATER MANAGEMENT SITE PLAN — The plan prepared by the applicant or his representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance, adopted by Lehigh and/or Northampton County

for the Watersheds as required by the Act of October 4, 1978, P.L. 864, (Act 167), as amended, and known as the "Stormwater Management Act". Stormwater Management Site Plan will be designated as SWM Site Plan throughout this Ordinance.

STREAM — A watercourse.

SUBAREA — The smallest unit of watershed breakdown for hydrologic modeling purposes for which the runoff control criteria have been established in the stormwater management plan.

SUBDIVISION — As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247, The division or redivision of a lot, tract or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership or building or lot development; provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than 10 acres, not involving any new street or easement of access or any residential dwelling, shall be exempted.

SURFACE WATERS — Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process.

SWALE — A low-lying stretch of land which gathers or carries surface water runoff. See also "vegetated swale."

TECHNICAL BEST MANAGEMENT PRACTICE MANUAL AND INFILTRATION FEASIBILITY REPORT, NOVEMBER 2002 — The report written by Cahill Associates that addresses the feasibility of infiltration in carbonate bedrock areas in the Little Lehigh Creek Watershed. The report is available at the Lehigh Valley Planning Commission offices.

TIMBER HARVESTING ACTIVITIES — Earth disturbance activities, including the construction of skid trails, logging roads, landing areas and other similar logging or silvicultural practices.

TRASH/DEBRIS COLLECTORS — Racks, screens or other similar devices installed in a storm drainage system to capture coarse pollutants (trash, leaves, etc.).

USDA — United States Department of Agriculture.

VEGETATED BUFFERS — Gently sloping areas that convey stormwater as sheet flow over a broad, densely vegetated earthen area, possibly coupled with the use of level spreading devices. Vegetated buffers should be situated on minimally disturbed soils, have low-flow velocities and extended residence times.

VEGETATED ROOFS — Vegetated systems installed on roofs that generally consist of a waterproof layer, a root-barrier, drainage layer (optional), growth media, and suitable vegetation. Vegetated roofs store and eventually evapotranspire the collected rooftop rainfall; overflows may be provided for larger storms.

VEGETATED SWALES —

- A. Vegetated earthen channels designed to convey stormwater. These swales are not considered to be water quality BMPs.
- B. Broad, shallow, densely vegetated, earthen channels designed to treat stormwater while slowly infiltrating, evapotranspiring, and conveying it. Swales should be gently sloping with low flow velocities to prevent erosion. Check dams may be added to enhance performance.

VEGETATED/SURFACE BMP — A BMP designed to provide vegetative uptake and soil renovation or surface infiltration of runoff. Capture/reuse BMPs are included if the captured runoff is applied to vegetated areas. Examples include bioretention and surface infiltration basins.

WATER QUALITY INSERTS — Any number of commercially available devices that are inserted into storm inlets to capture sediment, oil, grease, metals, trash, debris, etc.

WATER QUALITY VOLUME (WQV) — The increase in runoff volume on a development site associated with a 2-year, 24-hour storm event.

WATERCOURSE — Any channel of conveyance of surface water having 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.

WET DETENTION PONDS — Basins that provide for necessary stormwater storage as well as a permanent pool of water. To be successful, wet ponds must have adequate natural hydrology (both runoff inputs as well as soils and water table which allow for maintenance of a permanent pool of water) and must be able to support a healthy aquatic community so as to avoid creation of mosquito and other health and nuisance problems.

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.

Part 3 STORMWATER MANAGEMENT REQUIREMENTS

§ 301 General Requirements.

1. For all regulated activities, unless preparation of an SWM Site Plan is specifically exempted in § 106:
 - A. Preparation and implementation of an approved SWM Site Plan is required.
 - B. No regulated activities shall commence until the municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.
2. SWM Site Plans approved by the municipality, in accordance with § 409, shall be on site throughout the duration of the regulated activity.
3. The municipality may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.
4. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the Erosion and Sediment Pollution Control Program Manual (E&S Manual3), No. 363-2134-008, as amended or replaced from time to time.
5. Impervious areas:
 - A. 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.
 - B. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.
 - C. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance; except that the volume controls in § 309 and the peak rate controls of § 310 do not need to be retrofitted to existing impervious areas that are not being altered by the proposed regulated activity.

6. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification to the effected property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.
7. All regulated activities shall include such measures as necessary to:
 - A. Protect health, safety, and property.
 - B. Meet the water quality goals of this Ordinance by implementing measures to:
 - (1) Minimize disturbance to floodplains, wetlands, and wooded areas.
 - (2) Maintain or extend riparian buffers.
 - (3) Avoid erosive flow conditions in natural flow pathways.
 - (4) Minimize thermal impacts to waters of this Commonwealth.
 - (5) Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.
 - C. Incorporate methods described in the Pennsylvania Stormwater Best Management Practices Manual (BMP Manual), as amended or replaced from time to time. If methods other than green infrastructure and LID methods are proposed to achieve the volume and rate controls required under this Ordinance, the SWM Site Plan must include a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.
8. Infiltration BMPs should 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.
9. The design of all facilities over karst shall include an evaluation of measures to minimize adverse effects. The provisions of the Monocacy Creek Watershed Act 167 Plan, Appendix D, with respect to the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock shall apply to all Stormwater Management Districts. (See References.)
10. Normally dry, open top, storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.
11. The design storm volumes to be used in the analysis of peak rates of

discharge should be obtained from the latest version of the Precipitation-Frequency Atlas of the United States, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland.

NOAA's Atlas 145 can be accessed at:
<http://hdsc.nws.noaa.gov/hdsc/pfds/>

12. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.
13. Various BMPs and their design standards are listed in the Pennsylvania Stormwater BMP Manual, as amended or replaced from time to time.
14. Where a site is traversed by watercourses other than those for which a 100-year floodplain is defined by the municipality, there shall be provided drainage easements conforming substantially with the line of such watercourses. The width of any easement shall be adequate to provide for unobstructed flow of storm runoff based on calculations made in conformance with § 4105 for the Bushkill Creek Watershed District and § 6105 for the Monocacy Creek Watershed District for the 100-year return period runoff and to provide a freeboard allowance of 0.5 foot above the design water surface level. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations which may adversely affect the flow of stormwater within any portion of the easement. Also, periodic maintenance of the easement to ensure proper runoff conveyance shall be required. Watercourses for which the 100-year floodplain is formally defined are subject to the applicable municipal floodplain regulations.
15. When it can be shown that, due to topographic conditions, natural drainage swales on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainage swales. Capacities of open channels shall be calculated using the Manning Equation.
16. Techniques described in Attachment 8 of this Ordinance regarding Low-Impact Development Practices are encouraged because they reduce the costs of complying with the requirements of this Ordinance and the state water quality requirements.
17. Infiltration for stormwater management is encouraged where soils and geology permit, consistent with the provisions of this Ordinance and, where appropriate, the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Monocacy Creek Watershed Act 167 Plan Appendix D. Infiltration is encouraged for capturing and

treating the water quality volume (as calculated in § 4101 for the Bushkill Creek Watershed District, and in § 6101 and § 6102 for the Monocacy Creek Watershed District) any part of the water quality volume or for otherwise meeting the purposes of this Ordinance.

§ 302 Permit Requirements by Other Government Entities.

The following permit requirements apply to certain regulated and earth disturbance activities and must be met prior to commencement of regulated and earth disturbance activities, as applicable:

1. All regulated and earth disturbance activities subject to permit requirements by DEP under regulations at 25 Pa. Code Chapter 102.
2. Work within natural drainageways subject to permit by DEP under 25 Pa. Code Chapter 102 and Chapter 105.
3. Any stormwater management facility that would be located in or adjacent to surface waters of the commonwealth, including wetlands, subject to permit by DEP under 25 Pa. Code Chapter 105.
4. Any stormwater management facility that would be located on a state highway right-of-way or require access from a state highway shall be subject to approval by the Pennsylvania Dept. of Transportation (PennDOT).
5. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area and any facility which may constitute a dam subject to permit by DEP under 25 Pa. Code Chapter 105.

§ 303 Erosion and Sediment Control During Regulated Earth Disturbance Activities.

1. General Standards:
 - A. No regulated earth disturbance activities within the municipality shall commence until approval by the municipality of an erosion and sediment control plan for construction activities. Written approval by DEP or a delegated County Conservation District shall satisfy this requirement.
 - B. An erosion and sediment control plan is required by DEP regulations for any earth disturbance activity of 5,000 square feet or more under 25 Pa. Code Section 102.4(b).
 - C. A DEP NPDES stormwater discharges associated with construction activities permit is required for regulated earth disturbance activities under 25 Pa. Code Chapter 92a.

- D. Evidence of any necessary permit(s) for Regulated Earth Disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the municipality before the commencement of an Earth Disturbance Activity.
- E. A copy of the erosion and sediment control plan and any permit, as required by DEP regulations, shall be available at the project site at all times.

2. Performance Principles

- A. Measures used to control erosion and reduce sedimentation shall meet the standards and specifications of the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual, as amended. The Township Engineer, or other officials as designated, shall ensure compliance with the appropriate specifications, copies of which are available from the Northampton County Conservation District.
- B. The following measures are effective in minimizing erosion and sedimentation and shall be included where applicable in the control plan:
 - (1) Stripping of vegetation and grading shall be kept to a minimum.
 - (2) Development plans shall preserve significant natural features, keep cut-and-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 runoff.
 - (3) Whenever feasible, natural vegetation shall be retained, protected and supplemented.
 - (4) The disturbed area and the duration of exposure shall be in accordance with the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual.
 - (5) Disturbed soils shall be stabilized by permanent vegetation and/or by mechanical erosion control and drainage measures as soon as practicable in the development process.
 - (6) Temporary vegetation and/or mulching shall be used to protect exposed critical areas during development.

- (7) Provisions shall be made to effectively accommodate the increased runoff caused by soil and surface conditions during and after development. Where necessary, the rate of surface water runoff will be mechanically retarded.
- (8) Sediment in the runoff water shall be trapped until the disturbed area is stabilized by the use of debris basins, sediment basins, silt traps, or similar measures.

3. Grading for Drainage

To provide more suitable sites for building and other uses, improve surface drainage and control erosion, the following requirements shall be met:

- A. All lots, tracts or parcels within a proposed Project shall provide proper drainage away from buildings and dispose of surface water without ponding, except where an alternative drainage system is approved. Natural drainage patterns shall be preserved wherever possible.
- B. Cut-and-fill slopes shall not be steeper than 3:1 unless stabilized by a retaining wall or cribbing.
- C. Adequate provisions shall be made to prevent surface water from damaging the cut face of excavations of the sloping surfaces of fills.
- D. Cut and fills shall not endanger adjoining property.
- E. Fill shall be placed and compacted so as to minimize sliding or erosion of the soil.
- F. All cuts and fills within one-hundred-year floodplain areas must be in accordance with the Township's Floodplain Ordinance. Fills placed adjacent to constructed channels shall have suitable protection against erosion during periods of flooding.
- G. Grading will not be done in such a way as to divert water onto the property of other landowners without the written consent of the landowners.
- H. During grading operations, necessary measures for dust control will be exercised.
- I. No equipment shall alter or damage the bed and banks of any stream, unless approved by the Pennsylvania Department of Environmental Protection. Equipment shall cross streams only at approved crossings utilizing culverts or bridges.

§ 304 (Reserved).

§ 305 (Reserved).

§ 306 (Reserved).

§ 307 (Reserved).

§ 308 (Reserved).

§ 309 Volume Controls.

The green infrastructure and low impact development practices provided in the Pennsylvania Department of Environmental Protection's Pennsylvania Stormwater Best Management Practices Manual (December 2006), as amended or replaced from time to time, shall be utilized for all regulated activities wherever possible. Water volume controls shall be implemented using the Design Storm Method in Subsection A or the Simplified Method in Subsection B below. For regulated activity areas equal or less than one acre that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology and other factors.

1. The Design Storm Method [CG-1 in the Pennsylvania Department of Environmental Protection's Pennsylvania Stormwater Best Management Practices Manual (December 2006), as amended or replaced from time to time] is applicable to any size of regulated activity. This method requires detailed modeling based on site conditions.
 - A. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year, 24-hour duration precipitation.
 - B. For modeling purposes:
 - (1) Existing (predevelopment) non-forested pervious areas must be considered meadow in good condition.
 - (2) 20% of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions.
2. The Simplified Method [CG-2 in the Pennsylvania Department of Environmental Protection's Pennsylvania Stormwater Best Management Practices Manual (December 2006), as amended or replaced from time to time] provided below is independent of site conditions and should be used

if the Design Storm Method is not followed. This method is not applicable to regulated activities greater than one acre or for projects that require design of stormwater storage facilities. For new impervious surfaces:

- A. Stormwater facilities shall capture at least the first two (2) inches of runoff from all new impervious surfaces.
- B. At least the first one inch of runoff from new impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration.
- C. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first 0.5 inch of the permanently removed runoff should be infiltrated.
- D. This method is exempt from the requirements of § 4105 for the Bushkill Creek Watershed District and § 6105 for the Monocacy Creek Watershed District.

§ 310 Rate Controls.

1. For areas not covered by a release rate map from an approved Act 167 Stormwater Management Plan:

Post-development discharge rates shall not exceed the pre-development discharge rates for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the predevelopment analysis for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.

2. For areas covered by a release rate map from an approved Act 167 Stormwater Management Plan:

For the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events, the post-development peak discharge rates will follow the applicable approved release rate maps. For any areas not shown on the release rate maps, the post-development discharge rates shall not exceed the pre-development discharge rates.

§ 311 Riparian Buffers.

1. In order to protect and improve water quality, a Riparian Buffer Easement shall be created and recorded as part of any Project that encompasses a Riparian Buffer.
2. 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 a minimum of 50 feet from the top of the streambank (on each side).
3. Minimum Management Requirements for Riparian Buffers.
 - A. Existing native vegetation shall be protected and maintained within the Riparian Buffer Easement.
 - B. Whenever practicable invasive vegetation shall be actively removed and the Riparian Buffer Easement shall be planted with native trees, shrubs and other vegetation to create a diverse native plant community appropriate to the intended ecological context of the site.
4. The Riparian Buffer Easement shall be enforceable by the municipality 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 municipal Zoning Ordinance.
5. 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, and preserve and protect the ecological function of the floodplain.
6. The following conditions shall apply when public and/or private recreation trails are permitted within Riparian Buffers:
 - A. Trails shall be for non-motorized use only.
 - B. Trails shall be designed to have the least impact on native plant species and other sensitive environmental features.
7. Septic system drainfields and sewage disposal systems shall not be permitted within the Riparian Buffer Easement and shall comply with setback requirements established under 25 Pa. Code Chapter 73.

Part 4 DRAINAGE PLAN REQUIREMENTS

§ 401 General requirements.

For any of the activities regulated under this Ordinance, prior to the final approval of any proposed Project plans or the issuance of any permit or the commencement of any regulated earth disturbance activity, the owner, subdivider, applicant or his agent shall submit a drainage plan and receive municipal approval of the plan.

§ 402 Exemptions.

Exemptions from the drainage plan requirements are as specified in § 106.

§ 403 Drainage Plan Contents.

The following items shall be included in the drainage plan:

1. General.
 - A. General description of project.
 - B. General description of proposed permanent stormwater controls.
 - C. The name and address of the project site, the name and address of the owner of the property and the name of the individual or firm preparing the drainage plan.
2. Map(s) of the project area showing:
 - A. The location of the project relative to highways, municipalities or other identifiable landmarks.
 - B. Existing contours at intervals of two feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used. Off-site drainage areas impacting the project including topographic detail.
 - C. Streams, lakes, ponds or other bodies of water within the project area.
 - D. Other features including flood hazard boundaries, existing drainage swales, wetlands, closed depressions, sinkholes and areas of natural vegetation to be preserved.
 - E. Locations of proposed underground utilities, sewers and water lines. The locations of all existing and proposed utilities, sanitary sewers and water lines within 50 feet of property lines of the project site.

- F. An overlay showing soil types and boundaries based on the Lehigh or Northampton County Soil Survey, as applicable, latest edition. Any hydric soils present on the site should be identified as such.
 - G. An overlay showing geologic types, boundaries and any special geologic features present on the site.
 - H. Proposed changes to land surface and vegetative cover.
 - I. Proposed structures, roads, paved areas and buildings.
 - J. Final contours at intervals of two feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used.
 - K. Stormwater management district boundaries applicable to the site.
 - L. Clear identification of the location and nature of permanent stormwater BMPs.
 - M. An adequate access easement around all stormwater BMPs that would provide municipal ingress to and egress from a public right-of-way.
 - N. A schematic showing all tributaries contributing flow to the site and all existing man-made features beyond the property boundary that would be affected by the project.
 - O. The location of all public water supply wells within 400 feet of the project and all private water supply wells within 100 feet of the project.
3. Stormwater management controls and BMPs.
- A. All stormwater management controls and BMPs shall be shown on a map and described, including:
 - (1) Groundwater recharge methods such as seepage pits, beds or trenches. When these structures are used, the locations of septic tank infiltration areas and wells shall be shown.
 - (2) Other control devices or methods such as rooftop storage, semipervious paving materials, grass swales, parking lot ponding, vegetated strips, detention or retention ponds, storm sewers, etc.
 - B. All calculations, assumptions and criteria used in the design of the BMPs shall be shown.

