

## **Chapter 23**

### **Stormwater Management**

#### **Part 1 General Provisions**

- §23-101. Short Title
- §23-102. Statement of Findings
- §23-103. Purpose
- §23-104. Statutory Authority
- §23-105. Applicability/Regulated Activities
- §23-106. Compatibility With Other Ordinance Requirements

#### **Part 2 Definitions**

- §23-201. Interpretation
- §23-202. Definitions

#### **Part 3 Stormwater Management**

- §23-301. General Requirements
- §23-302. Permit Requirements by Other Government Entities
- §23-303. Erosion and Sediment Control During Regulated Earth Disturbance Activities
- §23-304. Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts)
- §23-305. Ground Water Recharge (Infiltration/Recharge/Bioretenction)
- §23-306. Water Quality Requirements
- §23-307. Streambank Erosion Requirements
- §23-308. Stormwater Management Districts
- §23-309. Calculation Methodology
- §23-310. Design Criteria for Stormwater Management Facilities

#### **Part 4 Drainage Plan Requirements**

- §23-401. General Requirements
- §23-402. Exemptions
- §23-403. Drainage Plan Contents
- §23-404. Plan Submission
- §23-405. Drainage Plan Review
- §23-406. Modification of Plans
- §23-407. Resubmission of Disapproved Drainage Plans

**Part 5**  
**Inspections**

§23-501. Schedule of Inspections

**Part 6**  
**Fees and Expenses**

§23-601. Borough Drainage Plan Fees  
§23-602. Expenses Covered by Fees  
§23-603. Performance Guarantee

**Part 7**  
**Maintenance Responsibilities**

§23-701. Stormwater Operations and Maintenance Plan  
§23-702. Borough Review of Stormwater Operations and Maintenance Plan  
§23-703. Adherence to Approved Stormwater Operations and Maintenance Plan  
§23-704. Operations and Maintenance Agreement for Privately-Owned Stormwater Controls and BMPs  
§23-705. Stormwater Management Easements  
§23-706. Recording of Approved Stormwater Operations and Maintenance Plan and Related Agreements  
§23-707. Borough Stormwater Operation and Maintenance Fund

**Part 8**  
**Prohibitions**

§23-801. Prohibited Discharges and Connections  
§23-802. Roof Drains  
§23-803. Alteration of Stormwater Management BMPs

**Part 9**  
**Enforcement and Penalties**

§23-901. Right-of-Entry  
§23-902. Public Nuisance  
§23-903. Enforcement Generally  
§23-904. Suspension and Revocation of Permits and Approvals  
§23-905. Penalties  
§23-906. Notification  
§23-907. Enforcement  
§23-908. Modification of Chapter Provisions  
§23-909. Appeals

**Appendices**

Appendix 23-A Stormwater Controls and Best Management Practices Operation and Maintenance Agreement  
Appendix 23-B Figure B-1 Infiltration Chart

Appendix 23-C	Deleted
Appendix 23-D	Stormwater Management District Watershed Map
Appendix 23-E	Low Impact Development (LID) Practices
Appendix 23-F	West Nile Virus Guidance
Appendix 23-G	References



**Part 1****General Provisions****§23-101. Short Title.**

This Chapter shall be known and may be cited as the “New Morgan Borough Stormwater Management Ordinance.”

(*Ord. 2008-4, 12/9/2008, §101*)

**§23-102. Statement of Findings.**

The Borough Council of the Borough finds that:

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

B. Inadequate planning and management of stormwater runoff resulting from land development and redevelopment throughout a watershed can also harm surface water resources by changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of stream-beds and stream-banks thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals, and pathogens. Groundwater resources are also impacted through loss of recharge.

C. A comprehensive program of stormwater management, including minimization of impacts of development, redevelopment and activities causing accelerated erosion, is fundamental to the public health, safety, and welfare and the protection of the people of the Borough and all the people of the Commonwealth, their resources, and the environment.

D. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed poses a threat to surface and groundwater quality.

E. Stormwater can be an important water resource by providing groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.

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

G. Public education on the control of pollution from stormwater is an essential

component in successfully addressing stormwater.

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

I. Non-stormwater discharges to Borough separate storm sewer systems can contribute to pollution of waters of the Commonwealth.

(Ord. 2008-4, 12/9/2008, §102)

**§23-103. Purpose.**

The purpose of this Chapter is to promote the public health, safety, and welfare within the Borough by maintaining the natural hydrologic regime by minimizing the impacts described in §23-102 of this Chapter through provisions designed to:

A. Promote alternative project designs and layout that minimize impacts to surface and ground water.

B. Promote nonstructural best management practices (BMPs).

C. Minimize increases in stormwater volume.

D. Minimize impervious surfaces.

E. Manage accelerated runoff and erosion and sedimentation problems at their source by regulating activities that cause these problems.

F. Provide review procedures and performance standards for stormwater planning and management.

G. Utilize and preserve the existing natural drainage systems.

H. Manage stormwater impacts close to the runoff source, which requires a minimum of structures and relies on natural processes.

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

J. Maintain existing base flows and quality of streams and watercourses, where possible.

K. Meet legal water quality requirements under state law, including regulations at 25 Pa.Code Chapter 93.4, to protect and maintain “existing uses” and maintain the level of water quality to support those uses in all streams, and to protect and maintain water quality in “special protection” streams.

L. Address the quality and quantity of stormwater discharges from the development site.

M. Implement an illegal discharge detection and elimination program to address non-stormwater discharges into the Borough's separate storm sewer system.

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

O. Prevent scour and erosion of streambanks and streambeds.

P. Provide proper operation and maintenance of all permanent stormwater

management facilities and BMPs that are implemented in the Borough.  
(*Ord. 2008-4, 12/9/2008, §103*)

**§23-104. Statutory Authority.**

1. *Primary Authority.* The Borough is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. §680.1 *et seq.*, as amended, the “Storm Water Management Act” and the Borough Code, 8 Pa.C.S.A. §101 *et seq.*, as amended.

2. *Secondary Authority.* The Borough also 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, 53 P.S. §10101 *et seq.*, as amended.

(*Ord. 2008-4, 12/9/2008, §104*)

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

1. All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Chapter.

2. The Borough includes areas from two different watersheds: the Conestoga River Watershed and the Schuylkill River Watershed (Berks County section). Regulated activities within the Conestoga River Watershed shall be consistent with the provisions of the Conestoga River Stormwater Management Plan. Regulated activities within the Schuylkill River Watershed shall be consistent with the provisions of the Schuylkill River Stormwater Management Plan. A Sub-Watershed Boundary Map is located in Appendix 23-D.

(*Ord. 2008-4, 12/9/2008, §105*)

**§23-106. Compatibility With Other Ordinance Requirements.**

Approvals issued and actions taken under this Chapter do not relieve the applicant of the responsibility to secure required permits or approvals for activities by any other code, law, regulation, or ordinance. Whenever there is a difference between the minimal applicable standards specified herein and those included in other applicable Borough regulation, the more stringent regulation or standard shall apply.

(*Ord. 2008-4, 12/9/2008, §108*)





**Part 2****Definitions****§23-201. Interpretation.**

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

A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.

B. The word “includes” or “including” shall not limit the term to the specific example, but is intended to extend its meaning to all other instances of like kind and character.

C. The word “person” includes an individual, firm, association, organization, partnership, trust, company, corporation, unit of government, or any other similar entity.

D. The words “shall” and “must” are mandatory; the words “may” and “should” are permissive.

E. The words “used or occupied” include the words “intended, designed, maintained, or arranged to be used, occupied, or maintained.”

(Ord. 2008-4, 12/9/2008, §201)

**§23-202. Definitions.**

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

*Agricultural activities*—the work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing and installation of conservation measures. For purposes of regulation by this Chapter, construction of new buildings or impervious area is not considered an agricultural activity.

*Alteration*—as applied to land, a change in topography as a result of the moving of soil and rock from one location or position to another; also the changing of surface conditions by causing the surface to be more or less impervious; land disturbance.

*As-built drawings*—those maintained by the contractor during construction of and at completion of the project, documenting the actual locations of the building components and changes to the original contract documents. These, or a copy of same, are turned over to the Borough Engineer at the completion of the project.

*Applicant*—a person who has filed an application for approval to engage in any regulated activities as defined in §23-105 of this Chapter.

*Bankfull*—the channel at the top-of-bank or point where water begins to overflow onto a floodplain.

*Base flow*—portion of stream discharge derived from groundwater; the sustained

discharge that does not result from direct runoff or from water diversions, reservoir releases, piped discharges, or other human activities.

*Bioretention*—a stormwater retention area which utilizes woody and herbaceous plants and soils to remove pollutants before infiltration occurs.