- C. All site testing data used to determine the feasibility of infiltration on a site.
 - D. All details and specifications for the construction of the stormwater management controls and BMPs.
4. The stormwater management facilities operations and management plan, as required in Part 7, describing how each permanent stormwater BMP will be operated and maintained and the identity of the person(s) responsible for operations and maintenance. A statement must be included, signed by the landowner, acknowledging that the stormwater BMPs are fixtures that cannot be altered or removed without approval by the municipality.
5. Act 167 Compliance Information:
- A. All drainage plans shall record existing impervious area and proposed maximum impervious area for the subject property and for each parcel that is part of a subdivision plan. Parcels related to subdivision plans that are on the same starting deed shall also be documented even if no physical subdivision/consolidation is proposed.
 - B. Based on Northampton County Tax Parcel and Recording records, it shall be determined what the parent tract is as of the start date of the applicable watershed district's Act 167 stormwater management plan and how many parcels have been subdivided to date.
 - C. Historical aerial photography available from the internet-based Pennsylvania Spatial Data Access resource shall be used to verify what impervious area may have existed before the Act 167 management plan for each watershed district in the Township. Pursuant to Act 167 regulations, impervious area predating the start date for the stormwater management plan for each stormwater management district is exempt from the requirements of this Ordinance. This shall be done for all parcels related to the parent tract since the start date of applicable watershed district's Act 167 stormwater management plan.
 - D. Based on historical aerial photography, or other records deemed authoritative by the Township, the Applicant shall record all impervious area to date added to all parent tract-related parcels after the Act 167 start date. Applicant then can determine if any of the 10,000 square feet of impervious area allowable by the Act 167 plan can be assigned to new and existing parcels. As applicable, the Applicant shall assign and record the allowable increase in impervious area for each parcel associated with the subdivision before Act 167 stormwater management requirements must be met.

- E. A note shall be added to the drainage plan stating that Act 167 stormwater management requirements must be met for all impervious area added since the start date of the applicable Act 167 stormwater management plan after the first 1,000 square feet of impervious area is added beyond the calculated allowable increase for each parcel.
 - F. For all projects, a table shall be provided that enumerates the maximum allowable impervious area for each lot/property for which the stormwater management facilities are designed.
 - G. In the case of subdivision and land development projects, all pertinent Act 167 compliance information, including the aforementioned table of maximum allowable impervious areas, shall be included on the record plans. For subsequent development of individual lots/properties, maximum allowable impervious area shall also be noted on the plot/grading plan.
6. Environmental resources site design assessment.
- A. An environmental resources site design assessment that describes the following:
 - (1) The extent to which the proposed grading and impervious cover avoid disturbance of significant environmental resources and preserve existing site hydrology.
 - (2) An assessment of whether alternative grading and impervious cover site design could lessen the disturbance of significant environmental resources and/or make better use of the site hydrologic resources.
 - (3) A description of how the proposed stormwater management controls and BMPs serve to mitigate any adverse impacts on environmental resources on the site.
 - B. Significant environmental resources considered in the site design assessment include, but are not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, floodplains, riparian vegetation, native vegetation and special geologic features.

§ 404 Plan Submission.

- 1. For regulated activities specified in § 105.1. & § 105.2.:
 - A. The drainage plan shall be submitted by the applicant to the Township as part of the application for any regulated activity.

- B. Two paper copies of the drainage plan shall be submitted along with a digital copy of all submitted documents in PDF format. The digital copies may be submitted by flash drive, email, or emailed file share link.
- C. Distribution of the drainage plan will be as follows:
 - (1) One copy will be retained by the Township.
 - (2) One copy will be forwarded to the Municipal Engineer.
- D. Drainage plans involving more than 10,000 square feet of additional impervious cover shall be submitted by the applicant to the LVPC as part of the preliminary plan submission. The LVPC will conduct an advisory review of the drainage plan for consistency with the Bushkill Creek or Monocacy Creek Watershed Stormwater Management Plan. The LVPC will not review details of the erosion and sedimentation plan or the BMP operations and maintenance plan.

The LVPC will provide written comments to the applicant and the municipality, within a time frame consistent with established procedures under the Municipalities Planning Code, as to whether the drainage plan has been found to be consistent with the stormwater management plan.

- 2. For regulated activities specified in § 105.3. & 105.4., the drainage plan shall be submitted by the applicant to the Zoning and/or Code Enforcement Officer as part of the building permit application.
- 3. For regulated activities specified in § 105.5., 105.6. & 105.7, the drainage plan shall be submitted by the applicant to the Lehigh Valley Planning Commission for coordination with the DEP permit application process under Chapter 105 (Dam Safety and Waterway Management), Chapter 106 (Floodplain Management) of DEP's rules and regulations and the NPDES regulations.
- 4. Earthmoving for all regulated activities under § 105 shall be conducted in accordance with the current federal and state regulations relative to the NPDES and DEP Chapter 102 regulations.

§ 405 Drainage Plan Review.

- 1. The municipality shall review the drainage plan, including the BMP operations and maintenance plan, for consistency with the provisions of this Ordinance and with any permits issued by DEP. The municipality shall also review the drainage plan against any additional storm drainage provisions contained in the municipal subdivision and land development

or zoning ordinance, as applicable.

2. The Municipality shall notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved. If the SWM Site Plan involves a Subdivision and Land Development Plan, the notification shall occur within the time period allowed by the Municipalities Planning Code (90 days). If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the municipality.
3. The municipality shall not approve any subdivision or land development (regulated activities § 105.1. & 2.) or building permit application (regulated activities § 105.3. & 4.) if the drainage plan has been found to be inconsistent with the stormwater management plan.
4. The municipality may require an as-built survey of all stormwater BMPs and an explanation of any discrepancies with the drainage plan.
5. For any SWM Site Plan that proposes to use any BMPs other than green infrastructure and LID practices to achieve the volume and rate controls required under this Ordinance, the Municipality will not approve the SWM Site Plan unless it determines that green infrastructure and LID practices are not practicable.
6. If the Municipality disapproves the SWM Site Plan, the Municipality will state the reasons for the disapproval in writing. The Municipality also may approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing.

§ 406 Modification of Plans.

A modification to a submitted drainage plan for a proposed development site which involves a change in control methods or techniques, or which involves the relocation or redesign of control measures, or which is necessary because soil or other conditions are not as stated on the drainage plan (as determined by the municipality) shall require a resubmission of the modified drainage plan consistent with § 404 subject to review per § 405 of this Ordinance.

§ 407 Hardship Waiver Procedure.

1. The municipality may hear requests for waivers where it is alleged that the provisions of this Ordinance inflict unnecessary hardship upon the applicant. The waiver request shall be in writing and accompanied by the requisite fee based upon a fee schedule adopted by the municipality. A copy of the waiver request shall be provided to each of the following: municipality, Municipal Engineer, Municipal Solicitor and Lehigh Valley Planning Commission. The request shall fully document the nature of the alleged hardship.

2. The municipality may grant a waiver, provided that all of the following findings are made in a given case:
 - A. That there are unique physical circumstances or conditions, including irregularity of lot size or shape, or exceptional topographical or other physical conditions peculiar to the particular property, and that the unnecessary hardship is due to such conditions, and not the circumstances or conditions generally created by the provisions of this Ordinance in the stormwater management district in which the property is located;
 - B. That because of such physical circumstances or conditions, there is no possibility that the property can be developed in strict conformity with the provisions of this Ordinance, including the no harm provisions, and that the authorization of a waiver is therefore necessary to enable the reasonable use of the property;
 - 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 Municipality unless that action is approved in advance by the Department of Environment Protection (DEP) or the delegated county conservation district.
 - D. That such unnecessary hardship has not been created by the applicant;
 - E. That the waiver, if authorized, will represent the minimum waiver that will afford relief and will represent the least modification possible of the regulation in issue; and
 - F. That financial hardship is not the criteria for granting of a hardship waiver.
3. In granting any waiver, the municipality may attach such conditions and safeguards as it may deem necessary to implement the purposes of this Ordinance. If a hardship waiver is granted, the applicant must still manage the quantity, velocity, direction and quality of resulting storm runoff as is necessary to prevent injury to health, safety or other property.
4. For regulated activities described in § 105.1. & 2., the Upper Nazareth Township Board of Supervisors shall hear requests for and decide on hardship waiver requests on behalf of the municipality.
5. For regulated activities in § 105.3., 4., 5., 6. & 7. the Upper Nazareth Township Board of Supervisors shall hear requests for and decide on hardship waiver requests on behalf of the municipality.

6. The municipality shall not waive the water quality provisions of this Ordinance.

§ 408 Resubmission of Disapproved SWM Site Plans.

A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Municipality shall require a resubmission of the modified SWM Site Plan in accordance with this Ordinance.

§ 409 Authorization to Construct and Term of Validity.

The Municipality's approval of an SWM Site Plan 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 Municipality 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 Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to § 410 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with § 408 of this Ordinance.

§ 410 As-Built Plans, Completion Certificate, and Final Inspection.

1. The applicant shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.
2. The as-built submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. The latitude and longitude coordinates for all permanent SWM BMPs must also be submitted, at the central location of the BMPs. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate.
3. After receipt by the Municipality of the certification of completion, the Municipality will conduct a final inspection.

Part 5 FEES AND EXPENSES

§ 501 General Provisions.

The municipality may charge a reasonable fee for review of the drainage plan, including the BMP operations and maintenance plan, to defray review costs incurred by the municipality. The applicant shall pay all such fees.

§ 502 Expenses Covered by Fees.

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

1. The review of the drainage plan, including the BMP operations and maintenance plan, by the municipality.
2. The site inspection.
3. The inspection of required controls and improvements during construction.
4. The final inspection upon completion of the controls and improvements required in the plan.
5. Any additional work required to monitor and enforce any permit provisions, regulated by this Ordinance, correct violations, and assure the completion of stipulated remedial actions.
6. Administrative and clerical costs.

Part 6 STORMWATER BMP OPERATIONS AND MAINTENANCE PLAN REQUIREMENTS

§ 601 General Requirements.

No regulated earth disturbance activities within the municipality shall commence until approval by the municipality of the BMP operations and maintenance plan which describes how the permanent (e.g., post-construction) stormwater BMPs will be properly operated and maintained.

§ 602 Responsibilities of Developers and Landowners.

1. The Municipality shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The municipality 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 municipality will accept the facilities. The municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.
2. The Facilities, areas, or structures used as SWM BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.
3. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land.
4. The Municipality may take enforcement actions against an owner for any failure to satisfy the provisions of this Ordinance.

§ 603 Adherence to Approved Stormwater Management Facilities Operations and Maintenance Plan.

It shall be unlawful to alter or remove any permanent stormwater BMP required by an approved Stormwater Management Facilities operations and maintenance plan or to allow the property to remain in a condition which does not conform to an approved Stormwater Management Facilities operations and maintenance plan unless an exception is granted, in writing, by the municipality.

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

1. The property owner shall sign an operations and maintenance agreement with the municipality covering all stormwater management facilities that are to be privately owned. The agreement shall include the terms of the format agreement referenced in Attachment 1 of this Ordinance.

2. The owner, successor and assigns shall maintain all facilities in accordance with the approved maintenance schedule in the O&M Agreement.
3. The owner shall convey to the Municipality conservation easements to assure access for periodic inspections by the Municipality and maintenance, as necessary.
4. The owner shall keep on file with the Municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Municipality within ten (10) working days of the change.
5. Other items may be included in the agreement where determined by the municipality to be reasonable or necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater management facilities. The agreement shall be subject to the review and approval of the municipality.
6. The owner is responsible for operation and maintenance of the SWM BMPs/SCMs. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

§ 605 Stormwater Management Easements.

Stormwater management easements shall be provided by the property owner if necessary for access for inspections and maintenance or for preservation of stormwater conveyance, infiltration, detention areas and other stormwater management facilities by persons other than the property owner. The purpose of the easement shall be specified in any agreement under § 604.

§ 606 Recording of Approved Stormwater Management Facilities Operations and Maintenance Plan and Related Agreements.

1. The owner of any land upon which permanent stormwater management facilities will be placed, constructed or implemented, as described in the Stormwater Management Facilities operations and maintenance plan, shall record the following documents in the office of the Recorder of Deeds for Northampton County within 90 days of approval of the Stormwater Management Facilities operations and maintenance plan by the municipality:
 - A. The operations and maintenance plan or a summary thereof.
 - B. Operations and maintenance agreements under § 604.

- C. Easements under § 605.
- 2. The municipality may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with this section.

§ 607 Municipal Stormwater Management Facilities Operations and Maintenance Fund.

- 1. If stormwater management facilities are accepted by the municipality for dedication, the municipality may require the applicant to pay a specified amount to the municipal stormwater BMP operations and maintenance fund to help defray costs of operations and maintenance activities. The amount may be determined as follows:
 - A. If the stormwater management facilities are to be owned and maintained by the municipality, the amount shall cover the estimated costs for operation and maintenance in perpetuity, as determined by the municipality.
 - B. The amount shall then be converted to present worth of the annual series values.
- 2. If a stormwater management facility is proposed that also serves as a recreation facility (e.g., ball field, lake), the municipality may adjust the amount due accordingly.

§ 608 Performance Guarantee.

For SWM Site Plans that involve subdivision and land development, the applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls 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.

Part 7 PROHIBITIONS

§ 701 Prohibited Discharges.

1. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.
2. No person in the municipality shall allow or cause to allow stormwater discharges into the municipality's separate storm sewer system which are not composed entirely of stormwater except as provided in § 701.3. below or as allowed under a state or federal permit.
3. No person in the municipality shall deposit, discharge, or stockpile leaves, grass clippings, trash, or other debris at a location, whether on private or public property, or in a manner that will allow or cause to allow same to enter the municipality's separate storm sewer system.
4. Discharges that may be allowed based on the municipality finding that the discharge(s) do not significantly contribute pollution to surface waters of the commonwealth are listed below.
 - A. Discharges or flows from firefighting activities.
 - B. 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).
 - C. Non-contaminated irrigation drainage. water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
 - D. Routine external building washdown which does not use detergents or other compounds.
 - E. Non-contaminated HVAC condensation and water from geothermal systems.
 - F. Water from individual residential (i.e. not commercial) vehicle wash water where cleaning agents are not utilized.
 - G. Diverted stream flows and springs.
 - H. Dechlorinated swimming pool discharges.
 - I. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.

5. In the event that the municipality or DEP determines that any of the discharges identified in § 701.3. significantly contribute pollutants to a regulated small MS4 or to the waters of the Commonwealth, the municipality or DEP will notify the responsible person(s)/party(s) to cease the discharge.
6. Nothing in this Part shall affect a discharger's responsibilities under state law.

§ 702 Prohibited Connections.

The following connections are prohibited, except as provided in § 701.3. above:

1. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater and wash water to enter the separate storm sewer system and any connections to the storm drain system from indoor drains and sinks.
2. Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system which has not been documented in plans, maps or equivalent records and approved by the municipality.

§ 703 Roof Drains and Sump Pumps.

1. Roof drains and sump pumps shall discharge to infiltration areas or vegetative BMPs to the maximum extent practicable.
2. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches, except as provided in § 703.3.
3. When it is more advantageous to connect directly to streets or storm sewers, connections of roof drains to streets or roadside ditches may be permitted by the municipality.

§ 704 Alteration of BMPS.

1. No person shall modify, remove, fill, landscape or alter any existing stormwater BMP without the written approval of the municipality unless it is part of an approved maintenance program.
2. No person shall place any structure, fill, landscaping or vegetation into a stormwater BMP or within a drainage easement, which would limit or alter the functioning of the BMP, without the written approval of the municipality.

§ 705 Animal Waste.

Animal waste shall be handled and disposed of in accordance with Chapter 2 ANIMALS of the Upper Nazareth Township Codified Ordinances, and in accordance with all applicable state and federal regulations.

Part 8 RIGHT OF ENTRY, NOTIFICATION AND ENFORCEMENT

§ 801 Right of Entry.

1. Upon presentation of proper credentials and with the consent of the landowner, duly authorized representatives of the municipality may enter at reasonable times upon any property within the municipality to inspect the implementation, condition or operation and maintenance of the stormwater management facilities or to investigate or ascertain the condition of the subject property in regard to any aspect regulated by this Ordinance.
2. In the event that the landowner refuses admission to the property, duly authorized representatives of the municipality may seek an administrative search warrant issued by a Magisterial District Judge to gain access to the property.
3. Persons working on behalf of the municipality shall have the right to temporarily locate on any stormwater management facilities in the municipality such devices as are necessary to conduct monitoring and/or sampling of the discharges from such facilities.
4. Unreasonable delay in allowing the municipality access to a stormwater management facility is a violation of this Ordinance.

§ 802 Notification.

1. Whenever the municipality finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the municipality may order compliance by written notice to the responsible person. Such notice may require, without limitation:
 - A. The name of the owner of record and any other person against whom the municipality intends to take action.
 - B. The location of the property in violation.
 - C. The performance of monitoring, analyses and reporting.
 - D. The elimination of prohibited connections or discharges.
 - E. Cessation of any violating discharges, practices or operations.
 - F. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property.
 - G. Payment of a fine to cover administrative and remediation costs.

- H. The implementation of stormwater BMPs.
 - I. Operation and maintenance of stormwater BMPs.
2. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violation(s). Said notice may further advise that should the violator fail to take the required action within the established deadline, the work will be done by the municipality or designee and the expense thereof, together with all related lien and enforcement fees, charges and expenses, shall be charged to the violator.
 3. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the municipality from pursuing any and all other remedies available in law or equity.

§ 803 Inspection.

1. The landowner or the owner's designee (including the Municipality for dedicated and owned facilities) shall inspect SWM BMPs/SCMs, facilities and/or structures regulated under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs/SCMs, facilities and/or structures continue to function as intended:
 - A. Annually for the first 5 years
 - B. Once every 3 years thereafter
 - C. During or immediately after the cessation of a 10-year or greater storm.

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

2. The landowner or the owner's designee (including the Municipality for dedicated and owned facilities) responsible for SWM BMPs/SCMs, facilities and/or structures regulated under this Ordinance shall be responsible for reporting any known or observable failure or damage to the approved facility to the Township within five (5) business days.
3. DEP or its designees (e.g., County Conservation District) normally ensure compliance with any permits issued, including those for stormwater management. In addition to DEP compliance programs, the municipality

or its designee may inspect all phases of the construction, operations, maintenance and any other implementation of stormwater BMPs/SCMs.

4. During any stage of the regulated earth disturbance activities, if the municipality or its designee determines that any BMPs/SCMs are not being implemented in accordance with this Ordinance, the municipality may suspend or revoke any existing permits issued by the municipality or other approvals issued by the municipality until the deficiencies are corrected.

§ 804 Enforcement.

1. 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 § 106.
2. It shall be unlawful to violate § 704 of this Ordinance.
3. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Municipality.
4. In the event that the Landowner fails to operate and maintain the Stormwater Improvements in good working order acceptable to the Township, the Township shall send written notice to the Landowner specifying the areas of noncompliance and the steps that shall be taken to cure the noncompliance. In the event that the Landowner does not cure the noncompliance within the time period set forth in the notice or diligently pursue compliance in circumstances where compliance is not possible within the time period set forth in the notice due to weather conditions or where otherwise determined by the Township in an emergency situation that notice is not practical or expedient, the Landowner shall be in violation of this Agreement, and the Landowner agrees that the Township or its representatives may, in addition to and not in derogation or diminution of any remedies available to it under the Stormwater Ordinance or other statutes, codes, rules or regulations, or this Agreement, enter upon the Property and take whatever action is deemed necessary to maintain the Stormwater Improvements. It is expressly understood and agreed that the Township is under no obligation to maintain or repair the Stormwater Improvements, and in no event shall this Agreement be construed to impose any such obligation on the Township.
5. In the event that the Township, 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 Township for all expenses (direct and indirect including, but not limited to, reasonable attorney's fees, reasonable engineering fees, and inspection costs and a twenty (20%) percent surcharge for administration expenses) incurred within thirty (30) days of delivery of an invoice from the Township.

§ 805 Public Nuisance.

1. The violation of any provision of this Ordinance is hereby deemed a public nuisance.
2. Each day that an offense continues shall constitute a separate violation.

§ 806 Suspension and Revocation of Permits and Approvals.

1. Any building, land development or other permit or approval issued by the Municipality may be suspended or revoked by the municipality for:
 - A. Noncompliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement.
 - B. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the Regulated Activity.
 - C. 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 which endangers the life or property of others.
2. A suspended permit or approval shall be reinstated by the municipality when:
 - A. The municipality or designee has inspected and approved the corrections to the stormwater BMPs or the elimination of the hazard or nuisance that caused the suspension.
 - B. The municipality is satisfied that the violation of the ordinance, law or rule and regulation has been corrected.
 - C. Payment of all municipal fees, costs and expenses related to or arising from the violation has been made.
3. A permit or approval which has been revoked by the municipality cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Ordinance.
4. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

§ 807 Penalties.

1. Any person, partnership or corporation who or which has violated 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 plus court costs, including reasonable attorney's fees incurred by the Municipality as a result thereof, for each violation, recoverable with costs, or imprisonment to the extent allowed by law for the punishment of summary offense, or both. Each day that the violation continues shall be a separate offense and penalties shall be cumulative. No judgment shall commence or be imposed, levied or payable until the date of the determination of a violation by the Magisterial District Judge. If the defendant neither pays nor timely appeals the judgment, the municipality may enforce the judgment pursuant to a separate violation, unless the Magisterial District Judge determining that there has been a violation further determines that there was a good-faith basis for the person, partnership, or corporation violating this Ordinance to have believed that there was no such violation, in which event there shall be deemed to have been only one such violation until the fifth day following the date of the determination of a violation by the Magisterial District Judge and, thereafter, each day that a violation continues shall constitute a separate violation.
2. In addition, the municipality, through its Solicitor, 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.
3. The court of common pleas, upon petition, may grant an order of stay upon cause shown, tolling the per diem judgment pending a final adjudication of the violation and judgment.
4. Nothing contained in this section shall be construed or interpreted to grant to any person or entity other than the municipality the right to commence any action for enforcement pursuant to this section.
5. Magisterial District Judges shall have initial jurisdiction in proceedings brought under this section.
6. In addition, the municipality, through its solicitor, 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.

§ 808 Appeals.

Any person aggrieved by any action of the municipality or its designee relevant to the provisions of this Ordinance may appeal using the appeal procedures established in the Pennsylvania Municipalities Planning Code.

1. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of the Ordinance, may appeal to the Municipality within 30 days of that action.
2. Any person aggrieved by any decision of the Municipality, 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 Municipality' decision.

Part 9 (RESERVED)

The Township Board of Supervisors reserves the right, by the authority granted by the General Assembly of the Commonwealth of Pennsylvania, to establish a stormwater fee to be assessed against impervious surface areas on properties within the Township for the purpose of offsetting the cost of installation and ongoing operation and maintenance of municipal stormwater management facilities.

Part 10 ENACTMENT OF ORDINANCE.

§ 909 Effective Date.

This ordinance shall become effective five (5) days from the date of its adoption.

ENACTED AND ORDAINED on this the 21st day of August, 2024 by a majority of the Board of Supervisors of Upper Nazareth Township, Northampton County, Commonwealth of Pennsylvania, at a duly advertised meeting.

**UPPER NAZARETH TOWNSHIP
BOARD OF SUPERVISORS**

Scott Sylvester
Chairman

ATTEST:

[Signature]
Secretary

Part 11 REFERENCES

1. 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/>.
2. U.S. Department of Agriculture, Natural Resources Conservation Service. 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.
3. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
4. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.
5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2, Version 3.0*, Silver Spring, Maryland. Internet address: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.
6. Bushkill Creek Act 167 Stormwater Management Plan (2006)
7. Monocacy Creek Act 167 Stormwater Management Plan (2017)

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Attachment 1 – Model Stormwater Operation and Maintenance Agreement

§ 1101 General Notes.

- A. All properties receiving approval under the provisions of the Upper Nazareth Township Stormwater Management Ordinance requiring stormwater management facilities shall enter into a Stormwater Operation & Maintenance Agreement with Upper Nazareth Township.
- B. The Stormwater Operation & Maintenance Agreement shall be recorded at the Northampton County Recorder's Office.
- C. Properties with existing Stormwater Operation & Maintenance Agreements proposing modifications to any existing stormwater facilities shall enter into a new Stormwater Operation and Maintenance Agreement documenting said modifications.
- D. The Model Stormwater Operation & Maintenance Agreement is subject to modification based on project-specific conditions at the discretion of the Township.

§ 1102 Model Stormwater Operation & Maintenance Agreement.

The model Stormwater Operation & Maintenance Agreement is as follows:

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RETURN TO: {information to be provided by Township}
[Township Solicitor]
[Address-1]
[Address-2]
Tel: [phone number]

Tax Parcel Identifier(s):

[County Tax Parcel ID #] – [Property Street Address], Upper Nazareth Township

STORMWATER OPERATION AND MAINTENANCE (O&M) AGREEMENT

THIS STORMWATER OPERATION AND MAINTENANCE AGREEMENT (“Agreement”) is made and entered into this _____ day of _____, 20__, with an effective date of _____, 20__, by and between [PROPERTY OWNER], with a mailing address of _____ (“Landowner”), and **UPPER NAZARETH TOWNSHIP**, a second class township, with a mailing address of 100 Newport Avenue, Nazareth, Pennsylvania 18064 (hereinafter the “Township”).

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property located in Upper Nazareth Township by virtue of a deed recorded at the Northampton County Recorder of Deeds Office at Northampton County Record Book ____, Page ____ (hereinafter “Property”); and

WHEREAS, the Landowner is proceeding to build and develop the Property pursuant to the Plan identified as “ [Name of Plan] ” prepared by [Name of Plan Preparer] dated [Plan Origin Date] and last revised [latest Plan Revision Date – as applicable] (“Plans”); and

WHEREAS, the Plans include the [Name of Project] Post-Construction Stormwater Management Plan approved by the Township with Long-Term BMP Operations and Maintenance requirements, which is attached hereto as Appendix A and made a part hereof and provides for management of stormwater within the Property with Best Management Practices (BMP) (“Stormwater Improvements”); and

WHEREAS, the Township, and the Landowner, for itself and its successors and assigns, agree that the Township Ordinances require the Stormwater Improvements be constructed and maintained; and

WHEREAS, the parties are entering into this Agreement to confirm the Landowner’s perpetual maintenance obligation.

NOW, THEREFORE, in consideration of the foregoing promises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto, intending to be legally bound hereby, agree as follows:

1. The foregoing recitals to this Agreement are incorporated as terms of this Agreement as if fully set forth in the body of this Agreement.
2. Landowner shall construct the Stormwater Improvements in accordance with the Plans as approved by the Township. In the event the Plans are modified and approved by the Township, Landowner shall construct in accordance with and all approved modifications.
3. Landowner shall operate and maintain the Stormwater Improvements in good working order acceptable to the Township and in accordance with the specific inspection and maintenance requirements on the Plans.
4. In the event that the Landowner fails to operate and maintain the Stormwater Improvements in good working order acceptable to the Township, the Township shall send written notice to the Landowner specifying the areas of noncompliance and the steps that shall be taken to cure the noncompliance. In the event that the Landowner does not cure the noncompliance within the time period set forth in the notice or diligently pursue compliance in circumstances where compliance is not possible within the time period set forth in the notice due to weather conditions or where otherwise determined by the Township in an emergency situation that notice is not practical or expedient, the Landowner shall be in violation of this Agreement, and the Landowner agrees that the Township or its representatives may, in addition to and not in derogation or diminution of any remedies available to it under the Stormwater Ordinance or other statutes, codes, rules or regulations, or this Agreement, enter upon the Property and take whatever action is deemed necessary to maintain. It is expressly understood and agreed that the Township is under no obligation to maintain or repair the Stormwater Improvements, and in no event shall this Agreement be construed to impose any such obligation on the Township.
5. In the event that the Township, 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 Township for all expenses (direct and indirect including, but not limited to, reasonable attorney's fees, reasonable engineering fees, and inspection costs and a twenty (20%) percent surcharge for administration expenses) incurred within thirty (30) days of delivery of an invoice from the Township.
6. The intent and purpose of this Agreement is to ensure the perpetual maintenance of the Stormwater Improvements by the Landowner; provided, however, that this Agreement shall not be deemed to create any additional liability on any party for damage alleged to result from or be caused by stormwater runoff.
7. The Township intends to inspect the Stormwater Improvements at a minimum of once every three years to ensure their continued functioning.

8. Landowner, for itself and its successors and assigns hereby releases and shall release the Township's employees, its agents and designated representatives from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees, agents or representatives arising out of the construction, presence, existence, or maintenance of the stormwater improvements by the Landowner. In the event that a claim is asserted or threatened against the Township, its employees, agents or designated representatives, the Township shall notify the Landowner, and the Landowner shall defend, at his own expense, any claim, suit, action or proceeding, or any threatened claim, suit, action or proceeding against the Township, or, at the request of the Township, pay the cost, including attorney's fees, of defense of the same undertaken on behalf of the Township. If any judgment or claims against the Township's employees, agents or designated representatives shall be allowed, the Landowner shall pay all damages, judgments or claims and any reasonable costs and expenses incurred by the Township, including attorney's fees, regarding said damages, judgments or claims. The foregoing shall not apply where said claim or judgment results from the negligence or willful misconduct of the Township, its employees, agents or designated representatives.
9. The Township may enforce this Agreement at law or in equity, against the Landowner for breach of this Agreement. Remedies may include fines, penalties, damages or such equitable relief as the parties may agree upon or as may be determined by a Court of competent jurisdiction. Recovery by the Township shall include its reasonable attorney's fees and costs incurred in seeking relief under this Agreement.
10. Failure or delay in enforcing any provision of this Agreement shall not constitute a waiver by the Township of its rights of enforcement hereunder.
11. This Agreement shall insure to the benefit of and be binding upon, the Township and the Landowner, as well as their successors and assigns and shall constitute a covenant running with the Property.
12. This Agreement shall be recorded in the Office of the Recorder of Deeds in and for Northampton County, Pennsylvania, and shall constitute a covenant running with the Property until such time that the Township may approve a different development scheme for the Property. In the event of such approval, an amendment to this Agreement or an extinguishment and termination of this Agreement, as applicable, shall be recorded in the Office of the Northampton County Recorder of Deeds.

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IN WITNESS WHEREOF, the parties hereto have executed this Agreement by their duly authorized officers and representatives on the date first indicated hereinabove.

WITNESS:

LANDOWNER
[PROPERTY OWNER NAME]

By: _____
Name: [Name of Authorized Signatory]
Title: _[Title]____

WITNESS:

UPPER NAZARETH TOWNSHIP

By: _____
Name: [Name Board Chair]
Title: Chair[man, person]

STATE OF _____)
COUNTY OF _____) : SS:

On this, the ____ day of _____, 2023, before me, a Notary Public, the undersigned officer, personally appeared, _____, who acknowledged [him, her]self to be the _title_ of [Property Owner Name or Property Address], and that [he, she] as such authorized signatory, being authorized to do so, executed the foregoing Agreement for the purposes therein contained by signing the name of the company by [him, her]self as _title_.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

(Notarial Seal)

My Commission Expires:

COMMONWEALTH OF PENNSYLVANIA)
: SS:
COUNTY OF NORTHAMPTON)

On this, the ____ day of _____, 20__, before me, a Notary Public, the undersigned officer, personally appeared, [Name of Board Chair], who acknowledged [him, her]self to be the Chair[man, person] of the Board of Supervisors of Upper Nazareth Township, and that [she, he] as such Chair[man, person] being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the Township by himself as Chair[man, person].

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

(Notarial Seal)

My Commission Expires:

APPENDIX A

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Attachment 2 – Preliminary Site Investigation and Testing Requirements

§ 2101 Required Data and Site Information.

The following data shall be gathered utilizing standard testing procedures as part of a Preliminary Site Investigation:

1. Bedrock composition – Any apparent boundaries between carbonate and non-carbonate bedrock must be verified by a qualified geotechnical professional.
2. Bedrock structural geology – This includes the possible presence of faults and mapping of conspicuous fracture traces or lineaments.
3. Overburden and soil mantle composition and thickness.
4. Permeability of the soil.
5. Depth to the seasonal high-water table.
6. Presence of special geologic features – This includes sinkholes, closed depressions, fracture traces, lineaments, joints, faults, caves, pinnacles and geologic contacts between carbonate and non-carbonate bedrock.

Preliminary Site Investigation Required for Sites Intending to Use Infiltration

§ 2102 Review of Available Data, Maps and Reports.

Some of the required information, listed in § 7101. above, can be found in existing published data. Suggested resources include the following:

1. Geologic maps and references for the development area.
2. The Little Lehigh Creek Basin Carbonate Prototype Area Closed Depression Map – available at the LVPC.
3. USGS topographic maps.
4. Lehigh and Northampton County soil survey maps.
5. Aerial photographs from the LVPC or other sources.
6. Relevant Pennsylvania Geologic Survey Open File Reports that provide maps of sinkholes and Karst features for Lehigh County (OF 87-01) and Northampton County (OF 87-02).

7. Kochanov and Reese (2003). Density of Mapped Karst Feature in South-Central and Southeastern Pennsylvania (Map 68).
8. DCNR Online Sinkhole Inventory – (<http://www.dcnr.state.pa.us/topogeo/hazards/sinkhole/default.asp>).

§ 2103 Field Inspections.

In addition to gathering data from published sources, a field inspection of the proposed site is required. A field inspection can provide additional information relating to site features such as carbonate bedrock features, indicators of seasonal high stream-level or water table levels, streams, springs, etc.

§ 2104 Soil Test Pit and Percolation Test Requirements.

A minimum of one test pit and a minimum of 2 percolation tests are required for every site. A test pit is a 2-3 foot wide, 8-foot-deep trench excavated with a backhoe for observing subsurface conditions. The test pits will be used to describe soil depth and quality, including soil horizons, and testing of permeability or percolation rates and can be conducted by a certified Sewage Enforcement Officer.

Percolation tests are to be conducted as follows (adapted from § 73.15. "Percolation Tests" of the Pennsylvania Code):

1. The percolation tests shall be made in separate holes uniformly spaced over the possible infiltration area.
2. An "Initial Presoak" should not be performed.
3. Percolation holes located within the possible infiltration area shall be used in the calculation of the average percolation rate.
4. An "Initial Presoak" should not be performed.
5. Percolation holes located within the possible infiltration area shall be used in the calculation of the average percolation rate.
6. Holes having a uniform diameter of 6 to 10-inches shall be bored or dug as follows:
 - A. To the depth of the bottom of the possible infiltration BMP/.
 - B. Alternate depths if the test pits/auger holes indicate that the soils are more suitable at a different depth (i.e. if a clay horizon is identified and more suitable soils are located beneath the horizon, an

infiltration test should be performed in the suitable horizon).

7. The bottom and sides of the hole shall be scarified with a knife blade or sharp-pointed instrument to completely remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. Loose material shall be removed from the hole. Two inches of coarse sand or fine gravel shall be placed in the bottom of the hole to protect the soil from scouring and clogging of the pores.
8. Immediately before the percolation test, as a final presoak, water shall be placed in the hole to a minimum depth of 6-inches over the gravel and readjusted every 30 minutes for 1 hour.
9. The drop in the water level during the last 30 minutes of the final presoaking period shall be applied to the following standard to determine the time interval between readings for each percolation hole:
 - A. If water remains in the hole, the interval for readings during the percolation test shall be 30 minutes.
 - B. If no water remains in the hole, the interval for readings during the percolation test may be reduced to 10 minutes.
10. After the final presoaking period, water in the hole shall again be adjusted to approximately 6-inches over the gravel and readjusted when necessary after each reading.
 - A. Measurement to the water level in the individual percolation holes shall be made from a fixed reference point and shall continue at the interval determined from step No. 7 (above) for each individual percolation hole until a minimum of eight readings are completed or until a stabilized rate of drop is obtained, whichever occurs first. A stabilized rate of drop means a difference of $\frac{1}{4}$ -inch or less of drop between the highest and lowest readings of four consecutive readings.
 - B. The drop that occurs in the final period in percolation test holes, expressed as inches per hour, shall be used to calculate the average percolation rate.
 - C. When the rate of drop in a percolation test is too slow to obtain a measurable rate, the rate of 0.25 inches per hour shall be assigned to that hole for use in calculating the average percolation rate. The infiltration area may be placed over holes with no measurable rate when the average percolation rate for the possible infiltration area is within the acceptable range.