*BMP (best management practice)*—methods, measures, or practices to prevent or reduce surface runoff and/or water pollution, including, but not limited to, structural and non-structural stormwater management practices and operation and maintenance procedures. See also “non-structured best management practice.”

*BMP manual*—the Department of Environmental Protection's *Pennsylvania Stormwater Best Management Practices Manual*, No. 363-0300-002 (December 30, 2006) or any updated versions thereof.

*Borough*—the Borough of New Morgan, Berks County, Pennsylvania.

*Borough Engineer*—a professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed as the engineer for the Borough of New Morgan.

*Channel*—a drainage element in which stormwater flows with an open surface. Open channels include, but shall not be limited to, natural and, man-made drainage ways, swales, streams, ditches, canals, and pipes flowing partly full.

*Chapter 102*—Chapter 102 of PaDEP regulations, 25 Pa.Code §102.1 *et seq.*

*Chapter 105*—Chapter 105 of PaDEP regulations, 25 Pa.Code §105.1 *et seq.*

*Chapter 106*—Chapter 106 of PaDEP regulations, 25 Pa.Code §106.1 *et seq.*

*Conestoga River Stormwater Management Plan*—the plan for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the tributaries to the Conestoga River Watershed adopted by Berks County as required by the Act of October 4, 1978, P.L. 864, (Act 167), 32 P.S. §680.1 *et seq.*, and known as the “Conestoga River Watershed Act 167 Stormwater Management Plan.”

*Conservation District*—the Berks County Conservation District.

*Culvert*—a structure with appurtenant works, which carries water under or through an embankment or fill.

*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. The dam falls under the requirements of Chapter 105, Dam Safety and Waterway Management, if the following is true:

- A. The contributory drainage area exceeds 100 acres.
- B. The greatest depth of water measured by upstream toe of the dam at maximum storage elevation exceeds 15 feet.
- C. The impounding capacity at maximum storage elevation exceeds 50 acre-feet.

*Designated watershed (Act 167)*—a watershed which is listed under the Pennsylvania Department of Environmental Protection's “Index of Designated Watersheds (Stormwater Management)” pursuant to the Stormwater Management Act, P.L. 864, No. 167, October 4, 1978, and published in the Pennsylvania Bulletin on May 31, 1980 and August 9, 1980, as amended.

*Designee*—the agent of the Berks County Planning Commission, Berks County Conservation District and/or agent of the governing body involved with the administration, review or enforcement of any provisions of this Chapter by contract or memorandum of understanding.

*Design professional (qualified)*—any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Chapter.

*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.

*Detention basin*—an impoundment designed to collect and retard stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate. Detention basins are designed to drain completely shortly after any given rainfall event and are dry until the next rainfall event.

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

*Development site*—the specific lot, tract, or parcels of land where any regulated activities in the Borough are planned, conducted or maintained.

*Diffused drainage discharge*—drainage discharge not confined to a single point location or channel, such as sheet flow or shallow concentrated flow.

*Discharge*—A. (verb) to release water from a project, site, aquifer, drainage basin or other point of interest. B. (noun) the rate and volume of flow of water such as in a stream, generally expressed in cubic feet per second (volume per unit of time). See also “peak discharge.”

*Discharge point*—the point of discharge for a stormwater facility.

*Disturbed areas*—unstabilized land area where an earth disturbance activity is occurring or has occurred.

*Ditch*—an artificial waterway for irrigation or stormwater conveyance.

*Drainage easement*—a right granted by a landowner to a grantee, allowing the use of private land for stormwater management purposes.

*Drainage plan*—the plan prepared by the applicant or its representative indicating how stormwater runoff will be managed at the particular site of interest according to this Chapter, the contents of which are established in §23-403.

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

*Emergency spillway*—a conveyance area that is used to pass peak discharge greater

than the maximum design storm controlled by the stormwater facility.

*Erosion*—the process by which the surface of the land, including channels, is worn away by water, wind, or chemical action.

*Erosion and sediment control plan*—a plan for a project site which identifies BMPs to minimize accelerated erosion and sedimentation.

*Exceptional value waters*—surface waters that satisfy Pennsylvania Code, Title 25 Environmental Protection, Chapter 93, Water Quality Standards, §93.4b(b) (relating to anti-degradation).

*Existing conditions*—the initial condition of a development site prior to the proposed alteration. If the initial condition of the site is undeveloped land, the land use shall be considered as “meadow” unless the natural land cover is proven to generate lower curve numbers or rational “C” value, such as forested lands.

*Flood*—a temporary condition of partial or complete inundation of land areas from the overflow of streams, rivers, and other waters of this Commonwealth.

*Floodplain*—any land area susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, as being a special flood hazard area.

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

*Forest management / timber operations*—planning and activities necessary for the management of forest land with no change of land use proposed. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, and reforestation.

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

*Grade*—a slope; usually of a road, channel or natural ground specified in percent and shown on plans as specified herein. (The term “to grade” shall mean to finish the surface of a roadbed, top of embankment or bottom of excavation.)

*Groundwater*—water beneath the earth's surface, often between saturated soil and rock that supplies wells and springs.

*Groundwater recharge*—replenishment of existing natural underground water supplies without degrading groundwater quality.

*HEC-HMS*—the U S Army Corps of Engineers, Hydrologic Engineering Center (HEC) - Hydrologic Modeling System (HMS). This model was used to model the Schuylkill River Watershed during the Schuylkill River Stormwater Management Plan development.

*Hotspots*—areas where land use or activities generate highly contaminated runoff,

with concentrations of pollutants in excess of those typically found in stormwater.

*Hydrograph*—a graph of discharge versus time for a selected point in the drainage system.

*Hydrologic regime (natural)*—the hydrologic cycle or balance that sustains quality and quantity of stormwater, base flow, storage, and groundwater supplies under natural conditions.

*Hydrologic soil group*—a classification of soils by the Natural Resources Conservation Service, formerly the Soil Conservation Service, into four runoff potential groups. The groups range from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff.

*Impervious surface*—a surface that prevents the infiltration of water into the ground. Impervious surface includes, but is not limited to, any roof, parking, or driveway areas, and any new streets and sidewalks. Any surface areas designed to be gravel or crushed stone shall be assumed to be impervious surfaces.

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

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

*Infiltration structures*—a structure designed to direct runoff into the ground (e.g., french drains, seepage pits, seepage trench).

*Inlet*—the upstream end of any structure through which water may flow.

*Intermittent stream*—a stream that flows only part of the time. Flow generally occurs for several weeks or months in response to seasonal precipitation, due to groundwater discharge.

*Land development*—any of the following activities.

A. The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving:

(1) A group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure.

(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 §503(1.1) of the Pennsylvania Municipalities Planning Code, 53 P.S. §10503(1.1).

*Landowner*—the legal or beneficial owner or owners of land, including the holder of an option or contract to purchase (whether or not such option or contract is subject to any condition), a lessee if such lessee is authorized under the lease to exercise the rights of the landowner, or other person having a proprietary interest in land.

*Limiting zone*—a soil horizon or condition in the soil profile or underlying strata

which includes one of the following:

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

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

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

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

*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.

*Natural hydrologic regime*—(see “hydrologic regime.”)

*Nonpoint source pollution*—pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

*Non-stormwater discharges*—water flowing in stormwater collection facilities, such as pipes or swales, which is not the result of a rainfall event or snowmelt.

*Nonstructural best management practice (BMPs)*—methods of controlling stormwater runoff quantity and quality by using broader planning and design approaches that preserve natural systems and hydrologic function, such as innovative site planning, impervious area and grading reduction, protection of natural depression areas, temporary ponding on site, and other techniques.

*NPDES*—National Pollutant Discharge Elimination System, the Federal government's system for issuance of permits regulating point source discharges under the Clean Water Act, which is delegated to PaDEP in Pennsylvania.

*NRCS*—Natural Resource Conservation Service (previously SCS).

*Outfall*—“Point source” as described in 40 CFR §122.2.

*Outlet*—points of water disposal to a stream, river, lake, tidewater, or artificial drain.

*PaDEP*—the Pennsylvania Department of Environmental Protection.

*PaDOT*—the Pennsylvania Department of Transportation.

*Parent tract*—all contiguous land held in single and separate ownership, regardless of whether (A) such land is divided into one or more lots, parcels, purparts or tracts; (B) such land was acquired by the landowner at different times or by different deeds, devise, partition or otherwise; or (C) such land is bisected by public or private streets or rights-of-way, which was held by the landowner or his predecessor in title on the effective date of this Chapter.

*Peak discharge*—the maximum rate of stormwater runoff from a specific storm event.

*Pipe*—a culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

*Planning Committee*—the Planning Committee of the Borough of New Morgan, Berks County, Pennsylvania.

*Point source*—any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged.