When a percolation test hole yields a percolation rate of greater than 12-inches per hour, the proposed infiltration area may not be designed or installed within 25-feet of this hole unless the municipality determines that a testing anomaly caused the fast percolation rate and a retest of the area yields acceptable percolation rates. This percolation rate limit is established to protect groundwater quality and to minimize the risk of subsidence.

Additional Site Investigation and Testing Required if Infiltration is Proposed

§ 2105 Soil Test Pit Requirements.

The required number of test pits varies with Effective Soil Thickness. As risk factors increase, the number of test pits increases. A minimum of 2 test pits, uniformly spaced within the proposed infiltration area (e.g., the 2 pits should be centered on each half of the proposed infiltration area), are required for any site proposing infiltration unless the applicant can demonstrate that one test pit is adequately representative of the area proposed for infiltration. For larger infiltration areas, multiple test pits shall be developed at the densities as listed below:

Effective Soil Thickness (ft.)	Test Pit Density (per acre of proposed infiltration area)*	Percolation Tests (per acre of proposed infiltration area)**	Auger Grid Spacing (Feet On-Center)***
8	4	8	50
4 to 8	6	12	35
2 to 4	8	16	25

* No. of Test Pits required = Infiltration sq. ft./43,560 sq. ft. x test pit density from chart rounded up to the nearest whole number

** No. of Percolation Tests required = Infiltration sq. ft./43,560 sq. ft. x percolation tests from chart rounded up to the nearest whole number

*** Auger testing is only required on Carbonate sites.

§ 2106 Soil Auger Testing Requirements for Carbonate Areas.

Because soil depth is not uniform in many carbonate areas, test pits will not be sufficient to accurately determine the depth to bedrock. Auguring provides this essential data as inexpensively as possible. Track-rig rotary soil auger test drilling allows relatively inexpensive, qualitative determination of the presence of overburden voids and will generally penetrate to the top-of-bedrock. Augers typically extend to depths of 20 feet. Special augers extend to as much as 50 feet. Augers do not extend into the bedrock. Auger testing should be performed in a grid pattern across the proposed infiltration area, spaced as indicated in the above table.

§ 2107 Percolation Testing Requirements.

For each proposed infiltration area, a minimum of six percolation tests shall be conducted with a vertical component permeability test unless the applicant can demonstrate that fewer tests accurately represent the percolation rate of the proposed infiltration area. Additional testing shall be required if the initial test results show significant variability in the vertical component percolation rate. For larger infiltration areas, percolation tests shall be conducted at the densities listed in the table above.

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Attachment 3 – Municipal Stormwater Management Districts and Storm Drainage Problem Areas

§ 3101 Municipal Stormwater Management Districts.

Upper Nazareth Township is divided between two Act 167 Stormwater Management Districts – the Monocacy Creek Watershed (District 10) and the Bushkill Creek Watershed (District 12). These Districts are illustrated on the Municipal Stormwater Management District Map for Lehigh & Northampton Counties delineating watersheds associated with PA Act 167 Stormwater Management Plans as prepared by the Lehigh Valley Planning Commission, latest revision. The April 2013 map is attached herewith as Map 3.1 for reference.

§ 3102 Bushkill Creek Watershed Storm Drainage Problem Areas.

(RESERVED)

§ 3103 Monocacy Creek Watershed Storm Drainage Problem Areas.

Mapping of identified Storm Drainage Problem Areas in the Monocacy Creek Watershed within the municipal boundaries of Upper Nazareth Township can be referenced in the appendices of the Monocacy Creek Watershed Act 167 Stormwater Management Plan (last revised June 2017).




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LEHIGH & NORTHAMPTON COUNTIES STORMWATER MANAGEMENT PLANS PA ACT 167

WATERSHED DESIGNATIONS

- | | |
|-------------------------------|---|
| 1. Little Lehigh Creek | 9. Nancy Run |
| 2. Jordan Creek | 10. Monocacy Creek |
| 3. Coplay Creek | 11. Catsaquia Creek and Adjacent Watersheds |
| 4. Trout/Bertsch Creeks | 12. Bushkill Creek |
| 5. Maiden Creek Headwaters | 13. Martins/Jacoby Creeks |
| 6. Perkiomen Creek Headwaters | 14. Fry's Run and Adjacent Watersheds |
| 7. Saucon Creek | 15. Sacony Creek Headwaters |
| 8. Hokendaquia Creek | 16. Tohickon Creek/Delaware River (North) |

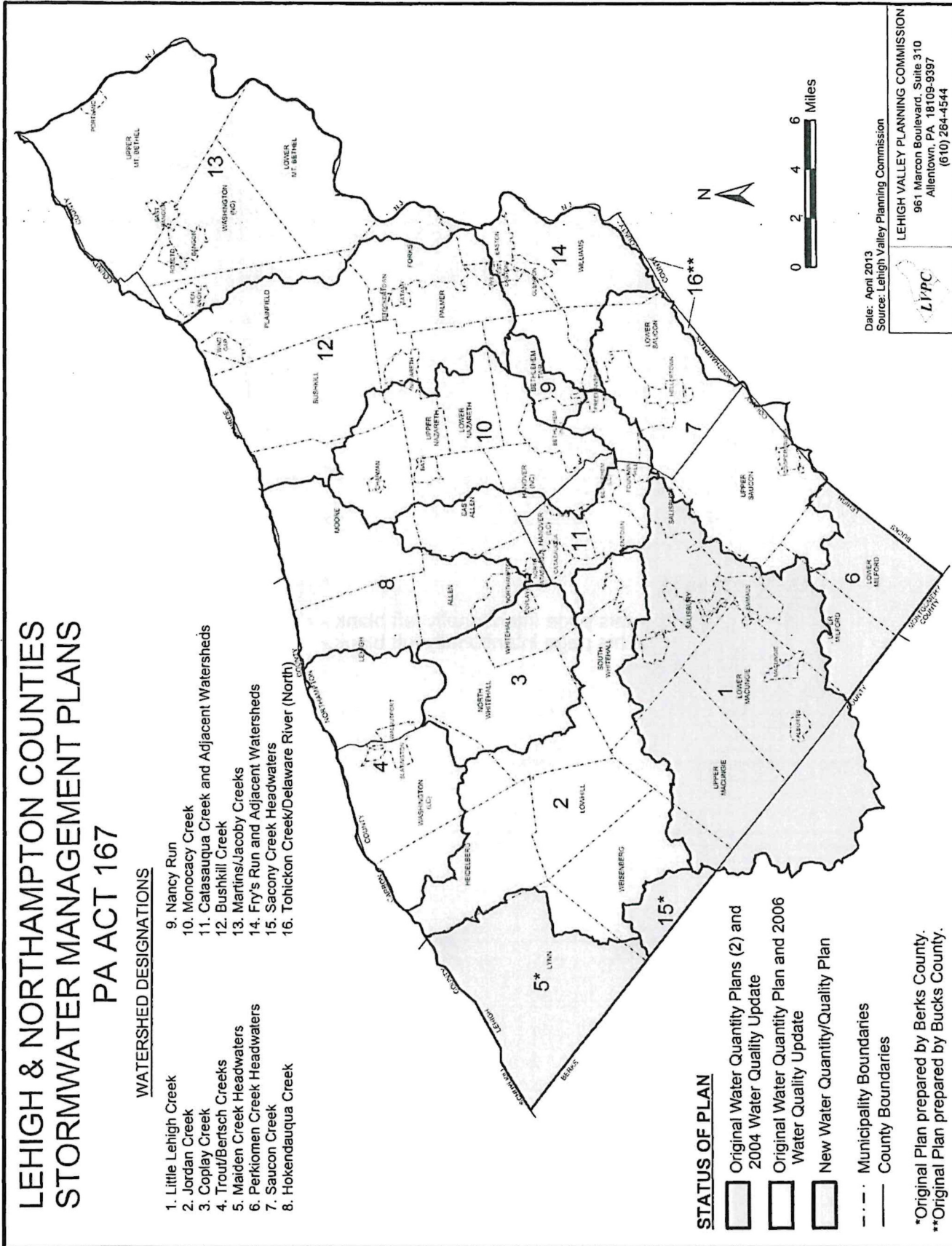
STATUS OF PLAN

-  Original Water Quantity Plans (2) and 2004 Water Quality Update
-  Original Water Quantity Plan and 2006 Water Quality Update
-  New Water Quantity/Quality Plan

-  Municipality Boundaries
-  County Boundaries

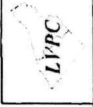
*Original Plan prepared by Berks County.

**Original Plan prepared by Bucks County.



Date: April 2013
Source: Lehigh Valley Planning Commission

LEHIGH VALLEY PLANNING COMMISSION
961 Marcon Boulevard, Suite 310
Allentown, PA 18109-9397
(610) 264-4544



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Attachment 4 – Bushkill Creek Watershed Technical Requirements

BUSHKILL CREEK WATERSHED ACT 167 STORMWATER MANAGEMENT PLAN TECHNICAL REQUIREMENTS

§ 4101 Post-Construction Water Quality Criteria.

1. No regulated earth disturbance activities within the municipality shall commence until approval by the municipality of a drainage plan which demonstrates compliance with this Ordinance. This Ordinance provides standards to meet NPDES permit requirements associated with construction activities and MS4 permit requirements.
2. The water quality volume (WQv) shall be captured and treated. The WQv shall be calculated two ways.
 - A. First, WQv shall be calculated using the following formula:

$$WQv = \frac{(c)(P)(A)}{12}$$

Where WQv = Water quality volume in acre feet
c = Rational Method post-development runoff coefficient for the two-year storm
P = 1.25 inches
A = Area in acres of proposed regulated activity

- B. Second, the WQv shall be calculated as the difference in runoff volume from predevelopment to post-development for the two-year return period storm. The effect of closed depressions on the site shall be considered in this calculation. The larger of these two calculated volumes shall be used as the WQv to be captured and treated, except that in no case shall the WQv be permitted to exceed 1.25 inches of runoff over the site area. This standard does not limit the volume of infiltration an applicant may propose for purposes of water quantity/ peak rate control.
3. The WQv shall be calculated for each post-development drainage direction on a site for sizing BMPs. Site areas having no impervious cover and no proposed disturbance during development may be excluded from the WQv calculations and do not require treatment.
4. If an applicant is proposing to use a dry extended detention basin, wet pond, constructed wetland or other BMP that ponds water on the land surface and may receive direct sunlight, the discharge from that BMP must be treated by infiltration, a vegetated buffer, filter strip, bioretention,

vegetated swale or other BMP that provides a thermal benefit to protect the high quality waters of the Bushkill Creek Watershed, from thermal impacts.

5. The WQv for a site as a result of the regulated activities must either be treated with infiltration or two acceptable BMPs such as those listed in § 4101.16, except for minor areas on the periphery of the site that cannot reasonably be drained to an infiltration facility or other BMP.
6. Infiltration BMPs shall not be constructed on fill unless the applicant demonstrates that the fill is stable and otherwise meets the infiltration BMP standards of this Ordinance.
7. The applicant shall document the bedrock type(s) present on the site from published sources. Any apparent boundaries between carbonate and noncarbonate bedrock shall be verified through more detailed site evaluations by a qualified geotechnical professional.
8. For each proposed regulated activity in the watershed where an applicant intends to use infiltration BMPs, the applicant shall conduct a preliminary site investigation, including gathering data from published sources, a field inspection of the site, a minimum of one test pit and a minimum of two percolation tests, as outlined in Attachment 2. This investigation will determine depth to bedrock, depth to the seasonal high water table, soil permeability and location of special geologic features, if applicable. This investigation may be done by a certified Sewage Enforcement Officer (SEO) except that the location(s) of special geologic features shall be verified by a qualified geotechnical professional.
9. Sites where applicants intend to use infiltration BMPs, with the exception of spray irrigation facilities, must meet the following criteria:
 - A. Depth to bedrock below the invert of the BMP greater than or equal to two feet.
 - B. Depth to seasonal high water table below the invert of the BMP greater than or equal to three feet; except for infiltration of residential roof runoff where the seasonal high water table must be below the invert of the BMP. (If the depth to bedrock is between two feet and three feet and the evidence of the seasonal high water table is not found in the soil, no further testing to locate the depth to seasonal high water table is required.)
 - C. Soil permeability (as measured by the adapted 25 Pa. Code Section 73.15 percolation test in Attachment 2) greater than or equal to 0.5 inches/hour and less than or equal to 12 inches per hour.
 - D. Setback distances or buffers as follows:

- (1) One hundred feet from water supply wells.
- (2) Fifteen feet downgradient or 100 feet upgradient from building foundations; except for residential development where the required set back is 15 feet downgradient or 40 feet upgradient from building foundations.
- (3) Fifty feet from septic system drainfields; except for residential development where the required setback is 25 feet from septic system drainfields.
- (4) Fifty feet from a geologic contact with carbonate bedrock unless a preliminary site investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area.
- (5) One hundred feet from the property line unless documentation is provided to show that all setbacks from existing or potential future wells, foundations and drainfields on neighboring properties will be met; except for one- and two-family residential dwellings where the required setback is 40 feet unless documentation is provided to show that all setbacks from existing or potential future wells, foundations and drainfields on neighboring properties will be met.

10. Infiltration by Spray Irrigation Facilities

- A. Spray Irrigation Facilities shall be designed in compliance with applicable PA-DEP requirements.
- B. Runoff storage basins utilized to store water that will be discharged via spray irrigation shall generally meet the requirements of PA-DEP and this Ordinance for the design of similar stormwater runoff storage facilities.
- C. Spray irrigation heads may not occupy or spray into utility easements, public property/right-of-way/easements, or adjoining properties without acquiring a permanent drainage easement from the impacted property/right-of-way/easement owner and providing a fully executed copy of said agreement to the Township.

11. For entirely noncarbonate sites, the recharge volume (REv) shall be infiltrated unless the applicant demonstrates that it is infeasible to infiltrate the REv for reasons of seasonal high water table, permeability rate, soil depth or setback distances; or except as provided in § 4101.22.

- A. The REv shall be calculated as follows:

$$REv = (0.25) * (I)/12$$

Where:

REv = Recharge volume in acre-feet

I = Impervious area in acres

- B. The preliminary site investigation described in Attachment 2. is required and shall continue on different areas of the site until a potentially suitable infiltration location is found or the entire site is determined to be infeasible for infiltration. For infiltration areas that appear to be feasible based on the preliminary site investigation, the Additional Site Investigation and Testing as outlined in Attachment 2 shall be completed.
- C. If an applicant proposes infiltration, the municipality may determine infiltration to be infeasible if there are known existing conditions or problems that may be worsened by the use of infiltration.
- D. The site must meet the conditions listed in § 4101.9.
- E. If it is not feasible to infiltrate the full REv, the applicant shall infiltrate that portion of the REv that is feasible based on the site characteristics. If none of the REv can be infiltrated, REv shall be considered as part of the WQv and shall be captured and treated as described in § 4101.16.
- F. If REv is infiltrated, it may be subtracted from the WQv required to be captured and treated.
12. Entirely carbonate areas.
- A. In entirely carbonate areas, where the applicant intends to use infiltration BMPs, the preliminary site investigation described in Attachment 2. shall be conducted. For infiltration areas that appear feasible based on the preliminary site investigation, the applicant shall conduct the additional site investigation and testing as outlined in Attachment 2. The soil depth, percolation rate and proposed loading rate, each weighted as described in § 4105, along with the buffer from special geologic features shall be compared to the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D of the Bushkill Creek Watershed Act 167 Stormwater Management Plan to determine if the site is recommended for infiltration. In addition to the recommendations in aforementioned Appendix D, the conditions listed in § 4101.9. are required for infiltration in carbonate areas.

- B. Applicants are encouraged to infiltrate the REv, as calculated in § 4101.11., but are not required to use infiltration BMPs on a carbonate site even if the site falls in the recommended range on the chart in aforementioned Appendix D. Any amount of volume infiltrated can be subtracted from the WQv to be treated by noninfiltration BMPs. If infiltration is not proposed, the full WQv shall be treated by two acceptable BMPs, as specified in § 4101.16.
13. If a site has both carbonate and noncarbonate areas, the applicant shall investigate the ability of the noncarbonate portion of the site to fully meet this Ordinance to meet the requirements for REv for the whole site through infiltration. If that proves infeasible, infiltration in the carbonate area as described in § 4101.12. or two other noninfiltration BMPs as described in § 4101.16. must be used. No infiltration structure in the noncarbonate area shall be located within 50 feet of a boundary with carbonate bedrock, except when a preliminary site investigation has been done showing the absence of special geologic features within 50 feet of the proposed infiltration area.
 14. If infiltration BMPs are proposed in carbonate areas, the post-development two- year runoff volume leaving the site shall be 80% or more of the predevelopment runoff volume for the carbonate portion of the site to prevent infiltration of volumes far in excess of the predevelopment infiltration volume.
 15. Site areas proposed for infiltration shall be protected from disturbance and compaction except as necessary for construction of infiltration BMPs.
 16. If infiltration of the entire WQv is not proposed, the remainder of the WQv shall be treated by two acceptable BMPs in series for each discharge location. Sheet flow draining across a pervious area can be considered as one BMP. Sheet flow across impervious areas and concentrated flow shall flow through two BMPs. If sheet flow from an impervious area is to be drained across a pervious area as one BMP, the length of the pervious area must be equal to or greater than the length of impervious area. In no case may the same BMP be employed consecutively to meet the requirement of this section. Acceptable BMPs are listed below along with the recommended reference for design.

- § 4101.P. table on next page -

Best Management Practice	Design Reference Number ^C
Bioretention ^A	4, 5, 11, 16
Capture/reuse ^B	4, 14
Constructed wetlands	4, 5, 8, 10, 16
Dry extended detention ponds	4, 5, 8, 12, 18
Minimum disturbance/minimum maintenance practices	1, 9
Significant reduction of existing impervious cover	N/A
Stormwater filters ^A (sand, peat, compost, etc.)	4, 5, 10, 16
Vegetated buffers/filter strips	2, 3, 5, 11, 16, 17
Vegetated roofs	4, 13
Vegetated swales ^A	2, 3, 5, 11, 16, 17
Water quality inlets ^D	4, 7, 15, 16, 19
Wet detention ponds	4, 5, 6, 8

NOTES:

- ^A This BMP could be designed with or without an infiltration component. If infiltration is proposed, the site and BMP will be subject to the testing and other infiltration requirements in this Ordinance.
- ^B If this BMP is used to treat the entire WQv then it is the only BMP required because of this BMPs superior water quality performance.
- ^C See table below.
- ^D Water quality inlets include such BMPs as oil/water separators, sediment traps/catch basin sumps, and trash/debris collectors in catch basins.

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Number	Design Reference Title
1	"Conservation Design For Stormwater Management - A Design Approach to Reduce Stormwater Impacts From Land Development and Achieve Multiple Objectives Related to Land Use," Delaware Department of Natural Resources and Environmental Control, The Environmental Management Center of the Brandywine Conservancy, September 1997.
2	"A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zone," Schueler, T. R., Kumble, P. and Heraty, M., Metropolitan Washington Board of Supervisors of Governments, 1992.
3	"Design of Roadside Channels with Flexible Linings," Federal Highway Administration, Chen, Y. H. and Cotton, G. K., Hydraulic Engineering Circular 15, FHWA-IP-87-7, McLean Virginia, 1988.
4	"Draft Stormwater Best Management Practices Manual," Pennsylvania Department of Environmental Protection, January 2005.
5	"Evaluation and Management of Highway Runoff Water Quality," Federal Highway Administration, FHWA-PD-96-032, Washington, D.C., 1996.
6	"Evaporation Maps of the United States," U.S. Weather Bureau (now NOAA/National Weather Service) Technical Paper 37, Published by Department of Commerce, Washington D.C., 1959.
7	"Georgia Stormwater Manual," AMEC Earth and Environmental, Center for Watershed Protection, Debo and Associates, Jordan Jones and Goulding, Atlanta Regional Commission, Atlanta, Georgia, 2001.
8	"Hydraulic Design of Highway Culverts," Federal Highway Administration, FHWA HDS 5, Washington, D.C., 1985 (revised May 2005).
9	"Low Impact Development Design Strategies An Integrated Design Approach, Prince Georges County, Maryland Department of Environmental Resources, June 1999.
10	"Maryland Stormwater Design Manual," Maryland Department of the Environment, Baltimore, Maryland, 2000.

Number	Design Reference Title
11	"Pennsylvania Handbook of Best Management Practices for Developing Areas," Pennsylvania Department of Environmental Protection, 1998.
12	"Recommended Procedures for Act 167 Drainage Plan Design," LVPC, revised 1997.
13	"Roof Gardens History, Design, and Construction," Osmundson, Theodore. New York: W.W. Norton and Company, 1999.
14	"The Texas Manual on Rainwater Harvesting," Texas Water Development Board, Austin, Texas, Third Edition, 2005.
15	"VDOT Manual of Practice for Stormwater Management," Virginia Transportation Research Board of Supervisors, Charlottesville, Virginia, 2004.
16	"Virginia Stormwater Management Handbook," Virginia Department of Conservation and Recreation, Richmond, Virginia, 1999.
17	"Water Resources Engineering," Mays, L. W., John Wiley and Sons, Inc., 2005.
18	"Urban Hydrology for Small Watersheds," Technical Report 55, US Department of Agriculture, Natural Resources Conservation Service, 1986.
19	US EPA, Region 1 New England website (as of August 2005) http://www.epa.gov/NE/assistance/ceitts/stormwater/techs/html

17. Stormwater runoff from hot spot land uses shall be pretreated. In no case may the same BMP be employed consecutively to meet this requirement and the requirement in § 4101.16.

A. Acceptable methods of pretreatment are listed below.

Hot Spot Land Use	Pretreatment 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

Hot Spot Land Use	Pretreatment Method(s)
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
Salvage yards and recycling facilities*	BMPs that are a part of a stormwater pollution prevention plan under an NPDES permit
Fleet storage yards and vehicle cleaning facilities*	BMPs that are a part of a stormwater pollution prevention plan under an NPDES permit
Facilities that store or generate regulated substances*	BMPs that are a part of a stormwater pollution prevention plan under an NPDES permit
Marinas*	BMPs that are a part of a stormwater pollution prevention plan under an NPDES permit
Certain industrial uses (listed under NPDES)*	BMPs that are a part of a stormwater pollution prevention plan under an NPDES permit

NOTES:

* Regulated under the NPDES stormwater program.

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- B. Design references for the pretreatment methods, as necessary, are listed below. If the applicant can demonstrate to the satisfaction of the municipality that the proposed land use is not a hot spot, then the pretreatment requirement would not apply.

Pretreatment Method	Design Reference ^A
Constructed wetlands	4, 5, 8, 10, 16
Diversion of stormwater away from potential contamination areas	4, 11
Stormwater collection and reuse (especially for irrigation)	4, 14
Stormwater filters (sand, peat, compost, etc.)	4, 5, 10, 16
Vegetated swales	2, 3, 5, 11, 16, 17
Water quality inlets	4, 7, 15, 16, 19

NOTES:

^A These numbers refer to the Design Reference Title Chart in § 4101.16. above.

18. The use of infiltration BMPs is prohibited on hot spot land use areas.
19. Stormwater infiltration BMPs shall not be placed in or on a special geologic feature(s). Additionally, stormwater runoff shall not be discharged into existing on- site sinkholes.
20. Applicants shall request, in writing, public water suppliers to provide the Zone I wellhead protection radius, as calculated by the method outlined in the Pennsylvania Department of Environmental Protection wellhead protection regulations, for any public water supply well within 400 feet of the site. In addition to the setback distances specified in § 4101.9., infiltration is prohibited in the Zone I radius as defined and substantiated by the public water supplier in writing. If the applicant does not receive a response from the public water supplier, the Zone I radius is assumed to be 100 feet.
21. The volume and rate of the net increase in stormwater runoff from the regulated activities must be managed to prevent the physical degradation of receiving waters from such effects as scour and stream bank destabilization, to satisfy state water quality requirements, by controlling the two-year post-development runoff to a 30% release rate.

- 22 The municipality may, after consultation with DEP, approve alternative methods for meeting the state water quality requirements other than those in this section, provided that they meet the minimum requirements of and do not conflict with state law, including but not limited to the Clean Streams Law.

§ 4102 (Reserved).

§ 4103 Stormwater Management Districts.

1. Mapping of stormwater management districts. To implement the provisions of the Bushkill Creek Watershed Stormwater Management Plan, the municipality is hereby divided into Stormwater Management Districts consistent with the Bushkill Creek Watershed Release Rate Map presented in the Plan Update. The boundaries of the Stormwater Management Districts are shown on Map 3.1 provided in Attachment 3 and the Act 167 Release Rate Map for the Bushkill Creek Watershed.
2. Description of stormwater management districts. Two types of stormwater management districts may be applicable to the municipality, namely conditional/ provisional no detention districts and dual release rate districts, as described below.
 - A. Conditional/provisional no detention districts. Within these districts, the capacity of the local runoff conveyance facilities (as defined in Article II) must be calculated to determine if adequate capacity exists. For this determination, the developer must calculate peak flows assuming that the site is developed as proposed and that the remainder of the local watershed is in the existing condition. The developer must also calculate peak flows assuming that the entire local watershed is developed per current zoning and that all new development would use the runoff controls specified by this Ordinance. The larger of the two peak flows calculated will be used in determining if adequate capacity exists. If adequate capacity exists to safely transport runoff from the site to the main channel (as defined in Article II), these watershed areas may discharge post-development peak runoff without detention facilities. If the capacity calculations show that the local runoff conveyance facilities lack adequate capacity, the developer shall either use a 100% release rate control or provide increased capacity of downstream elements to convey increased peak flows consistent with § 4104.16. Any capacity improvements must be designed to convey runoff from development of all areas tributary to the improvement consistent with the capacity criteria specified in By definition, a storm drainage problem area associated with the local runoff conveyance facilities indicates that adequate capacity does

not exist. Sites in these districts are still required to meet all of the water quality requirements in § 4101.

- B. Dual release rate districts. Within these districts, the two-year post-development peak discharge must be controlled to 30% of the predevelopment two-year runoff peak. Further, the ten-, twenty-five- and 100-year post-development peak runoff must be controlled to the stated percentage of the predevelopment peak. Release rates associated with the ten- through 100-year events vary from 50% to 100% depending upon location in the watershed.

§ 4104 Stormwater Management District Implementation Provisions.

1. Applicants shall provide a comparative pre- and post-construction stormwater management hydrograph analysis for each direction of discharge and for the site overall to demonstrate compliance with the provisions of this Ordinance.
2. Any stormwater management controls required by this Ordinance and subject to a dual release rate criteria shall meet the applicable release rate criteria for each of the two-, ten-, twenty-five- and 100-year return period runoff events consistent with the calculation methodology specified in § 4105.
3. The exact location of the stormwater management district boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours provided as part of the drainage plan. The district boundaries as originally drawn coincide with topographic divides or, in certain instances, are drawn from the intersection of the watercourse and a physical feature such as the confluence with another watercourse or a potential flow obstruction (e.g., road, culvert, bridge, etc.). The physical feature is the downstream limit of the subarea and the subarea boundary is drawn from that point up slope to each topographic divide along the path perpendicular to the contour lines.
4. Any downstream capacity analysis conducted in accordance with this Ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates:
 - A. Natural or man-made channels or swales must be able to convey the increased runoff associated with a two-year return period event within their banks at velocities consistent with protection of the channels from erosion.
 - B. Natural or man-made channels or swales must be able to convey the

increased twenty-five-year return period runoff without creating any hazard to persons or property.

- C. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area must be designed in accordance with DEP Chapter 105 regulations (if applicable) and, at minimum, pass the increased twenty-five-year return period runoff.
5. For a proposed development site located within one release rate category subarea, the total runoff from the site shall meet the applicable release rate criteria. For development sites with multiple directions of runoff discharge, individual drainage directions may be designed for up to a 100% release rate so long as the total runoff from the site is controlled to the applicable release rate.
6. For a proposed development site located within two or more release category subareas, the peak discharge rate from any subarea shall be the predevelopment peak discharge for that subarea multiplied by the applicable release rate. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the site. In this case, peak discharge in any direction may be a 100% release rate provided that the overall site discharge meets the weighted average release rate.
7. For a proposed development site located partially within a release rate category subarea and partially within a conditional/provisional no detention subarea, the size of the predevelopment drainage area on a site may not be changed post-development to create potentially adverse conditions on downstream properties except as part of a no harm or hardship waiver procedure.
8. No portion of a site may be regraded between any Upper Nazareth Township watershed, and any adjacent watershed except as part of a "no harm" or hardship waiver procedure.
9. Within a release rate category area, for a proposed development site which has areas which drain to a closed depression(s), the design release from the site will be the lesser of a) the applicable release rate flow assuming no closed depression(s) or b) the existing peak flow actually leaving the site. In cases where b) would result in an unreasonably small design release, the design discharge of less than or equal to the release rate will be determined by the available downstream conveyance capacity to the main channel calculated using § 4104.4. and the minimum orifice criteria.
10. Off-site areas which drain through a proposed development site are not

subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site using the capacity criteria in § 4104.4. and the detention criteria in § 4105.

11. For development sites proposed to take place in phases, all detention ponds shall be designed to meet the applicable release rate(s) applied to all site areas tributary to the proposed pond discharge direction. All site tributary areas will be assumed as developed, regardless of whether all site tributary acres are proposed for development at that time. An exception shall be sites with multiple detention ponds in series where only the downstream pond must be designed to the stated release rate.
12. Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area shall be subject to the release rate criteria. The impact area includes any proposed cover or grading changes.
13. Development proposals which, through groundwater recharge or other means, do not increase either the rate or volume of runoff discharged from the site compared to predevelopment are not subject to the release rate provisions of this Ordinance.
14. No harm water quantity option. For any proposed development site not located in a conditional/provisional no detention district, the developer has the option of using a less restrictive runoff control (including no detention) if the developer can prove that special circumstances exist for the proposed development site and that no harm would be caused by discharging at a higher runoff rate than that specified by the plan. Special circumstances are defined as any hydrologic or hydraulic aspects of the development itself not specifically considered in the development of the plan runoff control strategy. Proof of no harm would have to be shown from the development site through the remainder of the downstream drainage network to the confluence of the creek with the Delaware or Lehigh River. Proof of no harm must be shown using the capacity criteria specified in § 4104.4 if downstream capacity analysis is a part of the no harm justification.
 - A. Attempts to prove no harm based upon downstream peak flow versus capacity analysis shall be governed by the following provisions:
 - (1) The peak flow values to be used for downstream areas for the design return period storms (two-, ten-, twenty-five- and 100-year) shall be the values from the calibrated PSRM Model for the Bushkill Creek Watershed or as calculated by

an applicant using an alternate method acceptable to the municipality. The flow values from the PSRM Model would be supplied to the developer by the municipality upon request.

- (2) Any available capacity in the downstream conveyance system as documented by a developer may be used by the developer only in proportion to his development site acreage relative to the total upstream undeveloped acreage from the identified capacity (i.e., if his site is 10% of the upstream undeveloped acreage, he may use up to 10% of the documented downstream available capacity).
- (3) Developer-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove no harm, except in conjunction with proposed capacity improvements for the problem areas consistent with § 4103.17.

B. Any no harm justifications shall be submitted by the Applicant as part of the drainage plan submission per Part 4 of this Ordinance. Applicants submitting no harm justifications must still meet all of the water quality requirements in § 4101.

15. Regional detention alternatives. For certain areas within the study area, it may be more cost-effective to provide one control facility for more than one development site than to provide an individual control facility for each development site. The initiative and funding for any regional runoff control alternatives are the responsibility of prospective developers. The design of any regional control basins must incorporate reasonable development of the entire upstream watershed. The peak outflow of a regional basin would be determined based on the required release rate at the point of discharge.
16. Capacity improvements. In certain instances, primarily within the conditional/ provisional no detention areas, local drainage conditions may dictate more stringent levels of runoff control than those based upon protection of the entire watershed. In these instances, if the developer could prove that it would be feasible to provide capacity improvements to relieve the capacity deficiency in the local drainage network, then the capacity improvements could be provided by the developer in lieu of runoff controls on the development site. Peak flow calculations shall be done assuming that the local watershed is in the existing condition and then assuming that the local watershed is developed per current zoning and using the specified runoff controls. Any capacity improvements would be

designed using the larger of the above peak flows and the capacity criteria specified in § 4104.4. All new development in the entire subarea(s) within which the proposed development site is located shall be assumed to implement the developer's proposed discharge control, if any.

Capacity improvements may also be provided as necessary to implement any regional detention alternatives or to implement a modified no harm option which proposes specific capacity improvements to provide that a less stringent discharge control would not create any harm downstream.

17. Release Rates need to be met year-round. Designs involving BMPs that function differently in winter versus non-winter conditions (e.g., capture/reuse with spray irrigation shut off for the winter) must still meet release rates during the winter.

§ 4105 Calculation Methodology.

1. Stormwater runoff from all development sites shall be calculated using either the universal rational method or the soil-cover-complex methodology as conditioned in § 4105.4. and 5.

2. Infiltration BMP loading rate percentages.

- A. Infiltration BMP loading rate percentages in the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D of the Bushkill Creek Watershed Act 167 Stormwater Management Plan shall be calculated as follows:

$$\left(\frac{\text{(Area tributary to infiltration BMP)}}{\text{(Base area of infiltration BMP)}} \right) * 100\%$$

- B. The area tributary to the infiltration BMP shall be weighted as follows:

- (1) All disturbed areas to be made impervious: weight at 100%.
- (2) All disturbed areas to be made pervious: weight at 50%.
- (3) All undisturbed pervious areas: weight at 0%.
- (4) All existing impervious areas: weight at 100%.

3. Soil thickness.

- A. Soil thickness is to be measured from the bottom of any proposed infiltration system. The effective soil thickness in the Recommendation Chart for Infiltration Stormwater Management

BMPs in Carbonate Bedrock in aforementioned Appendix D is the measured soil thickness multiplied by the thickness factor based on soil permeability (as measured by the adapted 25 Pa. Code Section 73.15 percolation test in Attachment 2), as follows:

Permeability Range*	Thickness Factor
6.0 to 12.0 inches/hour	0.8
2.0 to 6.0 inches/hour	1.0
1.0 to 2.0 inches/hour	1.4
0.75 to 1.0 inches/hour	1.2
0.5 to 0.75 inches/hour	1.0

NOTES:

* If the permeability rate (as measured by the adapted 25 Pa. Code Section 73.15 percolation test in Attachment 2) falls on a break between two thickness factors, the smaller thickness factor shall be used.

- B. Sites with soil permeability greater than 12.0 in/hr or less than 0.5 in/hr, as measured by the adapted 25 PA\ a. Code Section 73.15 percolation test in Attachment 2, are not recommended for infiltration.
- 4. Stormwater runoff from watersheds of more than 200 acres shall be calculated using the Soil-Cover-Complex Method developed by the Natural Resources Conservation Service or other appropriate method acceptable to the Township Engineer.
- 5. Stormwater runoff from watersheds of 200 or less acres, and with a calculated time of concentration less than 60 minutes, is preferred to be calculated by the Universal Rational Method, or another Rational hydrograph that closely approximates the volume of the Universal Rational Hydrograph.
- 6. If the Universal Rational Method is being utilized, the time of concentration shall be the longest time of concentration within the drainage area to each point of interest. The time of concentration must be the same in both the pre- and post-development analysis in order to ensure the same storm is being compared.
- 7. When comparing different points of interest, drainage areas, etc. a consistent methodology shall be used.
- 8. Where runoff to a specified point of analysis includes multiple flow paths through definable sub-drainage areas, post-development runoff rates must

be minimally limited to pre-development rates for each sub-drainage area.