*Post-development*—period after construction where disturbed areas are stabilized, stormwater controls are in place and functioning and all proposed improvements in the approved land development plan are completed.

*Pre-development*—the initial existing condition of a development site prior to the proposed alteration.

*Pretreatment*—techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily meet the water quality volume requirements of §23-306.

*Project site*—the specific area of land where any regulated earth disturbance activities in the Borough are planned, conducted, or maintained.

*Rational method*—a rainfall-runoff relation used to estimate peak flow.

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

*Reconstruction*—demolition of and subsequent rebuilding of impervious surface.

*Redevelopment*—the demolition, construction, reconstruction (including, but not limited to, replacement paving), alteration, or improvement exceeding 2,000 square feet of land disturbance performed on sites where existing land use is commercial, industrial, institutional, or multifamily residential. Maintenance activities such as top-layer grinding and repaving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment. Utility trenches in streets are not considered redevelopment, unless more than 50 percent of the street width is removed and re-paved.

*Regulated activities*—redevelopment activities and any actions or proposed actions that involve the alteration or development of land in a manner that may affect stormwater runoff.

*Regulated earth disturbance activity*—activity involving earth disturbance subject to regulation under 25 Pa.Code, Chapter 92, Chapter 102, or the Clean Streams Law, 35 P.S. §691.1 *et seq.*

*Release rate*—the proportion of pre-development conditions peak rate of runoff from a site or subarea to which the post-development conditions peak rate of runoff must be reduced to protect downstream areas.

*Repaving*—replacement of the impervious surface that does not involve reconstruction of an existing paved (impervious) surface.

*Replacement paving*—reconstruction of and full replacement of an existing paved (impervious) surface.

*Retention basin*—a structure in which stormwater is stored and not released during the storm event retention basins do not typically have an outlet to other down stream conveyance features such as channels, storm sewer, or other surface waters, and generally empty via infiltration. These features may have an emergency spillway or

other overflow device for large events.

*Return period*—the average interval, in years, within which a storm event of a given magnitude can be expected to recur. For example, the 25-year return period rainfall would be expected to recur on the average of once every 25 years.

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

*Roof drains*—a drainage conduit or pipe that collects water runoff from a roof and leads it away from the structure.

*Runoff*—any part of precipitation that flows over the land surface.

*SALDO*—Subdivision and Land Development Ordinance [Chapter 22].

*Schuylkill River Stormwater Management Plan*—the plan for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the tributaries to the Schuylkill River Watershed adopted by Berks County as required by the Act of October 4, 1978, P.L. 864, (Act 167), 32 P.S. §680.1 *et seq.*, and known as the “The Tributaries to the Schuylkill River in Berks County Act 167 Stormwater Management Plan.”

*Sediment basin*—a barrier, dam, retention, or detention basin located and designed to retain rock, sand, gravel, silt, or other material transported by water during construction.

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

*Seepage pit/seepage trench*—an area of excavated earth filled with loose stone or similar coarse material, into which surface water is directed for infiltration into the ground.

*Shallow concentrated flow*—stormwater runoff flowing in shallow, defined ruts prior to entering a defined channel or waterway.

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

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

*Source water protection areas (SWPA)*—the zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

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

*Special protection subwatersheds*—watersheds for which the receiving waters are exceptional value (EV) or high quality (HQ) waters.

*Spillway*—a conveyance that is used to pass the peak discharge of the maximum design storm controlled by the stormwater facility.

*Storm sewer/separate storm sewer system (MS4)*—a conveyance or system of conveyances (including roads with drainage systems, Borough streets, catch basins,



curbs, gutters, ditches, man-made channels, or storm drains) primarily used for collecting and conveying stormwater runoff, but excludes domestic sewage and industrial wastes.

*Stormwater*—the surface runoff generated by precipitation reaching the ground surface.

*Stormwater management district*—those subareas in which some type of detention is required to meet the requirements and the goals of Act 167 stormwater management plans.

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

*Stream*—a natural watercourse.

*Stream buffer*—the land area adjacent to each side of a stream, measured perpendicular to and horizontally from the top-of-bank, essential to maintaining water quality.

*Subarea (subwatershed)*—the smallest drainage unit of a watershed for which stormwater management criteria have been established in the stormwater management plans.

*Subdivision*—the division or redivision of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels, or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development. Provided, 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.

*Swale*—a low lying stretch of land that gathers or carries surface water runoff.

*Timber operations*—see “forest management.”

*Time-of-concentration ( $T_c$ )*—the time for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

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

*TR-20 (calibrated)*—the computer based hydrologic modeling technique used to model the Conestoga River Watershed during the Conestoga River Stormwater Management Plan development.

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

*Waters of the Commonwealth*—any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Common-

wealth.

*Watershed*—region or area drained by a river, watercourse or other body of water, whether natural or artificial.

*Wet basin*—basin for stormwater management that is designed to detain runoff and always contain water.

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

(*Ord. 2008-4*, 12/9/2008, §202)

**Part 3****Stormwater Management****§23-301. General Requirements.**

1. Applicants proposing regulated activities in the Borough, which do not fall under the exemption criteria of §23-402, shall submit a drainage plan to the Borough for review. The applicant shall determine whether the development site is located within the Conestoga River Watershed or the Schuylkill River Watershed. The drainage plan shall be consistent with this Chapter by incorporating the criteria of the appropriate watershed. These criteria shall apply to the total proposed development even if development is to take place in stages

2. All drainage plans shall be designed and certified by individuals registered as professional engineers in the Commonwealth of Pennsylvania, or such other person as may be approved by the Borough Engineer.

3. The applicant is required to evaluate practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces, and the degradation of waters of the Commonwealth, and must maintain, as much as possible, the natural hydrologic regime.

4. The drainage plan must be consistent with the sequencing provisions of §23-304 to ensure maintenance of the natural hydrologic regime and to promote groundwater recharge and protect groundwater and surface water quality and quantity. The drainage plan designer must proceed sequentially in accordance with this Part of this Chapter.

5. Existing points of concentrated drainage that discharge onto adjacent property shall not be altered in any manner that could cause property damage without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this Chapter.

6. Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by this Chapter. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent property, the applicant must document that adequate downstream conveyance facilities exist to transport safely the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding, or other impacts will result from the concentrated discharge.

7. Where a development site is traversed by existing watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall conform to the provisions contained in §23-705 of this Chapter.

8. Any stormwater management facilities regulated by this Chapter that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PaDEP through the joint permit application process, or, where deemed appropriate by PaDEP, the general permit process.

9. Any alteration that affects stormwater flow directly or indirectly toward a

PaDOT facility shall be subject to PaDOT regulations.

10. Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc., are encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities or other structural BMPs.

11. Roof drains shall not be connected to impervious surfaces in order to promote overland flow and infiltration of stormwater where advantageous to do so. When site conditions preclude infiltration, then it shall be permitted on a case by case basis by the Borough.

12. All stormwater runoff directed to a designed stormwater BMP shall be pretreated for water quality.

13. Transference of runoff to or from an EV/HQ watershed is prohibited unless otherwise authorized by PaDEP, the Delaware River Basin Commission, or the Susquehanna River Basin Commission.

(Ord. 2008-4, 12/9/2008, §301)

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

Permits must comply with any and all applicable local, County, State, and Federal regulations.

(Ord. 2008-4, 12/9/2008, §302)

#### **§23-303. Erosion and Sediment Control Dining Regulated Earth Disturbance Activities.**

1. No regulated earth disturbance activities within the Borough shall commence until the Borough receives a “deemed adequate” letter from the Conservation District of an erosion and sediment control plan for construction activities.

2. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate PaDEP regional office or County Conservation District must be provided to the Borough Engineer.

3. A copy of the erosion and sediment control plan and any required permit, as required by PaDEP regulations, shall be available at the project site at all times.

4. Additional erosion and sediment control design standards and criteria are recommended to be applied where infiltration BMPs are proposed, including the following:

A. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity.

B. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has achieved final stabilization. Nevertheless, the requirements of this §23-303.7.B shall not be interpreted to preclude the conversion of temporary sediment basins and other erosion and sedimentation devices into permanent basins and/or infiltration BMPs, so long as the infiltration performance of the BMPs can be reasonably demonstrated. The Borough, in its sole discretion, shall determine if the applicant has met its burden to prove that (1) the infiltration performance of the BMPs can be reasonably demonstrated and (2) the infiltration performance is in accordance with

the standards set forth in this Chapter.

(Ord. 2008-4, 12/9/2008, §303)

**§23-304. Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts).**

1. For projects disturbing 1 acre or more, the design of all regulated activities shall include the evaluation of practicable alternatives to (A) the surface discharge of stormwater, (B) the creation of impervious surfaces, and (C) the degradation of waters of the Commonwealth, and shall reasonably maintain the natural hydrologic regime of the site.