9. Where no existing point of concentrated discharge to adjoining properties exists, Applicant shall use level spreaders, or similar facilities, to discharge runoff in a distributed manner. Runoff rates shall not exceed PA-DEP standard for level spreaders measured on the basis of rate per lineal foot of discharge width.
10. The design of any detention basin intended to meet the requirements of this Ordinance shall be verified by routing the design storm hydrograph through the proposed basin using the storage indication method or other methodology demonstrated to be more appropriate. For basins designed using the rational method technique, the design hydrograph for routing shall be either the universal rational hydrograph or another rational hydrograph that closely approximates the volume of the universal rational hydrograph.
11. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall be routed using the storage indication method.
12. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall provide storage volume for the full WQv below the lowest outlet invert
13. Wet detention ponds designed to have a permanent pool for the WQv shall assume that the permanent pool volume below the primary outlet is full at the beginning of design event routing for the purposes of evaluating peak outflows.
14. All stormwater detention facilities shall provide a minimum 1.0-foot freeboard above the maximum pool elevation associated with the two-through twenty-five- year runoff events. A 0.5-foot freeboard shall be provided above the maximum pool elevation of the 100-year runoff event. The freeboard shall be measured from the maximum pool elevation to the invert of the emergency spillway. The two- through 100-year storm events shall be controlled by the primary outlet structure. An emergency spillway for each basin shall be designed to pass the 100-year return frequency storm peak basin inflow rate with a minimum 0.5-foot freeboard measured to the top of basin.

The freeboard criteria shall be met considering any off-site areas tributary **to the basin as developed**, as applicable. If this detention facility is considered to be a dam as per DEP Chapter 105, the design of the facility must be consistent with the Chapter 105 regulations and may be required to pass a storm greater than the 100-year event.

Exceptions to the freeboard requirements are as follows:

- A. Bioretention BMPs with a ponded depth less than or equal to 0.5 feet are exempt from the freeboard requirements.
 - B. Small detention basins, with a ponded depth less than or equal to 1.5 feet or having a depth to the top of the berm less than or equal to 2.5 feet, may provide twenty percent additional storage volume measured from the maximum ponded depth to the invert of the emergency spillway in lieu of the above requirements. The depth of the emergency spillway must be sufficient to pass either two times the 100-year peak or the 100-year peak with 0.2' of freeboard to the top of berm, whichever is greater.
 - C. Small infiltration basins, with a ponded depth less than or equal to 1.5 feet or having a depth to the top of the berm less than or equal to 2.5 feet, may provide twenty percent additional storage volume measured from the maximum ponded depth to the top of the berm in lieu of the above Requirements. In this case, an emergency spillway is only necessary if runoff in excess of the basin volume would cause harm to downstream owners. If a spillway is necessary, it must be sufficiently sized to pass the 100-year peak inflow.
 - D. If this detention facility is considered to be a dam as per DEP Chapter 105, the design of the facility must be consistent with the Chapter 105 regulations and may be required to pass a storm greater than the 100-year event.
15. The minimum circular orifice diameter for controlling discharge rates from detention facilities shall be three inches. Designs where a lesser size orifice would be required to fully meet release rates shall be acceptable with a three-inch orifice, provided that as much of the site runoff as practical is directed to the detention facilities. The minimum three-inch diameter does not apply to the control of the WQv.
16. Runoff calculations using the Soil-Cover-Complex Method shall use the Natural Resources Conservation Service Type II twenty-four-hour rainfall distribution. The twenty-four-hour rainfall depths for the various return periods to be used consistent with this Ordinance shall be taken from the latest version of the Precipitation-Frequency Atlas of the United States, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland. Graphical and tabular presentations of the Type II, 24-hour distribution are included in Appendix C of the Bushkill Creek Watershed Act 167 Stormwater Management Plan.
17. Runoff calculations using the Rational Method shall use rainfall intensities

consistent with appropriate times of concentration and return periods and NOAA Atlas 14, Precipitation Frequency Atlas of the United States, current volume, or the Pennsylvania Department of Transportation Drainage Manual, 2015 Edition for Region 4, or the Intensity-Duration-Frequency Curves as presented in aforementioned Appendix C.

18. Runoff curve numbers (CNs) to be used in the Soil-Cover-Complex Method shall be based upon the matrix presented in aforementioned Appendix C.
19. Runoff coefficients for use in the Rational Method shall be based upon the table presented in aforementioned Appendix C.
20. All time of concentration calculations shall use a segmental approach which may include one or all of the flow types below:
 - A. Sheet flow (overland flow) calculations shall use either the NRCS average velocity chart (Figure 3-1, Technical Release-55, 1975) or the modified kinematic wave travel time equation (Equation 3-3, NRCS TR-55, June 1986). If using the modified kinematic wave travel time equation, the sheet flow length shall be limited to 50 feet for designs using the Rational Method and limited to 150 feet for designs using the Soil-Cover-Complex Method.
 - B. Shallow concentrated flow travel times shall be determined from the watercourse slope, type of surface and the velocity from Figure 3-1 of TR-55, June 1986.
 - C. Open channel flow travel times shall be determined from velocities calculated by the Manning Equation. Bankfull flows shall be used for determining velocities. Manning 'n' values shall be based on the table presented in aforementioned Appendix C.
 - D. Pipe flow travel times shall be determined from velocities calculated using the Manning Equation assuming full flow and the Manning 'n' values from aforementioned Appendix C.
21. If using the Rational Method, all predevelopment calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas. If using the Rational Method, all post-development calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas.
22. The Manning Equation shall be used to calculate the capacity of watercourses. Manning 'n' values used in the calculations shall be consistent with the table presented in aforementioned Appendix C or other

appropriate standard engineering 'n' value resources. Pipe capacities shall be determined by methods acceptable to the municipality.

23. The Pennsylvania DEP Chapter 105 rules and regulations apply to the construction, modification, operation or maintenance of both existing and proposed dams, water obstructions and encroachments throughout the watershed. Criteria for design and construction of stormwater management facilities according to this Ordinance may differ from the criteria that are used in the permitting of dams under the Dam Safety Program.

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Attachment 5 – (RESERVED)

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Attachment 6 – Monocacy Creek Watershed Technical Requirements

MONOCACY CREEK WATERSHED ACT 167 STORMWATER MANAGEMENT PLAN TECHNICAL REQUIREMENTS

§ 6101 Post-Construction Water Quality Criteria.

1. No regulated earth disturbance activities within the municipality shall commence until approval by the municipality of a drainage plan which demonstrates compliance with this Ordinance.
2. The water quality volume (WQv) shall be captured and treated with vegetated/surface and/or direct recharge/subsurface BMPs. The WQv shall be calculated as the difference in runoff volume from pre-development to post-development for the 24-hour, 2-year return period storm. This may be calculated using either the soil-cover-complex method or universal rational method using the 2-year rainfall depth as noted in § 6105.9 and 10. The effect of closed depressions on the site shall be considered in this calculation. The WQv shall be captured and treated in a manner consistent with the standards outlined in § 6102.
3. The WQv shall be calculated for each post-development drainage direction on a site for sizing BMPs. Site areas having no impervious cover and no proposed disturbance during development may be excluded from the WQv calculations and do not require treatment.
4. The applicant shall document the bedrock type(s) present on the site from published sources. Any apparent boundaries between carbonate and non-carbonate bedrock shall be verified through more detailed site evaluations by a qualified geotechnical professional.
5. For each proposed regulated activity in the watershed where an applicant intends to use infiltration BMPs, the applicant shall conduct a preliminary site investigation, including gathering data from published sources, a field inspection of the site, a minimum of one test pit and a minimum of two percolation tests, as outlined in Attachment 2. This investigation will determine depth to bedrock, depth to the seasonal high water table, soil permeability and location of special geologic features, if applicable. This investigation may be done by a certified Sewage Enforcement Officer (SEP) except that the location(s) of special geologic features shall be verified by a qualified geotechnical professional.

6. Sites where applicants intend to use infiltration BMPs must meet the following criteria:
 - A. Depth to bedrock below the invert of the BMP greater than or equal to 2 feet.
 - B. Depth to seasonal high water table below the invert of the BMP greater than or equal to 2 feet: except for infiltration of residential roof runoff where the seasonal high water table must be below the invert of the BMP.
 - C. Soil permeability (as measured using the standards listed in Appendix C of the Pennsylvania Stormwater Best Practices Manual, as amended or replaced from time to time) greater than or equal to 0.1 inches/hour and less than or equal to 10 inches per hour.
 - D. Setback distances or buffers as follows:
 - a. 100 feet from water supply wells, or 50 feet in residential development.
 - b. 10 feet downgradient or 100 feet upgradient from building foundations.
 - E. 50 feet from septic system drainfields.
 - F. 50 feet from a geologic contact with carbonate bedrock unless a preliminary site investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area.
7. Infiltration by Spray Irrigation Facilities
 - A. Spray Irrigation Facilities shall be designed in compliance with applicable PA-DEP requirements.
 - B. Runoff storage basins utilized to store water that will be discharged via spray irrigation shall generally meet the requirements of PA-DEP and this Ordinance for the design of similar stormwater runoff storage facilities.
 - C. Spray irrigation heads may not occupy or spray into utility easements, public property/right-of-way/easements, or adjoining properties without acquiring a permanent drainage easement from the impacted property/right-of-way/easement owner and providing a fully executed copy of said agreement to the Township.

8. In entirely carbonate areas, where the applicant intends to use infiltration BMPs, the preliminary site investigation described in Attachment 2 shall be conducted. For infiltration areas that appear feasible based on the preliminary site investigation, the applicant shall conduct the additional site investigation and testing as outlined in Attachment 2. The soil depth, percolation rate and proposed loading rate, each weighted as described in Attachment 2, along with the buffer from special geologic features shall be compared to the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D of the Monocacy Creek Watershed Act 167 Stormwater Management Plan to determine if the site is recommended for infiltration. In addition to the recommendation from aforementioned Appendix D, the conditions listed in § 6101.6. are required for infiltration in carbonate areas.
9. Site areas proposed for infiltration shall be protected from disturbance and compaction except as necessary for construction of infiltration BMPs.
10. If infiltration of the entire WQv is not proposed, the remainder of the WQv shall be treated by acceptable BMPs for each discharge location. Acceptable BMPs are listed in Appendix H of the Monocacy Creek Watershed Act 167 Stormwater Management Plan.
11. Stormwater runoff from hot spot land uses shall be pre-treated. Suggested methods of pre-treatment are listed in aforementioned Appendix H.
12. The use of infiltration BMPs is prohibited on hot spot land use areas unless the applicant can demonstrate that existing and proposed site conditions, including any proposed runoff pre-treatment, create conditions suitable for runoff infiltration under this Ordinance.
13. Stormwater infiltration BMPs shall not be placed in or on a special geologic feature(s). Additionally, stormwater runoff shall not be discharged into existing on-site sinkholes.
14. Stormwater drainage wells may only be used for runoff from roof areas.
15. Applicants shall request, in writing, public water suppliers to provide the Zone I wellhead protection radius, as calculated by the method outlined in the Pennsylvania Department of Environmental Protection Wellhead Protection regulations, for any public water supply well within 400 feet of the site. In addition to the setback distances specified in §6101.6., infiltration is prohibited in the Zone I radius as defined and substantiated by the public water supplier in writing. If the applicant does not receive a response from the public water supplier, the Zone I radius is assumed to be 100 feet.

16. The municipality may, after consultation with DEP, approve alternative methods for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including but not limited to the Clean Streams Law.

§6102 Green Infrastructure and Existing Water Balance Preservation Standards.

1. The entire WQv as calculated in § 6101.2. shall be captured and treated by either direct recharge/subsurface and/or vegetated/surface BMPs.
2. As much proposed impervious area as practical shall be directed to water quality BMPs.
3. Existing impervious area that is not proposed to be treated by direct recharge/subsurface BMPs should be excluded from all water balance calculations.
4. Vegetated/surface BMPs shall be employed "first" for the site to capture the equivalent of a minimum of 0.38 inches of runoff for each square foot of impervious area, unless proven not feasible by the applicant. For proposed impervious cover directed to multiple BMPs, the vegetated/surface BMP capture volume chart in Appendix C of the Monocacy Creek Watershed Act 167 Stormwater Management Plan shall be used to determine overall site compliance. Direct recharge/subsurface BMPs may be used "first" for portions of the impervious cover provided the overall vegetated/surface BMP "first" standard is met.
5. A maximum of 30% of the total annual rainfall for a site may be directly recharged to groundwater using direct recharge/subsurface BMPs, for runoff from impervious areas.
 - A. For development sites with greater than 33% proposed impervious cover:
 - (1) If all impervious cover is directed to vegetated/surface BMPs to capture the entire 2-year, 24-hour event, the direct recharge standard is met.
 - (2) Up to 33% of the site as impervious cover may be directed to direct recharge/subsurface BMPs designed to capture the entire 2-year, 24-hour event provided the overall vegetated/surface BMP "first" standard is met. All remaining impervious cover shall be directed to vegetated/surface BMPs designed to capture the remainder of the WQv.

(3) For vegetated/surface and/or direct recharge/subsurface BMPs designed for runoff from impervious areas designed to capture less than the entire 2-year, 24-hour event, aforementioned Appendix C shall be used to assure that the maximum direct recharge standard is met.

B. The maximum 30% direct recharge standard applies on an overall site basis, rather than in each drainage direction.

§ 6103 Stormwater Management Districts.

1. Mapping of stormwater management districts. To implement the provisions of the Monocacy Creek Watershed Stormwater Management Plan, the municipality is hereby divided into Stormwater Management Districts consistent with the Monocacy Creek Watershed Release Rate Map presented in the Plan Update. The boundaries of the stormwater management districts are shown Map 3.1 provided in Attachment 3 and the Act 167 Release Rate Map for the Monocacy Creek Watershed
2. Release Rate Districts - There are six single release rate districts that differ in the extent to which the post-development runoff must be controlled. The release rate districts are 50%, 60%, 70%, 80%, 90% and 100%. Within a given district, the post-development peak rate of storm runoff must be controlled to the stated percentage of the pre-development peak rate of runoff for each of the 10-, 25-, 50- and 100-year return period storms to protect downstream watershed areas. There is one dual release rate district. Within this district, the 10-year return period event needs to meet a 30% release rate, and the 25-year and higher return period events need to meet a 100% release rate.
3. Conditional No Detention Districts - These watershed areas peak very early with respect to the total watershed peak flow and contribute very minimal flow to the watershed peak flow. For that reason, these watershed areas may discharge post-development peak runoff without detention for the 10-through 100-year return periods without adversely affecting the total watershed peak flow. These areas are designated as "conditional" no detention areas because in certain instances the "local" runoff conveyance facilities, which transport runoff from the site to the main channel, may not have adequate capacity to safely transport the peak flows associated with no detention for a proposed development. In those instances, a 100% release rate control would have to be provided or, alternately, the capacity deficiency(ies) would have to be corrected.

§ 6104 Stormwater Management District Implementation Provisions.

1. Applicants shall provide a comparative pre- and post-construction stormwater management hydrograph analysis for each direction of discharge and for the site overall to demonstrate compliance with the provisions of this Ordinance.
2. Any stormwater management controls required by this Ordinance and subject to release rate criteria shall meet the applicable release rate criteria for each of the 2-, 10-, 25-, 50- and 100-year return period runoff events consistent with the calculation methodology specified in § 6105.
3. The exact location of the stormwater management district boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours provided as part of the drainage plan. The district boundaries as originally drawn coincide with topographic divides or, in certain instances, are drawn from the intersection of the watercourse and a physical feature such as the confluence with another watercourse or a potential flow obstruction (e.g., road, culvert, bridge, etc.). The physical feature is the downstream limit of the subarea, and the subarea boundary is drawn from that point up slope to each topographic divide along the path perpendicular to the contour lines.
4. Any downstream capacity analysis conducted in accordance with this Ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates:
 - A. Natural or man-made channels or swales must be able to convey the increased runoff associated with a 2-year return period event within their banks at velocities consistent with protection of the channels from erosion.
 - B. Natural or man-made channels, swales, culverts, bridges, storm sewers or any other facilities which must convey flows from the tributary area must be able to convey the increased 25-year return period runoff.
5. For a proposed development site located within one release rate category subarea, the total runoff from the site shall meet the applicable release rate criteria. For development sites with multiple directions of runoff discharge, individual drainage directions may be designed for up to a 100% release rate so long as the total runoff from the site is controlled to the applicable release rate.

6. For a proposed development site located within two or more release category subareas, the peak discharge rate from any subarea shall be the predevelopment peak discharge for that subarea multiplied by the applicable release rate. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the site. In this case, peak discharge in any direction may be a 100% release rate provided that the overall site discharge meets the weighted average release rate.
7. For sites straddling major watershed divides (e.g., Monocacy Creek and Bushkill Creek), runoff volumes shall be managed to prevent diversion of runoff between watershed, as practicable.
8. Within a release rate category area, for a proposed development site which has areas which drain to a closed depression(s), the design release from the site will be the lesser of (a) the applicable release rate flow assuming no closed depression(s) or (b) the existing peak flow actually leaving the site. In cases where (b) would result in an unreasonably small design release, the design discharge of less than or equal to the release rate will be determined by the available downstream conveyance capacity to the main channel calculated using § 6104.4. and the minimum orifice criteria.
9. Off-site areas which drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site using the capacity criteria in § 6104.4. and the detention criteria in § 6105. In addition to the criteria in § 6104.4., on-site conveyance systems designed to carry runoff to a detention basin must be able to transport the basin's 100-year tributary flow either in-system, in-gutter or overland.
10. For development sites proposed to take place in phases, all detention ponds shall be designed to meet the applicable release rate(s) applied to all site areas tributary to the proposed pond discharge direction. All site tributary areas will be assumed as developed, regardless of whether all site tributary areas are proposed for development at that time. An exception shall be sites with multiple detention ponds in series where only the downstream pond must be designed to the stated release rate.
11. Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area shall be subject to the release rate criteria. The impact area includes any proposed cover or grading changes.
12. Development proposals which, through groundwater recharge or other

means, do not increase either the rate or volume of runoff discharged from the site compared to pre-development are not subject to the release rate provisions of this Ordinance.

13. "No Harm" Water Quantity Option - For any proposed development site, the developer has the option of using a less restrictive runoff control if the developer can prove that special circumstances exist for the proposed development site and that "no harm" would be caused by discharging at a higher runoff rate than that specified by this Ordinance. Special circumstances are defined as any hydrologic or hydraulic aspects of the development itself not accommodated by the runoff control standards of this Ordinance. Proof of "no harm" would have to be shown from the development site through the remainder of the downstream drainage network to the confluence of the Monocacy Creek with the Lehigh River. Proof of "no harm" must be shown using the capacity criteria specified in § 6104.4. if downstream capacity analysis is a part of the "no harm" justification.

Attempts to prove "no harm" based upon downstream peak flow versus capacity analysis shall be governed by the following provisions:

- A. Any available capacity in the downstream conveyance system as documented by a developer may be used by the developer only in proportion to his development site acreage relative to the total upstream undeveloped acreage from the identified capacity (i.e. if his site is 10% of the upstream undeveloped acreage, he may use up to 10% of the documented downstream available capacity).
- B. Developer-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no harm".
- C. Any downstream capacity improvements proposed by the developer as part of a "no harm" justification would be designed using the capacity criteria specified in § 6104.4. Peak flow contributions to the proposed improvements shall be calculated as the larger of; (1) assuming the local watershed is in the existing condition, or (2) assuming that the local watershed is developed per current zoning and using the specified runoff controls.

Any "no harm" justifications shall be submitted by the developer as part of the drainage plan submission per Article 4. Developers submitting "no harm" justifications must still meet all of the water quality requirements in § 6101. The municipality will process all eligible "no harm" requests in accordance with § 6101.15.

14. Capacity Improvements - In certain instances, local drainage conditions may dictate more stringent levels of runoff control than those based upon protection of the entire watershed. In these instances, if the developer could prove that it would be feasible to provide capacity improvements to relieve the capacity deficiency in the local drainage network, then the capacity improvements could be provided by the developer in lieu of runoff controls on the development site. Peak flow calculations shall be done assuming that the local watershed is in the existing condition and then assuming that the local watershed is developed per current zoning and using the specified runoff controls. Any capacity improvements would be designed using the larger of the above peak flows and the capacity criteria specified in § 6104.4. All new development in the entire subarea(s) within which the proposed development site is located shall be assumed to implement the developer's proposed discharge control, if any.
15. Release rates need to be met year round. Designs involving BMPs that function differently in winter versus non-winter conditions (e.g., capture/reuse with spray irrigation shut off for the winter) must still meet release rates during the winter.

§ 6105 Calculation Methodology.

1. Stormwater runoff from all development sites shall be calculated using either the universal rational method or the soil-cover-complex methodology.
 - A. Stormwater runoff from watersheds of more than 200 acres shall be calculated using the Soil-Cover-Complex Method developed by the Natural Resources Conservation Service or other appropriate method acceptable to the Township Engineer.
 - B. Stormwater runoff from watersheds of 200 or less acres, and with a calculated time of concentration less than 60 minutes, is preferred by the Township to be calculated by the Universal Rational Method, or another Rational hydrograph that closely approximates the volume of the Universal Rational Hydrograph.
 - C. If the Universal Rational Method is being utilized, the time of concentration shall be the longest time of concentration within the drainage area to each point of interest. The time of concentration must be the same in both the pre- and post-development analysis in order to ensure the same storm is being compared.
2. When comparing different points of interest, drainage areas, etc. a consistent methodology shall be used.

3. Where runoff to a specified point of analysis includes multiple flow paths through definable sub-drainage areas, post-development runoff rates must be minimally limited to pre-development rates for each sub-drainage area.
4. Where no existing point of concentrated discharge to adjoining properties exists, Applicant shall use level spreaders, or similar facilities, to discharge runoff in a distributed manner. Runoff rates shall not exceed PA-DEP standard for level spreaders measured on the basis of rate per lineal foot of discharge width.
5. Infiltration BMP loading rate percentages in the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D of the Monocacy Creek Watershed Act 167 Stormwater Management Plan shall be calculated as follows:

$$\frac{\text{Area tributary to infiltration BMP} * 100\%}{\text{Base area of infiltration BMP}}$$

The area tributary to the infiltration BMP shall be weighted as follows:

- | | |
|--|----------------|
| All disturbed areas to be made impervious: | weight at 100% |
| All disturbed areas to be made pervious: | weight at 50% |
| All undisturbed pervious areas: | weight at 0% |
| All existing impervious areas: | weight at 100% |

6. The design of any detention basin intended to meet the requirements of this Ordinance shall be verified by routing the design storm hydrograph through the proposed basin using the storage indication method or other methodology demonstrated to be more appropriate. For basins designed using the rational method technique, the design hydrograph for routing shall be either the universal rational hydrograph or another rational hydrograph that closely approximates the volume of the universal rational hydrograph.
7. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall be routed using the storage indication method.
8. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall provide storage volume for the full WQv below the lowest outlet invert.
9. Wet detention ponds designed to have a permanent pool for the WQv shall assume that the permanent pool volume below the primary outlet is full at the beginning of design event routing for the purpose of evaluating peak outflows.
10. All above-ground stormwater detention facilities shall provide a minimum 0.5 feet of freeboard above the maximum pool elevation associated with the

2- through 100-year runoff events, or an additional ten percent of the 100-year storage volume as freeboard volume, whichever is greater

All below-ground stormwater detention and infiltration facilities shall have an additional ten percent of the 100-year storage volume available within the storage medium, as well as a minimum of 0.5 feet of freeboard.

The freeboard shall be measured from the maximum pool elevation to the invert of the emergency spillway for above-ground facilities, and from the maximum pool elevation to the lowest overflow elevation for below-ground facilities. The 2- through 100-year storm events shall be controlled by the primary outlet structure. An emergency spillway for each above-ground basin shall be designed to pass the 100-year return frequency storm peak basin inflow rate with a minimum 0.5-foot freeboard measured to the top of basin. The freeboard criteria shall be met considering any off-site areas tributary to the basin as developed, as applicable. Exceptions to the freeboard requirements are as follows:

- A. Bioretention BMPs with a ponded depth less than or equal to 0.5 feet are exempt from the freeboard requirements.
- B. Small detention basins, with a ponded depth less than or equal to 1.5 feet or having a depth to the top of the berm less than or equal to 2.5 feet, may provide twenty percent additional storage volume measured from the maximum ponded depth to the invert of the emergency spillway in lieu of the above requirements. The depth of the emergency spillway must be sufficient to pass either two times the 100-year peak or the 100-year peak with 0.2' of freeboard to the top of berm, whichever is greater.
- C. Small infiltration basins, with a ponded depth less than or equal to 1.5 feet or having a depth to the top of the berm less than or equal to 2.5 feet, may provide twenty percent additional storage volume measured from the maximum ponded depth to the top of the berm in lieu of the above Requirements. In this case, an emergency spillway is only necessary if runoff in excess of the basin volume would cause harm to downstream owners. If a spillway is necessary, it must be sufficiently sized to pass the 100-year peak inflow.

If this detention facility is considered to be a dam as per DEP Chapter 105, the design of the facility must be consistent with the Chapter 105 regulations and may be required to pass a storm greater than the 100-year event.

- 11. The minimum circular orifice diameter for controlling discharge rates from detention facilities shall be 3 inches. Designs where a lesser size orifice

would be required to fully meet release rates shall be acceptable with a 3-inch orifice provided that as much of the site runoff as practical is directed to the detention facilities. The minimum 3-inch diameter does not apply to the control of the WQv.

12. Runoff calculations using the soil-cover-complex method shall use the natural resources conservation service Type II 24-hour rainfall distribution. The 24-hour rainfall depths for the various return periods to be used consistent with this Ordinance may be taken from NOAA Atlas 14, Precipitation Frequency Atlas of the United States, current volume, or the Pennsylvania Department of Transportation Drainage Manual, 2015 Edition for Region 4. The following values are taken from the Drainage Manual:

Return Period	24-Hour Rainfall Depth
1-year	2.64 inches
2-year	3.16 inches
5-year	3.91 inches
10-year	4.57 inches
25-year	5.60 inches
50-year	6.53 inches
100-year	7.63 inches

Graphical and tabular presentations of the Type II, 24-hour distribution are included in Appendix C of the Monocacy Creek Watershed Act 167 Stormwater Management Plan.

13. Runoff calculations using the rational method shall use rainfall intensities consistent with appropriate times of concentration and return periods and NOAA Atlas 14, Precipitation Frequency Atlas of the United States Precipitation and Intensity Charts, current volume, as presented in aforementioned Appendix C.
14. Runoff curve numbers (CN's) to be used in the soil-cover-complex method shall be based upon the table presented in aforementioned Appendix C.
15. Runoff coefficients for use in the rational method shall be based upon the table presented in aforementioned Appendix C.
16. All time of concentration calculations shall use a segmental approach which may include one or all of the flow types below:
 - A. Sheet flow (overland flow) calculations shall use either the NRCS average velocity chart (Figure 3-1, Technical Release-55.1975) or

the modified kinematic wave travel time equation (equation 3-3, NRCS TR-55, June 1986). If using the modified kinematic wave travel time equation, the sheet flow length shall be limited to 50 feet for designs using the rational method and limited to 150 feet for designs using the soil-cover-complex method.

- B. Shallow concentrated flow travel times shall be determined from the watercourse slope, type of surface and the velocity from Figure 3-1 of TR-55, June 1986.
 - C. Open channel flow travel times shall be determined from velocities calculated by the Manning Equation. Bankfull flows shall be used for determining velocities. Manning 'n' values shall be based on the table presented in aforementioned Appendix C.
 - D. Pipe flow travel times shall be determined from velocities calculated using the Manning Equation assuming full flow and the Manning 'n' values from aforementioned Appendix C.
17. If using the rational method, all pre-development calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas. If using the rational method, all post-development calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas.
18. When conditions exist such that a proposed detention facility may experience a tailwater effect, the basin shall be analyzed without any tailwater effect for all storm events for comparison against the required release rates. An additional routing of the 100-year storm with the full tailwater effect shall be performed to check that the basin has sufficient storage to contain the 100-year tributary flow and meet freeboard requirements.
19. The Manning Equation shall be used to calculate the capacity of watercourses. Manning 'n' values used in the calculations shall be consistent with the table presented in aforementioned Appendix C or other appropriate standard engineering 'n' value resources. Pipe capacities shall be determined by methods acceptable to the municipality.
20. The Pennsylvania DEP, Chapter 105, Rules and Regulations, apply to the construction, modification, operation or maintenance of both existing and proposed dams, water obstructions and encroachments throughout the watershed. Criteria for design and construction of stormwater management facilities according to this Ordinance may differ from the criteria that are used in the permitting of dams under the dam safety program.

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Attachment 7 – (RESERVED)

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Attachment 8 – Low Impact Development Practices

LOW IMPACT DEVELOPMENT PRACTICES ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

§ 8101 Low Impact Development Practices.

Natural hydrologic conditions may be altered radically by poorly planned development practices, such as introducing unneeded 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 may lead 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, which will minimize needs for artificial conveyance and storage facilities. To simulate pre-development hydrologic conditions, forced infiltration is often necessary to offset the loss of infiltration by creation of impervious surfaces. The ability of the ground to infiltrate depends upon the soil types and its conditions.

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. The following describes various techniques to achieve the alternative approach:

1. **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 typically are 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 minimize the amount of grading on site

2. **Protecting Natural Depression Storage Areas.**
Depression storage areas 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.
3. **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 on runoff.
4. **Reducing the Hydraulic Connectivity of Impervious Surfaces.**
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
5. **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.
6. **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.
7. **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.

8. **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.
9. **Using Permeable Paving Materials.**
These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.
10. **Reducing Building Setbacks.**
Reducing building setbacks reduces driveway and entry walks and is most readily accomplished along low-traffic streets where traffic noise is not a problem.
11. **Constructing Cluster Developments.**
Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings is in 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.

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Attachment 9 – (RESERVED)

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Attachment 10 – Design Standards for Stormwater Management Infrastructure

§ 10101 General Design Standards for Stormwater Management Infrastructure.

Where specific design standards are absent in this Ordinance, design standards from the following entities shall be applied at the Township Engineer's discretion:

- Pennsylvania Department of Environmental Protection
- Pennsylvania Department of Transportation
- United States Department of Transportation/Federal Highway Administration

§ 10102 Open Channel Flow/Pipe Systems Not Under Pressure.

Manning's Equation shall be used to determine the velocity of flow in open channels and closed drains not under pressure. Manning's Equation is listed below. The second equation is used to determine the capacity after velocity has been determined.

$$V = \frac{1.486}{n} r^{2/3} S^{1/2}$$

Where:

V = velocity in feet per second

n = coefficient of roughness[‡]

r = hydraulic radius = a/p

a = cross-sectional area of flow in square feet

p = wetted perimeter, the length of the line of contact between the water and the bottom and sides of the channel or pipe around the cross-section in feet

S = slope of the channel or pipe in feet per foot

[‡] The coefficient of roughness used shall be in accordance with values provided in an applicable watershed-specific Act 167 Stormwater Management Plan. Where provided values do not adequately characterize of given situation, values provided in PennDOT Publication 584 section on the design of open channels (latest edition) or Table 3.1 of the HEC-RAS Hydraulic Reference Manual (latest edition) will be used subject to the Township Engineer's approval

$$Q = Va$$

Where:

Q = capacity of the channel or pipe in cubic feet per second

V = velocity in feet per second

a = cross-sectional area of flow in square feet

§ 10103 Maximum Stream Velocities in Open Channels.

Maximum permissible velocities in channels shall be based upon the PA-DEP Erosion and Sediment Pollution Control Program Manual, as amended or replaced from time to time.

§ 10104 Storm Drainage Systems – General Provisions.

Storm drainage systems shall be provided in order to:

1. Permit unimpeded flow of natural watercourses, except as may be modified to address stormwater management requirements of this Ordinance conditioned on PA-DEP approval as applicable.
2. Ensure adequate drainage of all low points along the line of streets.
3. Intercept stormwater runoff along streets at intervals related to the extent and grade of the area drained.
4. Provide positive drainage away from on-site sewage disposal systems.
5. Take surface water from the bottom of vertical grades, to lead water from springs and to avoid excessive use of cross gutters at street intersections and elsewhere.
6. Prevent overloading of downstream drainage systems, closed depressions, and watercourses as a result of increased rate of runoff caused by the proposed development.
7. Ensure that the extent of ponded water is not increased within downstream closed depressions as a result of additional runoff volume.
8. Accommodate, receive and convey all runoff from adjacent upstream tributary drainage areas.

§ 10105 Storm Drainage Systems – General Requirements.

1. A site drainage plan for the proposed Project shall be prepared which illustrates the following information:
 - A. Mapping of the watershed area or areas in which the proposed Project is located.
 - B. Calculations of runoff for all points of runoff concentration.
 - C. Complete drainage systems for the Project. All existing drainage features which are to be incorporated in the design shall be so identified. If the Project is to be developed in stages, a general

drainage plan for the entire Project shall be presented with the first stage and appropriate development stages for the drainage system shall be indicated.

- D. Sufficient mapping of existing off-site drainage features located downstream from the points of runoff discharge for the proposed Project. Mapping features shall include closed depressions, streams, watercourses and storm sewer systems on the downstream properties.
2. The existing points of natural drainage discharge and the mode of drainage conduct onto adjacent property shall not be altered, unless:
 - A. Written consent of affected landowner is obtained by the applicant; or
 - B. The applicant demonstrates that no damage to any adjacent landowner or infringement of the public safety for conditions up to and including a one-hundred-year storm event will result.
 3. No stormwater runoff or natural drainage shall be so diverted as to increase the flow to existing drainage systems, create flooding, or the need for additional drainage structures on other private properties or public lands, without safe and adequate provisions being made by the developer for properly handling such conditions, and the applicant obtaining the written consent of the impacted landowners.
 4. Where a property is traversed by watercourses other than state and federally regulated streams, there shall be provided on the plan, a drainage easement conforming substantially with the line of such watercourse which shall be offered to the Township for dedication. The width of the easement shall be adequate to provide for unimpeded flow of storm runoff based on calculations made in conformance with this Ordinance and to provide a freeboard allowance of 0.5 foot above the design water surface level.
 5. Drainage structures that are located on state highway rights-of-way shall be approved by the Pennsylvania Department of Transportation and a letter from that office indicating such approval shall be obtained prior to final plan approval.
 6. All streets shall be so designed as to provide for the discharge of surface water from their rights-of-way.
 7. Storm drainage facilities and appurtenances shall be so designed and provided as to minimize erosion in watercourse channels and at all points of discharge as per the requirements of the Pennsylvania Department of Environmental Protection and the Northampton County Conservation District.

8. Stormwater management plans and calculations for any development located within an Act 167 stormwater management district shall be submitted to the Lehigh Valley Planning Commission for their review and comment.
9. A Project proposing alterations or relocations of existing watercourses may be required to obtain permit approval from the Pennsylvania Department of Environmental Protection in accordance with their current applicable rules and regulations.

§ 10106 Storm Drainage Systems – General Design Standards.

1. Storm drainage systems required by this Ordinance shall be designed to provide protection from a two- to one-hundred-year storm as determined by the Township. If the site of the Project is within a watershed with an approved Stormwater Management Plan enacted pursuant to Act 167, the criteria in the applicable plan shall be used.
 - A. A twenty-five-year design storm is appropriate where a storm in excess of the design storm will cause major inconvenience to people and traffic in high-use areas such as business districts and along local collector or arterial roads. Roadside swales and storm sewer systems shall be designed to convey the entirety of the 25-year flow without flooding onto the roadway or surcharging stormwater structures. In such cases, the 50-year flow must be conveyed through combination of swale or storm sewer with roadway encroachment/gutter spread not to exceed 1/3 the width of the roadway.
 - B. A one-hundred-year design storm is appropriate where a storm in excess of the design storm will cause damage to existing or future structures or their contents, or where a roadway is determined by the Township to be a critical emergency management route.
 - (1) Curbed roadways may convey the required runoff flow rates through a combination of storm sewer capacity and a maximum gutter spread of 1/4 the width of roadway, whichever is less.
 - (2) Uncurbed roadways shall have roadside swales having the conveyance capacity of the full 100-year storm.
 - C. The design or analysis of all major natural or man-made overland drainage systems shall have adequate capacity for the twenty-five to one-hundred-year design storm and shall further consider the two-year storm event for velocity. Permissible velocities are as indicated in NRCS criteria.