A. An alternative is practicable if it is available and able to be implemented after taking into consideration cost, existing technology, and logistics in light of the overall project purposes, and is consistent with this Chapter and any other Borough requirement.

B. All practicable alternatives to the discharge of stormwater are presumed to have less adverse impact on the quantity and quality of waters of the Commonwealth unless otherwise demonstrated.

2. The applicant shall demonstrate that the design of the regulated activities that disturb 1 acre or more include consideration of the following issues.

A. Prepare an existing resource and site analysis map (ERSAM), showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal pools, flood plains, stream buffer zones, hydrologic soil groups A and B (areas conducive to infiltration), special geologic features, any existing recharge areas, and any other requirements outlined in the Borough Subdivision and Land Development Ordinance [Chapter 22].

B. Establish appropriate buffers for each of the delineated environmentally sensitive areas per the Borough Zoning Ordinance [Chapter 27]. (See §23-306.D for stream buffers and §23-310.19 for special geologic feature buffers).

C. Prepare a draft project layout avoiding sensitive areas identified in subsection .2.A.

D. Identify site specific existing conditions drainage areas, discharge points, recharge areas, and hydrologic soil groups A and B.

E. *Evaluate Nonstructural Stormwater Management Alternatives.*

(1) Minimize earth disturbance.

(2) Minimize impervious surfaces.

(3) Break up large impervious surfaces.

F. Satisfy infiltration objective (§23-305) and provide for stormwater pretreatment prior to infiltration. Pretreatment may not be necessary for rooftop runoff that enters the infiltration facility directly from a roof leader.

G. Satisfy water quality (§23-306) and streambank erosion protection objective (§23-307).

H. Determine what management district the site falls into (Appendix 23-D) and conduct a pre-development conditions runoff analysis.

I. Prepare final project design to maintain existing conditions drainage areas and discharge points, minimize earth disturbance and impervious surfaces, and, to the maximum extent possible, ensure the remaining site development has no surface or point discharge.

J. Conduct a post-development conditions runoff analysis based on the final design and to meet the release rate and in turn the overbank flow and extreme event requirements (§23-308).

K. Manage any remaining runoff through treatment prior to discharge, as part of detention, bioretention, direct discharge, or other structural control.

L. Any other applicable DEP or Conservation District requirement.

(Ord. 2008-4, 12/9/2008, §304)

### **§23-305. Ground Water Recharge (Infiltration/Recharge/Bioretention).**

Maximizing the ground water recharge capacity of the area being developed is required. Design of infiltration stormwater management facilities shall give consideration to providing ground water recharge to compensate for the reduction in the percolation that occurs when the ground surface is disturbed or impervious surface is created. The volume of stormwater to be infiltrated shall be known as the “recharge volume” and shall be calculated in accordance with §23-305.1. It is recommended that roof runoff be directed to infiltration BMPs which may be designed to compensate for the runoff from parking areas. These measures are required to be consistent with §23-103, and take advantage of utilizing any existing recharge areas.

Infiltration may not be feasible on every site due to site-specific limitations such as soil type. If infiltration cannot be accomplished, due to seasonal high water table, soil permeability rate, soil depth, setback distances from special geologic features or other pertinent factors, then the design professional shall be responsible to show that such infiltration cannot be or should not be accomplished.

1. Infiltration BMPs shall meet the following minimum requirements:

A. *Infiltration Requirements.* Regulated activities will be required to infiltrate, where site conditions permit, a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be infiltrated shall be determined from subsection .1.C in the Schuylkill River Watershed, or subsection .1.D in the Conestoga River Watershed, dependent upon the location of the development site.

B. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:

(1) A minimum depth of 24 inches between the bottom of the BMP and the limiting zone.

(2) An infiltration and/or percolation rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the applicant's design professional.

(3) The infiltration facility shall be capable of completely infiltrating the required retention (infiltration) volume within 4 days (96 hours).

(4) Pretreatment shall be provided prior to infiltration.

C. In the Schuylkill River Watershed, the size of the infiltration facility shall be based upon the following volume criteria:

(1) *NRCS Curve Number Equation.* The NRCS curve number equation shall be utilized to calculate infiltration requirements (I) in inches.

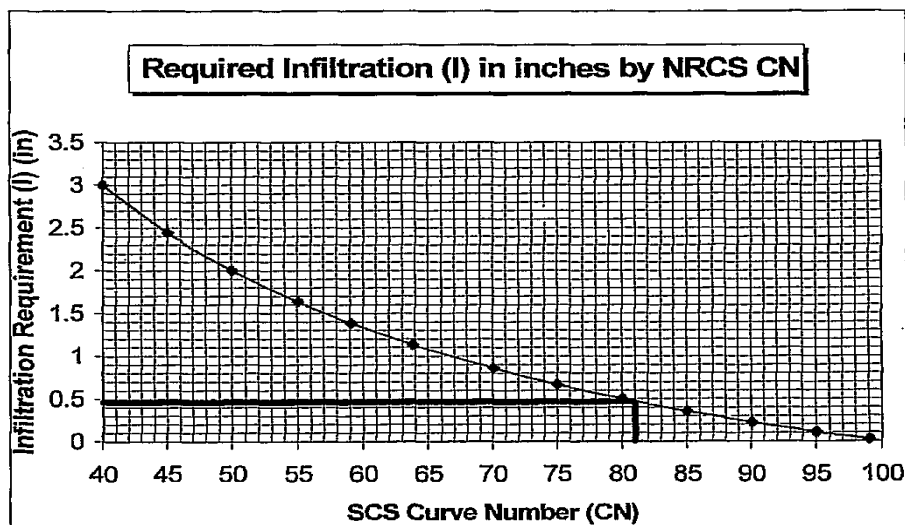
$$I \text{ (Infiltration requirement, in inches)} = (200/CN) - 2 \quad \text{Eqn: 305.1}$$

Where:

CN = NRCS curve number of pre-development conditions contributing to the infiltration facility.

This equation is displayed graphically in, and the infiltration requirement can be determined from, Figure 23-305-1.

It has been determined that infiltrating 0.46 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. However, the rounded number 0.5 inches will be used.



**Figure 23-305-1. Infiltration Requirement for the Schuylkill River Watershed Based upon NRCS Curve Number.**

The recharge volume ( $Re_v$ ) required to meet the infiltration requirement would therefore be computed as:

$$Re_v = (0.5 \text{ or } I, \text{ whichever is greater}) \times \text{impervious area (sq. ft.)} / (12 \text{ in/ft}) = \text{Cubic Feet} \quad \text{Eqn: 305.2}$$

Where:

I = infiltration requirements (in inches).

(2) *Annual Recharge–Water Budget Approach.* If the goals of subsection .1.C(1) cannot be achieved because of demonstrated site conditions, then 0.5

inches of rainfall shall be infiltrated from all impervious areas, up to an existing site conditions curve number of 81. Above a curve number of 81, Equation 305.1 or the curve in Figure 23-305-1 should be used to determine the infiltration requirement.

The recharge volume ( $Re_v$ ) required again would therefore be computed as:

$$Re_v (0.5 \text{ or } I, \text{ as determined}) \times \text{impervious area (sq. ft.)} / (12\text{in/ft}) = \text{Cubic Feet.}$$

D. In the Conestoga River Watershed, the size of the infiltration facility shall be based upon the following volume criteria:

(1) *Hydrologic Soil Group (HSG) Equation.* The hydrologic soil group equation shall be utilized to calculate the Recharge Volume ( $Re_v$ ) required to meet the infiltration requirement.

$$Re_v = [(S) (R_v) (A)] / (12\text{in/ft}) \quad \text{Eqn: 305.3}$$

$Re_v$  = Recharge volume in acre-feet

A = Total contributing drainage area to the infiltration BMP (acres)

$R_v$  =  $0.05 + 0.9(I)$  where  $I$  = net increase in impervious area / A

S = Soil Specific Recharge Factor

Soil Specific Recharge Factor varies according to soil type, as follows:

Hydrologic Soil Group	Soil Specific Recharges Factor (S)
A	0.32
B	0.22
C	0.10
D	0.05

Each specific recharge factor (S) is based on the USDA average annual recharge volume per soil type divided by the annual rainfall in Lancaster County (41 inches per year) and multiplied by 90 percent (to model a volume which captures 90 percent of the runoff). This keeps the recharge volume calculation consistent with the WQ methodology. The USDA average annual recharge volume per soil type is 18 inches for HSG “A,” 12 inches for HSG “B,” 6 inches for HSG “C,” and 3 inches for HSG “D” (Rawls, Brakensiek & Saxton, 1982).

If more than one hydrologic soil group (HSG) is present at a development site, a composite recharge volume shall be computed based upon the proportion of total development site area within each HSG.