2. The design of any stormwater runoff storage basin facility (e.g. detention, retention, infiltration, etc.) shall be verified by routing the proposed post-development hydrograph through the basin using a storage-indication technique.
3. The Manning equation explained in §10102 shall be used in calculating capacities of watercourses and storm sewer systems not under pressure.
4. When natural drainage swales on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainage swales. Capacities shall be calculated using the Manning equation as explained in § 10102 of this Ordinance.
5. The hydraulic design of culverts and bridges shall be designed using methods acceptable to the Township Engineer. As determined by the Township Engineer, standards of the Pennsylvania Department of Transportation, US Federal Highway Administration, and/or US Army Corps of Engineers will be applied.
6. Complete detailed drainage calculations and applicable charts and nomographs certified by the design engineer shall be submitted to the Township Engineer.

§ 10107 Stormwater Collection and Conveyance Systems.

1. Roadside Drainage Swales. The construction of roadside drainage swales shall be in accordance with the following requirements:
 - A. On all uncurbed streets, drainage swales will be required along both sides of the street.
 - B. On all local collector and arterial streets, the roadside swales shall be designed to convey the runoff as required by § 10106.
 - C. As a minimum, the depth of all roadside swales shall be six inches. The swales shall be designed to convey the runoff from the roadway as required by § 10106.
 - D. Any proposed road or driveway crossing of a drainage swale shall be designed with a profile matching the cross section of the swale or a cross pipe or culvert, at the discretion of the Township Engineer. For public and private roadways, commercial driveways, and shared residential driveways serving more than two (2) dwelling units, the pipe or culvert shall have a minimum equivalent diameter of fifteen (15) inches. For private residential driveways serving up to two (2) dwelling units, pipes may have a minimum equivalent

diameter of eight (8) inches as long as any pipe smaller than twelve (12) inches is SDR-26 PVC and the pipe is adequately sized to convey peak flows from the required design storm event. For private residential driveways serving up to four (4) dwelling units, structural depth of cover over pipes shall meet manufacturer's minimum requirements. For private roads, commercial driveways, and driveways serving more than four (4) residential dwelling units, structural depth of cover shall meet the greater of PennDOT's or manufacturer's minimum requirements.

In all cases, property owners having private roadway and/or driveway crossings of roadside swales serving municipal roadways shall be responsible for the perpetual maintenance, repair, and future replacement of said crossings. Crossings that are not satisfactorily maintained may be subject to the Township performing any required work and imposing a fee for reimbursement of Township costs on the responsible property owner(s).

- E. Where a pipe or secondary swale discharges into a swale, the angle of discharge should be as little as is feasible. Any angle between 15° and 90° will require protective armoring of the receiving swale to prevent erosion issues. The type and extent of swale armoring shall be subject to approval by the Township Engineer.
 - F. Discharges into swales or natural water courses greater than 90° (i.e. directed upstream) are prohibited.
2. Curbed Street Drainage; Inlets. On streets constructed with curbing, the surface runoff collection system shall be in accordance with the following requirements:
- A. Inlet spacing and gutter capacities shall be designed to convey the runoff as required by § 10106.
 - B. Inlet capture, capacity and gutter spread calculations shall be provided for all inlets. Gutter spread calculations shall be calculated in accordance with current PennDOT standards.
 - C. Inlets.

The placement of inlets shall be governed by the following design criteria:

- (1) Inlets shall be placed at points of abrupt changes in the horizontal or vertical directions of storm sewer pipes and drainage swales and on both sides of a street at all designed low points.

- (2) On streets with center line grades of 2% or less, inlets shall be spaced at a maximum distance of 300 feet apart. On streets with center line grades greater than 2%, inlet spacing shall not exceed 500 feet.
 - (3) Inlets shall be depressed two inches below the grade of the gutter or ground surface and shall be provided with bicycle-safe grates.
 - (4) Capacity calculations shall be provided for all inlets. The calculations shall account for all bypass surface runoff from upstream inlets, where applicable.
 - (5) PennDOT-approved bicycle-safe vane grates may be used to improve inlet flow capacity. Applicant shall be modelled using engineering programs that specifically model the capture characteristics of vane grates.
 - (6) Storm sewer manholes may be substituted for inlets at locations where inlets are not required to handle surface runoff.
 - (7) Inlets shall be placed at street intersections to limit the cross-gutter flow from upstream areas.
 - (8) Storm inlets shall be provided behind the curbline to capture concentrated upstream surface runoff directed toward the street.
3. Storm Sewer Pipe. The design of storm sewer pipe systems shall be in accordance with the following requirements:
- A. All storm sewer lines shall be designed with a minimum 0.005 feet per foot (0.50%) slope. The minimum diameter of storm sewer pipe shall be 15 inches.
 - B. Storm sewer hydraulic grade line calculations shall be performed. The storm sewer shall be designed for the required design year storm. The starting tailwater elevation for pipes ending in basins (underground or above ground) shall be the routed water surface elevation for the 100-year storm. The starting tailwater elevation for pipes terminating in streams, tidal areas, etc. shall be determined based on project-specific conditions to the satisfaction of the Township Engineer.
 - C. Where intended to convey the full flow of a subdrainage area or watershed to a stormwater management facility and the stormwater

capture and conveyance system is not adequately sized to carry the full 100-year storm, Applicant must demonstrate all water will reach the stormwater management facility. Applicant shall accordingly provide exhibits, illustrations, and calculations to the Township Engineer's satisfaction.

- D. Storm sewer lines within street rights-of-way shall be parallel to the center line as far as practical. A sufficient number of structures (inlets or manholes) shall be provided to eliminate unnecessary crossings of other utility lines and passage beneath curbs.
- E. Storm sewer shall be designed on the basis of inlet or outlet control, as applicable, unless a more detailed backwater analysis is deemed necessary by the Township Engineer.
- F. No storm sewer headwalls or endwalls shall be constructed within any street right-of-way.
- G. Safety grating shall be installed across the openings of all storm sewer pipe inlet headwalls.
- H. Underdrain pipe systems shall be required in all streets per the Township's Standard Roadway Construction Details.
- I. All storm sewers within street cartway areas shall be reinforced concrete pipe, Class III or better, with O-ring gasket joints.
- J. Storm sewer located outside street cartway areas shall be either reinforced concrete pipe, Class III or better, with O-ring gasket joints or high-density polyethylene pipe, smooth interior, with watertight couplings.
- K. When there is a change in pipe size within a storm sewer structure, the elevation for the top of pipes shall be the same, or the top elevation of the inflow pipe(s) can be set higher as necessary.
- L. Pipes shall not discharge to a drainage structure an angle greater than 90° (i.e. directed in the upstream direction). An exception can be made where a pipe discharges into an inlet or manhole structure a minimum of 1 ft. or 1/2 pipe diameter (whichever is greater) above any other pipe connected to the structure discharging in the intended direction of flow to establish a drop.
- M. All storm sewer lines shall be televised after installation. Televising event shall be recorded on a medium acceptable to the Township. Recording shall be labeled and presented to the Township along with documentation clearly identifying location of said lines. All work shall be per Township specifications.

§ 10108 Backflow Preventers in Storm Sewer Systems.

1. Backflow preventers are generally prohibited unless used specifically to mitigate backflow from flooding of natural watercourses or existing low-lying areas.
2. Subject to the approval of the Township Board of Supervisors with affirmative recommendation from the Township Engineer, backflow preventers may be considered for use in such a manner so as to make an upstream property a "downstream property" conditioned on the following submission requirements being met to the Township's satisfaction:
 - A. Upstream flooding areas created by the use of a backflow preventer shall be modeled and the flood limits shall be illustrated on a plan in a manner acceptable to the Township Engineer.
 - B. Upstream flood area overflow routes shall be mapped and illustrated on a plan in a manner acceptable to the Township Engineer. Upstream overflow that would have passed through a stormwater control measure if the backflow preventer were not in place will have to be managed in a manner acceptable to the Township Engineer that does meets all site discharge rate, volume, water balance, and water quality requirements of this Ordinance in a manner acceptable to the Township Engineer. Applicant shall provide calculations demonstrating downstream collection and conveyance systems, both man-made and natural, have the capacity to handle any change in stormwater runoff discharge rates and volumes.
 - C. Backflow preventers shall be installed in such a manner that permits ease of maintenance and future replacement as determined to be acceptable to the Township Engineer.
 - D. Applicant shall submit to the Township PDF copies of all documents accompanying written notification to the neighboring property owner (even if owned by Applicant but on a separate parcel). This notification shall explain how drainage characteristics will change pre- versus post-development and include the plan illustrating the extent of flooding areas and the overflow pathway.
 - E. Prior to the recording of a plan and/or issuance of a building permit, Applicant shall secure a Permanent Drainage Easement Agreement from any impacted Property Owner(s), record said Agreement, and submit to the Township a PDF copy of said Agreement along with Recording Receipt.

§ 10109 Detention/Retention/Infiltration Facilities.

1. Stormwater detention/retention/infiltration facilities shall be designed in accordance with the latest PA DEP regulations, in compliance with the respective Act 167 Plan design metrics for each Stormwater Management District, as defined in Attachments 4 and 6 of this Ordinance, and the following supplemental requirements.
2. For purposes of this Section, detention, retention, infiltration, rain garden, infiltration berm, and similar facilities, also referred to as ponds and basins, shall be herewith referenced as storage facilities.
3. Where surface/above-ground storage facilities are included as part of the storm drainage system, the following provisions will apply:
 - A. Storage facilities shall be designed so that they return to normal conditions within approximately 72 hours after the termination of the storm, unless the Township Engineer finds that downstream conditions may warrant other design criteria for stormwater release. Storage facilities linked to a spray irrigation system may dewater as required by the latest PA-DEP regulations.
 - B. The developer shall demonstrate that such ponds are designed, protected and located to assure that public safety is maximized and health problems are prevented. The following minimum criteria shall apply:
 - (1) Top berm width shall be a minimum of eight (8) feet.
 - (2) All above-ground storage facilities shall have maximum side slope of four horizontal to one vertical or flatter except when retaining walls are used. Where retaining walls are used, fences meeting building code requirements shall be required.
 - (3) In all above-ground storage facilities, access ramps are required with a maximum 1:5 slope as follows:
 - A minimum of one (1) access ramp is required per basin.
 - Supplemental access ramps shall be provided such that no part of a basin bottom is more than three hundred (300) feet from a point measured from the base of an access ramp.
 - Where a basin is divided into cells with vertical barriers such as baffle walls, access ramps shall be provided to enter into each distinct cell area.
 - (4) A minimum 10-foot wide concrete cable mat pathway shall be placed on the long axis of the bottom of all basins greater

than 200 feet long. As applicable, there shall be a connection from the main pathway to the outlet control structure.

- (5) All non-infiltration storage facilities shall incorporate an impervious clay liner having a minimum depth of one foot or an impermeable geosynthetic liner. The design analysis of the required pond liner shall be incorporated into the required geologic/karst features report.
 - (6) If a basin is proposed to be lined below observed seasonal high water tables and/or the presence of water, an analysis shall be provided demonstrating the effectiveness and structural stability of the proposed liner.
 - (7) Storage facilities shall be designed with minimum freeboard as required by Act 167 requirements for each Stormwater Management District.
 - (8) All storage facilities shall be designed with a minimum bottom slope of 1% except for ponds intended to be used for infiltration which may be designed with a 0% slope.
 - (9) In a situation where, due to basin elevations, an inlet may surcharge prior to a designated emergency spillway, those inlet(s) shall be analyzed as the emergency spillway and calculations shall be provided to illustrate the adequacy of these inlets in an emergency spillway situation.
 - (10) In all storage facilities having surface discharge, the outfall end section and outside toe of berm shall be located a minimum of 20 feet from the adjoining downstream property line.
- C. The developer shall verify that the operation of the storage facilities will not aggravate potential downstream peaking conditions.
- D. Emergency overflow facilities shall be provided for storage facilities to handle runoff in excess of design flows.
- E. Where retaining walls are proposed as sidewalls of surface/above-ground storage facilities, Applicant shall furnish certification of structural adequacy signed and sealed by a Pennsylvania-licensed structural engineer prior to the issuance of a building permit.
- F. A drainage easement, described by bearings and distances, shall be provided around all storage facilities. The easement shall encompass the limits of the pond berm, the one-hundred-year water

surface elevation plus the basin outflow to the point of off-site discharge, and reasonable access pathways for operations and maintenance purposes.

- G. Perpetual O&M responsibilities for common Storage Facilities serving multiple parcels may not be assigned to specific residential building lots except when said facilities only manage stormwater from the assigned lots. In general, the perpetual maintenance and operation responsibility of common stormwater management facilities shared by multiple residential lots must be assigned to homeowner's association or similar entity in a legal framework acceptable to the Township Solicitor.
 - H. Since the storage facilities will remain in common ownership, the developer shall provide an annotation on the record plan imposing a covenant running with the land requiring perpetual maintenance and repair of the storage facilities and all appurtenances, by the respective lot owner(s). The covenant shall also state that no structures, fences, trees or other landscaping materials (other than grass) shall be placed or planted within the storage facilities unless a naturalized planting plan is approved by PA-DEP.
4. Where subsurface storage facilities are included as part of the drainage system, the following provisions will apply:
- A. Subsurface storage facilities shall comply with the following minimum requirements:
 - (1) Subsurface storage facilities shall not be permitted within public street rights-of-way or other lands intended for dedication to the Township.
 - (2) Subsurface storage facilities shall be provided with a sufficient number of access manholes for maintenance and inspection purposes.
 - (3) All non-infiltration storage facilities shall incorporate an impervious clay liner having a minimum depth of one foot or an impermeable geosynthetic liner. The design analysis of the required pond liner shall be incorporated into the required geologic/karst features report.
 - (4) If a basin is proposed to be lined below observed seasonal high water tables and/or the presence of water, an analysis shall be provided demonstrating the effectiveness and structural stability of the proposed liner.

- (5) Storage facilities shall be designed with minimum freeboard as required by Act 167 requirements for each Stormwater Management District.
 - (6) All storage facilities shall be designed with a minimum bottom slope of 1% except for ponds intended to be used for infiltration which may be designed with a 0% slope.
 - (7) In a situation where, due to basin elevations, an inlet may surcharge prior to a designated emergency spillway, those inlet(s) shall be analyzed as the emergency spillway and calculations shall be provided to illustrate the adequacy of these inlets in an emergency spillway situation.
 - (8) In all storage facilities having surface discharge, the outfall end section and outside toe of berm shall be located a minimum of 20 feet from the adjoining downstream property line.
 - (9) Subsurface storage facilities located under parking, loading or driveway areas shall include a structural analysis to confirm their design capability under maximum load conditions.
 - (10) Prior to plan approval, Applicant shall provide certification from a qualified Pennsylvania licensed structural engineer or issued by a proprietary system manufacturer demonstrating the any subsurface basin design is structurally adequate for the proposed burial depth of the facility.
- B. A drainage easement, described by bearings and distances, shall be provided around all subsurface storage facilities. The easement shall encompass the limits of the pond berm, the one-hundred-year water surface elevation plus the basin outflow to the point of off-site discharge, and reasonable access pathways for operations and maintenance purpose.
- C. Since subsurface storage facilities will not be accepted for dedication by the Township, the developer shall provide covenants on the Record Plan requiring perpetual maintenance and repair of these facilities and all appurtenances, by the respective lot owner(s). The covenant shall also state that no structures or trees shall be placed or planted within twelve (12) feet of the horizontal limit of the subsurface storage facilities.
5. Where stormwater infiltration facilities are included as part of the drainage system, the following provisions shall apply:

- A. Surface infiltration facilities, which are designed with a stormwater detention component, shall comply with § 10109.C. with the following exceptions:
- (1) Basins can be designed with bottom slopes of less than 1%.
 - (2) Infiltration basins are exempt from the impervious liner requirements.
 - (3) Infiltration basins shall be designed not to exceed loading rates established by a qualified, Pennsylvania-licensed professional geotechnical engineer or professional geologist. Applicable small projects provisions established in this Ordinance are exempted.
- B. Subsurface infiltration facilities shall comply with § 10109.D. with the following exceptions:
- (1) Basins can be designed with bottom slopes of less than 1%.
 - (2) Infiltration basins are exempt from the impervious liner requirements.
 - (3) Infiltration basins shall be designed not to exceed loading rates established by a qualified, Pennsylvania-licensed professional geotechnical engineer or professional geologist. Applicable small projects provisions established in this Ordinance are exempted.
- C. In a situation where, due to basin elevations, an inlet may surcharge prior to a designated emergency spillway, those inlet(s) shall be analyzed as the emergency spillway and calculations shall be provided to illustrate the adequacy of these inlets in an emergency spillway situation.
- D. In all storage facilities having surface discharge, the outfall end section and outside toe of berm shall be located a minimum of 20 feet from the adjoining downstream property line.
- I. The developer shall verify that the operation of the storage facilities will not aggravate potential downstream peaking conditions.
- J. Emergency overflow facilities shall be provided for storage facilities to handle runoff in excess of design flows.
- E. A drainage easement, described by bearings and distances, shall be provided around the surface or subsurface infiltration facilities.

The easement shall encompass the entire limits of the facility, plus the basin outflow to the point of off-site discharge, where applicable.

- F. Since infiltration facilities will not be accepted for dedication by the Township, the developer shall provide covenants on the record plan requiring perpetual maintenance and repair of these facilities and all appurtenances, by the respective lot owner(s). The covenant shall also state that no structures or trees shall be placed or planted within twelve (12) feet of the horizontal limit of the storage facilities – this shall be measured from the top of berm or side wall as applicable.
- G. The adequacy and location of any areas intended for infiltration shall be evaluated and recommended as part of the required Karst features study.
- H. Infiltration testing shall be conducted in accordance with all applicable local, state or federal guidelines.

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