(2) Development sites where the post-developed impervious area is equal to or less than the pre-developed impervious area shall not be required to infiltrate the recharge volume. However, the Borough encourages applicants to incorporate innovative BMP controls to address groundwater recharge



within drainage plans.

2. *Soils.* A detailed soils evaluation of the project site shall be required where practicable to determine the suitability of infiltration facilities. The evaluation shall be performed by a qualified design professional, and, at a minimum, address soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be:

A. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of sub-grade stability; infiltration is not permitted to be ruled out without conducting these tests.

B. Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.

C. Design the infiltration structure for the required retention ( $Re_v$ ) volume based on field determined capacity at the level of the proposed infiltration surface.

D. If on-lot infiltration structures are proposed by the applicant's design professional, it must be demonstrated to the Borough that the soils are conducive to infiltrate on the lots identified.

3. *Carbonate Areas.* The applicant is required to investigate the ability of all areas on the site which are not underlain by carbonate rock to meet the infiltration requirements of subsection .1. If this investigation proves infeasible, infiltration can occur on areas underlain by carbonate rock by following the recommended procedure below in conjunction with Figure B-1 in Appendix 23-B. However, the applicant is not required to use infiltration in carbonate areas even if the site falls into the "recommended" range on Figure B-1 in Appendix 23-B. If infiltration is not proposed, the calculated infiltration volume (subsection .1) shall be treated by an acceptable BMP.

Infiltration BMP loading rate percentages in Figure B-1 in Appendix 23-B shall be calculated as follows:

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

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

Area Description	Weighting
All disturbed areas to be made impervious	100%
All disturbed areas to be made pervious	50%
All undisturbed impervious areas	100%
All undisturbed pervious areas	0%

Soil thickness is to be measured from the bottom of any proposed infiltration BMP. The effective soil thickness in Figure B-1 in Appendix 23-B is the measured soil

thickness multiplied by the thickness factor based on soil permeability, as follows:

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

The design of all facilities over carbonate areas shall include an evaluation of measures to minimize adverse effects.

4. *Stormwater Hotspots.* Following is a list of examples of designated hotspots. If a site is designated as a hotspot, it has important implications for how stormwater is managed. First and foremost, untreated stormwater runoff from hotspots shall not be allowed to recharge into groundwater where it may contaminate water supplies. Therefore, the  $Re_v$  requirement shall NOT be applied to development sites that fit into the hotspot category (the entire  $WQ_v$  must still be treated). Second, a greater level of stormwater treatment shall be considered at hotspot sites to prevent pollutant washoff after construction. EPA's NPDES stormwater program requires some industrial sites to prepare and implement a stormwater pollution prevention plan.

A. *Examples of Hotspots.*

- (1) Vehicle salvage yards and recycling facilities.
- (2) Vehicle fueling stations.
- (3) Vehicle service and maintenance facilities.
- (4) Vehicle and equipment cleaning facilities.
- (5) Fleet storage areas (bus, truck, etc.).
- (6) Industrial sites (based on Standard Industrial Codes).
- (7) Marinas (service and maintenance).
- (8) Outdoor liquid container storage.
- (9) Outdoor loading/unloading facilities.
- (10) Public works storage areas.
- (11) Facilities that generate or store hazardous materials.
- (12) Commercial container nursery.
- (13) Other land uses and activities as designated by an appropriate review authority.

B. The following land uses and activities are not normally considered hotspots:

- (1) Residential streets and rural highways.
- (2) Residential development.
- (3) Institutional development.

(4) Office developments.

(5) Nonindustrial rooftops.

(6) Pervious areas, except golf courses and nurseries (which may need an integrated pest management (IPM) plan).

While large highways (average daily traffic volume (ADT) greater than 30,000) are not designated as a stormwater hotspot; it is important to ensure that highway stormwater management plans adequately protect groundwater.

5. Caution shall be exercised where infiltration is proposed in source water protection areas as defined by the Borough.

6. Infiltration facilities shall be used in conjunction with other innovative or traditional stormwater control facilities that are found within the PaDEP BMP Manual.

7. Caution shall be exercised where salt or chloride (i.e., Borough salt storage) would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration facility and perform a hydrogeologic justification study if necessary.

8. The infiltration requirement in high quality or exceptional value waters shall be subject to the PaDEP's 25 Pa.Code, Chapter 93, Antidegradation Regulations.

9. Dependant upon certain land use or hotspots, an impermeable liner may be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Borough.

10. The Borough shall require the applicant to provide safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or spill.

11. Setback requirements for commercial, industrial, institutional, and regional infiltration facilities for projects that disturb 1 acre or more are set forth in the New Morgan Borough Zoning Ordinance [Chapter 27].

(Ord. 2008-4, 12/9/2008, §305)

#### **§23-306. Water Quality Requirements.**

The applicant shall comply with the following water quality requirements of this Part.

A. Developed areas shall provide adequate storage and treatment facilities necessary to capture and treat stormwater runoff. The volume of stormwater to be treated shall be known as the "water quality volume." The recharge volume computed under §23-305 may be a component of the water quality volume if the applicant chooses to manage both components in a single facility. If the recharge volume is less than the water quality volume, the remaining water quality volume may be captured and treated by methods other than infiltration BMPs. The required water quality volume (WQv) is the storage capacity needed to capture and treat a portion of stormwater runoff from the developed areas of the site.

To achieve this goal, the following criterion is established:

(1) For the Schuylkill River Watershed, the following calculation formula is to be used to determine the water quality storage volume, (WQ<sub>v</sub>), in acre-feet

of storage:

$$WQ_v = [(P)(R_v)(A)]/12$$

Eqn: 306.1

$WQ_v$  = water quality volume (acre-feet)

$P$  = 1 inch

$A$  = Total contributing drainage area to the water quality BMP (acres)

$R_v$  =  $0.05 + 0.009(I)$  where  $I$  is the percent of the area that is impervious surface  $((\text{impervious area}/A) \times 100)$

(2) For the Conestoga River Watershed, the following calculation formula is to be used to determine the water quality storage volume, ( $WQ_v$ ), in acre-feet of storage:

$$WQ_v = [(P)(R_v)(A)]/12$$

Eqn: 306.1

$WQ_v$  = water quality volume (acre-feet)

$P$  = 1.2 inches

$A$  = Total contributing drainage area to the water quality BMP (acres)

$R_v$  =  $0.05 + 0.009(I)$  where  $I$  is the percent of the net increase in impervious surface  $((\text{net increase in impervious area}/A) \times 100)$

Development sites, within the Conestoga River Watershed, where the post-developed impervious area is equal to or less than the pre-developed impervious area shall not be required to provide water quality volume unless required by NPDES Part II. However, the Borough encourages applicants to incorporate innovative BMP controls to address water quality within drainage plans.

B. To accomplish the above, the applicant shall use innovative or traditional stormwater control facilities, such as the permanent volume of a wet basin or the detained volume from other BMPs, that are found within the PaDEP BMP Manual.

Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall provide for protection from clogging and unwanted sedimentation and so that water is released slowly for a minimum of 24 hours subsequent to any storm event.

C. For areas within defined special protection subwatersheds, which include exceptional value (EV), high quality (HQ), and cold water fishery (CWF) waters, the temperature and quality of water and streams shall be maintained.

D. If a perennial or intermittent stream passes through the site, the applicant shall create a stream buffer extending a minimum of 50 feet to either side of the top-of-bank of the channel. The buffer area shall be maintained with appropriate native vegetation (Reference to Appendix H of Pennsylvania *Handbook of Best Management Practices for Developing Areas* for plant lists). If the applicable rear or side yard setback is less than 50 feet, the buffer width may be reduced to 25 percent of the setback to a minimum of 10 feet. If an existing buffer is legally prescribed (i.e., deed, covenant, easement, etc.) and it exceeds the requirements of this Chapter, the existing buffer shall be maintained. This does not include lakes

or wetlands.

(*Ord. 2008-4, 12/9/2008, §306*)

**§23-307. Streambank Erosion Requirements.**

1. In the Schuylkill River Watershed only, in addition to control of the water quality volume, in order to minimize the impact of stormwater runoff on downstream streambank erosion, the primary requirement is to design a BMP to detain the proposed conditions 2-year, 24-hour design storm to the existing conditions 1-year peak flow using the SCS Type II distribution. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the proposed conditions 1-year storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the 1-year storm is captured (i.e., the maximum water surface elevation is achieved in the facility). Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility).

The minimum orifice size in the outlet structure to the BMP shall be a 3-inch diameter orifice and a trash rack shall be installed to prevent clogging. On sites with small contributing drainage areas to this BMP that do not provide enough runoff volume to allow a 24-hour attenuation with the 3-inch orifice, the calculations shall be submitted showing this condition. Orifice sizes less than 3 inches can be utilized provided that the design will prevent clogging of the intake.

2. In the Conestoga River Watershed, no corresponding requirement for streambank erosion protection exists.

(*Ord. 2008-4, 12/9/2008, §307*)

**§23-308. Stormwater Management Districts.**

1. The Borough has been divided into Stormwater Management Districts. The boundaries of the Stormwater Management Districts are shown on an official map that is available for inspection at the Borough office. A copy of the official map at a reduced scale is included in Appendix 23-D of this Chapter. 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 2-foot topographic contours (or most accurate data required) provided as part of the drainage plan.

A. In the Schuylkill River Watershed (Management Districts A and B), standards for managing runoff for the 2-year through 100-year design storms are shown in Table 23-308-1. Development sites located in each of the Districts must control the post-development proposed conditions runoff rates to the pre-development existing conditions runoff rates for the design storms in accordance with Table 23-308-1.

**Table 23-308-1–Schuylkill River Watershed Stormwater Quantity Requirements**

Management District	Post-Development Design Storm		Pre-Development Design Storm
A	2-year	Reduce To	1-year
	5-year		5-year
	10-year		10-year
	25-year		25-year
	50-year		50-year
	100-year		100-year
B	2-year	Reduce To	1-year
	5-year		2-year
	10-year		5-year
	25-year		10-year
	50-year		25-year
	100-year		50-year

All areas, regardless of the release rate, must still meet the requirements of the groundwater recharge criteria (§23-305) and water quality criteria (§23-306).

B. In the Conestoga River Watershed (Management Districts C and D), post-development rates of runoff from any regulated activity shall not exceed a given percentage of the peak rate of runoff prior to development for all design storms. The percentage of the pre-development peak rate which may be released is known as the “release rate” and is determined in accordance with Table 23-308-2.

**Table 23-308-2–Conestoga River Watershed Water Quantity Requirements**

Management District	Post-Development Release Rate		Pre-Development Release Rate
C	All design storms	reduce to	30%
D	All design storms	reduce to	50%

In the Conestoga River Watershed, the applicant is encouraged to provide stormwater management planning which will allow the post-development hydrograph to match the pre-development hydrograph, along all parts of the hydrograph, for the development site. To match the pre-development hydrograph means that it is not to be exceeded at all points in time. The recharge volume (§23-305.1.D) and the water quality volume (§23-306.A.2), along with other innovative methods, can be used to match the pre-development hydrograph. If the pre-development hydrograph can be matched, the criteria for the release rate have been met.

2. *Sites Located in More than One Watershed.* For a proposed development site

located within the Schuylkill River Watershed and the Conestoga River Watershed, stormwater shall not be transferred from one watershed to another, unless approval for such transfer is given by the Delaware River Basin Commission or Susquehanna River Basin Commission, as appropriate.

3. *Sites Located in More than One District.* For a proposed development site located within two stormwater management district category subareas, the peak discharge rate from any subarea shall meet the management district criteria for which the discharge is located, as indicated in §23-308. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea.

4. *Off-Site Areas.* Off-site areas that 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.

5. *Site Areas.* Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area utilizing stormwater management measures shall be subject to the management district criteria. In other words, unimpacted areas bypassing the stormwater management facilities would not be subject to the management district criteria.

6. *Sub-Regional (Combined Development Site) Storage.* Stormwater can be managed regionally by one or more developers, either on-site or off-site. The design and release rate shall be consistent with this Chapter. This option also applies to the recharge volume (§23-305) and water quality volume (§23-306).

(Ord. 2008-4, 12/9/2008, §308)

### **§23-309. Calculation Methodology.**

1. Stormwater runoff from all development sites with a drainage area of greater than 200 acres shall be calculated using a generally accepted calculation technique that is based on the NRCS soil cover complex method. Table 23-309-1 summarizes acceptable computation methods and the method selected by the design professional shall be based on the individual limitations and suitability of each method for a particular site. The Borough may allow the use of the rational method to estimate peak discharges from drainage areas that contain less than 200 acres.

**Table 23-309-1  
Acceptable Computation Methodologies for  
Stormwater Management Drainage Plans**

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

PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1.
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites less than 200 acres and with time of concentration less than 60 minutes ( $t_c < 60$ min), or as approved by the Borough Engineer.
Other Methods	Varies	Other computation methodologies approved by the Borough Engineer.

\*Note: Successors to the above methods are also acceptable. These successors include WINNTR55 for TR55 and WINTR20 for TR20 and SWMM.

2. All calculations consistent with this Chapter using the soil cover complex method shall use the appropriate design rainfall depths for the various return period storms according to the region in which they are located. If a hydrologic computer model such as PSRM or HEC-1/HEC-HMS is used for stormwater runoff calculations, then the duration of rainfall shall be 24 hours. The rainfall distribution should reference to NOAA Atlas 14.

3. For the purposes of pre-development conditions flow rate determination, undeveloped land shall be considered as “meadow” in good condition, unless the natural ground cover generates a lower curve number or Rational “C” value (i.e., forest).

4. All calculations using the rational method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods from the NOAA Atlas 14 Precipitation-Frequency Atlas of the United States (2004, revised 2006, and as amended). Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of *Urban Hydrology for Small Watersheds*, NRCS, TR-55 (as amended). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation. NRCS lag equation divided by 0.6 is an acceptable method for Tc in undeveloped areas.

5. Runoff curve numbers (CN) for both pre-development and post-development conditions to be used in the soil cover complex method shall be determined using accepted engineering design practices as approved by the Borough Engineer.

6. Runoff coefficients (c) for both pre-development and post-development conditions for use in the Rational method shall be determined using accepted engineering design practices as approved by the Borough Engineer.

7. Where uniform flow is anticipated, the Manning equation shall be used for hydraulic computations, and to determine the capacity of open channels, pipes, and storm sewers. Values for Manning's roughness coefficient (n) shall be determined using accepted engineering design practices as approved by the Borough Engineer. Full flow shall be assumed for closed conduits.

8. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Chapter using any generally accepted hydraulic analysis technique or method.

9. The design of any stormwater detention facilities intended to meet the



performance standards of this Chapter shall be verified by routing the design storm hydrograph through these facilities using the storage-indication method. For drainage areas greater than 200 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph (i.e., TR-20, TR-55, HEC-1, PSRM). The Borough may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

(Ord. 2008-4, 12/9/2008, §310)

**§23-310. Design Criteria for Stormwater Management Facilities.**

1. Any stormwater management facility designed to store stormwater runoff and requiring a berm or earth embankment (i.e., detention or retention basin) shall be designed to provide an emergency spillway to handle the 100-year post-development peak flow rate. The height of embankment must be set to provide a minimum 1.0 foot of freeboard above the maximum elevation computed when the entire 100-year peak flow passes through the spillway. (Requirements of the PaDEP Dam Safety Program shall be followed where applicable.) The following standards shall be required:

A. The maximum water depth shall not exceed 8 feet for wet basins and 15 feet for dry basins.

B. The minimum top width of all embankments/berms shall be 5 feet.

C. The interior side slopes shall not be greater than three horizontal to one vertical.

D. All basins shall be structurally sound and shall be constructed of sound and durable materials. The completed structure and the foundation of all basins shall be stable under all probable conditions of operation. An emergency spillway shall be provided for the basin and shall be capable of discharging the 100-year peak rate of runoff that enters the basin after development, in a manner which will not damage the integrity of the facility and will not create a downstream hazard. Where practical, the emergency spillway shall be constructed in undisturbed ground. An easement shall be provided in accordance with the provisions of §23-705 of this Chapter.

E. All basins, not including groundwater recharge and/or water quality storage, shall include an outlet structure to permit draining the basin to a completely dry position within a recommended 96 hours following the end of the design rainfall. All basins that do include groundwater recharge and/or water quality storage shall include an outlet structure to permit draining the basin to the level of the groundwater recharge and/or water quality storage within a recommended 96 hours following the end of the design rainfall.

F. A cutoff trench of relatively impervious material shall be provided within all basin embankments.

G. All structures passing through detention basin embankments shall have properly spaced concrete cutoff collars and all piping must be watertight. All structures passing through dam embankments shall have seepage diaphragms and drains.

H. All discharge control devices with appurtenances (except discharge pipes)

shall be made of reinforced concrete and stainless or hot dip galvanized steel. Bolts/fasteners are to be stainless or galvanized steel. Discharge pipes shall conform to the requirements of subsection .4 below.

I. Low flow channels shall be provided from each water carrying facility to the outlet structure for all basins that do not include groundwater recharge and/or water quality storage. Low flow channels shall be 1 percent minimum slope and shall be designed to enable ease of maintenance. All basins that do include groundwater recharge and/or water quality storage shall not be required to have a low flow channel.

J. Minimum slope within a basin that does not include groundwater recharge and/or water quality storage shall be 2 percent positive grade to the low flow channel.

K. Design storms for the computation of retention basins (where approved) volumes shall be based upon a 24-hour storm with 100-year return period (a storm with a 1 percent chance of occurrence each year).

L. The effect on downstream areas if the basin embankment fails shall be considered in the design of all basins. Where possible, the basin shall be designed to minimize the potential damage caused by such failure of the embankment.

M. Soils used for the construction of basins shall have low erodibility factors ("K" factors).

2. Minimum floor elevations for all structures that would be affected by a basin, other temporary impoundments, or open conveyance systems where ponding may occur shall be 2 feet above the 100-year water surface. If basement or underground facilities are proposed, detailed calculations addressing the effects of stormwater ponding on the structure and water-proofing and/or flood-proofing design information shall be submitted for approval.

3. All storm sewer pipes, culverts and bridges (excluding detention and retention basin outfall structures), gutters and swales conveying water originating only from within the boundaries of the development site shall be designed for a 25-year storm event. All storm sewer pipes, culverts and bridges (excluding detention and retention basin outfall structures) conveying water originating from offsite shall be designed to safely convey off-site flows through the development site.

4. Storm sewer pipes other than those used as roof drains, detention basin underdrains, and street sub base underdrains, shall have a minimum diameter of 15 inches and be made of reinforced concrete pipe, corrugated galvanized metal pipe, smooth lined corrugated polyethylene pipe, or approved equivalent. Where installation conditions merit, structural calculations that address the actual design requirements will be required.

5. Storm sewer pipes and culverts shall be installed on sufficient slopes to provide a minimum velocity of 3 feet per second when flowing full.

6. All storm sewer pipe and culverts shall be laid to a minimum depth of 1 foot from finished sub-grade to the crown of pipe in paved areas and 1 foot from finished grade to the crown of pipe in grassed areas.

7. Curves in pipes or box culverts without an inlet or manhole are prohibited. Tee joints, elbows and wyes in conveyance systems are also prohibited.

8. Manholes, inlets, headwalls and endwalls proposed for dedication or located along streets or subject to vehicular traffic shall conform to the requirements of the PaDOT, Bureau of Design, Standards for Roadway Construction, in effect at the time the design is submitted, or as otherwise modified by the Borough.

9. Headwalls and endwalls shall be used where stormwater runoff enters or leaves the storm sewer horizontally from a natural or manmade channel. PaDOT Type “DW” headwalls and endwalls shall be utilized.

10. Stormwater roof drains, sump pumps, and pipes, shall not directly discharge water into a street right-of-way or discharge into a sanitary sewer or storm sewer.

11. All existing and natural watercourses, channels, drainage systems, wetlands and areas of surface water concentration shall be maintained in their existing condition unless an alteration is approved by the Borough Engineer and any necessary approving body, including the Borough Council.

12. Flow velocities from any storm sewer may not result in erosion of the receiving channel.

13. Energy dissipaters shall be placed at the outlets of all storm sewer pipes, culverts, and bridges where flow velocities exceed maximum permitted channel velocities as specified below:

A. Three feet per second where only sparse vegetation can be established and maintained because of shade or soil condition.

B. Four feet per second where normal growing conditions exist and vegetation is to be established by seeding.

C. Five feet per second where a dense, vigorous sod can be quickly established or where water can be temporarily diverted during establishment of vegetation. Netting and mulch or the equivalent methods for establishing vegetation shall be used.

D. Six feet per second where there exists a well established sod of good quality.

14. The following conditions shall be met for all swales:

A. Capacities and velocities shall be computed using the Manning equation. The design parameters shall be as follows:

(1) Vegetated swales shall have “n” factors that comply with accepted engineering design practices as approved by the Borough Engineer, such as TR-55.

(2) All vegetated swales shall have a minimum slope of 1 percent unless approved by the Borough Engineer.

(3) The “n” factors to be used for paved or rip-rap swales or gutters shall be based upon accepted engineering design practices as approved by the Borough Engineer.

(4) The applicant may propose alternative methodologies for this calculation, which shall be subject to the review and approval of the Borough Engineer.

B. All swales shall be designed to concentrate low flows to minimize siltation and meandering.

15. Manning “n” values used for design of pipes and culverts shall comply with accepted engineering design practices as approved by the Borough Engineer.

16. All storm sewer crossings of streets shall be perpendicular to the street centerline.

17. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.

18. All wet basin designs shall incorporate biologic minimization controls consistent with the West Nile Guidance found in Appendix 23-F.

19. No stormwater detention facilities shall be placed within 50 feet of a special geologic feature. No stormwater conveyance facility shall be constructed within 50 feet of a special geologic feature, unless it is constructed of durable pipe utilizing watertight joints.

20. A modification or waiver of the design criteria may be granted by the Borough upon recommendation of the Borough Engineer.

21. The Borough reserves the right to disapprove any design that would result in the construction in or continuation of a stormwater problem area.

*(Ord. 2008-4, 12/9/2008, §310)*

**Part 4****Drainage Plan Requirements****§23-401. General Requirements.**

For any of the activities regulated by this Chapter, the preliminary or final approval of subdivision and/or land development plan, the issuance of any building or occupancy permit, or the commencement of any earth disturbance activity may not proceed until the property owner or applicant or his/her agent has received written approval of a drainage plan from the Borough unless the project qualifies for an exemption from the requirements to submit a drainage plan.

(Ord. 2008-4, 12/9/2008, §401)

**§23-402. Exemptions.**

1. *General Exemptions.* The following land use activities are exempt from the drainage plan submission requirements of this Chapter.

A. Use of land for gardening for home consumption.

B. Agricultural activities, which excludes construction of new buildings or impervious area, are exempt from the rate control and drainage plan preparation requirements of this Chapter provided the activities are performed according to the requirements of 25 Pa.Code, Chapter 102.

C. Forest management and timber operations are exempt from the rate control and drainage plan preparation requirements of this Chapter provided the activities are performed according to the requirements of 25 Pa.Code, Chapter 102.

D. Regulated activities that create an additional 1,000 square feet of cumulative impervious area are exempt from the stormwater quantity control and drainage plan preparation requirements of this Chapter provided that flows from the site after development leave the site in the same manner as the pre-development condition and there are no adverse affects to any adjacent property.

2. *Stormwater Quantity Control Exemption.*

A. In the Schuylkill River Watershed, any regulated activity that meets the impervious area exemption criteria in Table 23-402-1 shall not be required to implement the stormwater quantity controls for the release rate, specified in §23-308 of this Chapter. These criteria shall apply to the total development even if development is to take place in phases. The date of the Borough ordinance adoption 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. Impervious areas existing on the “parent tract” prior to adoption of this Chapter shall not be considered in cumulative impervious area calculations for exemption purposes.

**Table 23-402-1**  
**Impervious Area Exemption Criteria**

Total Parcel Size	Impervious Area Exemption (sq. ft.)
0 to <0.125 ac	1,000 sq. ft.
0.125 to <0.5 ac	2,500 sq. ft.
0.5 to <1 ac	5,000 sq. ft.
1 to <2 ac	7,500 sq. ft.
2 to <3 ac	10,000 sq. ft.
3 to <4 ac	12,500 sq. ft.
> 4 ac	15,000 sq. ft.

B. In the Conestoga River Watershed, the applicant is encouraged to provide stormwater management planning, which will allow the post-development hydrograph to match the pre-development hydrograph, along all parts of the hydrograph, for the development site. To match the pre-development hydrograph means that it is not to be exceeded at all points in time. The recharge volume (§23-305.1.D) and the water quality volume (§23-306.A.2), along with other innovative methods, can be used to match the pre-development hydrograph. If the pre-development hydrograph can be matched, the criteria for the release rate have been met and the applicant is not required to meet the stormwater quantity controls for release rate, specified in §23-308 of this Chapter.

C. Submissions for projects that utilize the exemption under subsection .2 shall still be required to meet the recharge volume (§23-305), water quality volume (§23-306), and streambank erosion controls (§23-307, if applicable) of this Chapter. Drainage plans in accordance with §23-403 must still be submitted. Any exemption must first be approved by the Borough Engineer.

### 3. *Additional Exemption Requirement.*

A. *Exemption Responsibilities.* An exemption shall not relieve the applicant from implementing such measures as are necessary to protect the public health, safety, and property. An exemption shall not relieve the applicant from providing adequate stormwater management for regulated activities to meet the requirements of this Chapter.

B. *HQ and EV Streams.* This exemption shall not relieve the applicant from meeting the special requirements for watersheds draining to high quality (HQ) or exceptional value (EV) waters, and identified source water protection areas (SWPA) and requirements for nonstructural project design sequencing (§23-304), groundwater recharge (§23-305), water quality (§23-300, and streambank erosion (§23-307).

C. All regulated activities occurring in drainage areas tributary to waters designated HQ or EV pursuant to 25 Pa.Code, Chapter 93, shall not change any biological, chemical, or physical characteristics, including volume, rate, velocity, course, current, cross-section, or temperature of the waters, unless the activity is specifically permitted in accordance with the environmental laws of the Commonwealth.

D. *Drainage Problems.* If a drainage problem is documented or known to exist downstream of, or expected from the proposed activity, then the Borough may require a drainage plan submittal.

(Ord. 2008-4, 12/9/2008, §402)

**§23-403. Drainage Plan Contents.**

1. The drainage plan shall consist of a general description of the project, including sequencing items described in §23-304, calculations, maps and plans. A note on the maps shall refer to the associated computations and erosion and sediment control plan by title and date. The cover sheet of the computations and erosion and sediment control plan shall refer to the associated maps by title and date. All drainage plan materials shall be submitted to the Borough in a format that is clear, concise, legible, neat, and well organized. Incomplete submissions shall be returned to the applicant within 14 days, along with a statement that the submission is incomplete, and stating the deficiencies found. Otherwise, the application shall be deemed accepted for filing as of the date of submission. Acceptance shall not, however, constitute a waiver of any deficiencies or irregularities.

The following items shall be included in the drainage plan:

A. *General.*

(1) General description of the project including those areas described in §23-304.

(2) General description of permanent stormwater management techniques, including construction specifications of the materials to be used for stormwater management facilities.

(3) Complete hydrologic, hydraulic, and structural computations for all stormwater management facilities.

(4) An erosion and sediment control plan, including all reviews and approvals by the Conservation District when available.

(5) A general description of nonpoint source pollution controls.

B. *Maps.* Map(s) of the project area shall be submitted on 24-inch x 36-inch sheets and/or shall be prepared in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Berks County. The contents of the map(s) shall include, but not be limited to:

(1) The location of the project relative to highways, municipalities or other identifiable landmarks.

(2) Existing contours at intervals of 2 feet. In areas of steep slopes (greater than 15 percent), 5-foot contour intervals may be used.

(3) Existing streams, lakes, ponds or other waters of the Commonwealth within the project area.

(4) Other physical features including flood hazard boundaries, stream buffers, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.

(5) The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines.

- (6) An overlay showing soil names and boundaries.
- (7) Limits of earth disturbance, including the type and amount of impervious area that would be added.
- (8) Proposed structures, roads, paved areas, and buildings.
- (9) Final contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), 5-foot contour intervals may be used.
- (10) The name of the development, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
- (11) The date of submission.
- (12) A graphic and written scale of 1 inch equals no more than 50 feet; for tracts of 20 acres or more, the scale shall be 1 inch equals no more than 100 feet.
- (13) A north arrow.
- (14) The total development site boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
- (15) Existing and proposed land use(s).
- (16) A key map showing all off-site existing man-made features which may be affected by stormwater runoff or stormwater management controls for the project.
- (17) Location of all open channels.
- (18) Overland drainage patterns and swales.
- (19) Proposed easements required under the provisions of §23-705 of this Chapter or, for all facilities to be offered for public dedication, identification of the property to be dedicated.
- (20) The location of all erosion and sediment control facilities.
- (21) A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities that would be located on/off-site. All on/off-site facilities shall meet the performance standards and design criteria specified in this Chapter.
- (22) A statement, signed by the landowner, acknowledging that any revision to the approved drainage plan must be approved by the Borough Council and the Conservation District.
- (23) The following signature block for the design engineer:

“I, (Design Engineer), on this date (date of signature), hereby certify that the drainage plan meets all design standards and criteria of the New Morgan Borough Act 167 Stormwater Management Ordinance.”

C. *Supplemental Information.*

- (1) A written description of the following information shall be submitted:
  - (a) The overall stormwater management concept for the project designed in accordance with §23-304.
  - (b) Stormwater runoff computations as specified in this Chapter.
  - (c) Stormwater management techniques to be applied both during



and after development.

(d) Expected project time schedule.

(e) Development stages (project phases) if so proposed.

(2) The effect of the project (in terms of runoff volumes and peak flows) on adjacent properties and on any existing Borough stormwater collection system that may receive runoff from the project site.

(3) A land clearing and grading plan shall be included in the drainage plan entire site clearing and excessive grading are discouraged. The plan should evaluate alternatives to minimize earth disturbance and include a strategy to preserve existing stands of trees and/or vegetation where desirable or necessary to provide required buffer areas.

(4) A low compaction construction plan shall be included in the drainage plan. The plan shall provide a strategy to protect and preserve infiltration areas during land clearing and construction activities, and provide specifications for construction of infiltration BMPs using current industry standards for low compaction construction.

*D. Stormwater Management Facilities.*

(1) All stormwater management facilities must be located on a plan and described in detail.

(2) When infiltration facilities such as seepage pits, beds or trenches are used, the locations of existing and proposed septic tank infiltration areas and wells must be shown. A minimum 50-foot separation from septic tank infiltration areas is required.

(3) All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown. If multiple facilities are used in conjunction with each other, a summary narrative shall be included describing any sequencing and how the facilities are meant to function with each other to manage stormwater.

(4) A stormwater operations and maintenance plan, consistent with the requirements established in §23-701 of this Chapter, shall be submitted by the applicant. In accordance with §23-702 of this Chapter, the stormwater operations and maintenance plan will be reviewed in conjunction with the drainage plan for consistency with the purpose and requirements of this Chapter.

(Ord. 2008-4, 12/9/2008, §403)

**§23-404. Plan Submission.**

The Borough shall require receipt of a complete plan, as specified in this Chapter. For any activities that require an NPDES permit for stormwater discharges from construction activities, a PaDEP joint permit application, a PaDOT highway occupancy permit, or any other permit under applicable State or Federal regulations or are regulated under 25 Pa.Code, Chapter 105 (Dam Safety and Waterway Management), or 25 Pa.Code, Chapter 106 (Floodplain Management), of PaDEP's rules and regulations, the proof of application for said permit(s) or approvals shall be part of the drainage plan. The drainage plan shall be coordinated with the State and Federal

permit process and the Borough Subdivision and Land Development Ordinance review process [Chapter 22].

A. For projects which require Subdivision and Land Development Ordinance approval, the drainage plan shall be submitted by the applicant as part of the preliminary plan submission where applicable for the regulated activity.

B. For those regulated activities that do not require Subdivision and Land Development Ordinance approval, see §23-401, "General Requirements."

C. Ten copies of the drainage plan shall be submitted and distributed as follows:

(1) Four copies to the Borough accompanied by the requisite Borough application fee, as specified in this Chapter.

(2) Two copies to the Berks County Conservation District.

(3) One copy to the Borough Engineer.

(4) Three copies to the Berks County Planning Commission.

(Ord. 2008-4, 12/9/2008, §404)

#### **§23-405. Drainage Plan Review.**

1. The Borough shall review the drainage plan with the standards set forth in this Chapter. Incomplete submissions shall be returned to the applicant within 14 days, along with a statement that the submission is incomplete, stating the deficiencies found.

2. For activities regulated by this Chapter, the Borough shall notify the applicant in writing, within 90 calendar days, whether the drainage plan is consistent with this Chapter.

A. Should the drainage plan be determined to be consistent with this Chapter, the Borough Engineer shall forward an approval letter to the Borough Secretary who will then forward a copy to the applicant.

B. Should the drainage plan be determined to be inconsistent with this Chapter, the Borough Engineer shall forward a disapproval letter to the Borough Secretary who will then forward a copy to the applicant. The disapproval letter shall cite the reason(s) and specific Chapter Sections for the disapproval. Disapproval may be due to inadequate information to make a reasonable judgment as to compliance with this Chapter. Any disapproved drainage plans may be revised by the applicant and resubmitted in accordance with §23-404 of this Chapter.

3. For regulated activities specified in §23-105 of this Chapter, which require a building permit, the Borough Engineer shall notify the Borough Code Enforcement Officer in writing, within a time frame consistent with the Borough Building Code [Chapter 5, Part 1] and/or Subdivision and Land Development Ordinance [Chapter 22], whether the drainage plan is consistent with this Chapter and forward a copy of the approval/disapproval letter to the applicant. Any disapproved drainage plan may be revised by the applicant and resubmitted in accordance with §23-404 of this Chapter.

4. For regulated activities under this Chapter that require an NPDES permit, the applicant shall forward a copy of the Borough Engineer's letter stating that the

drainage plan is consistent with this Chapter to the Conservation District PaDEP and the Conservation District may consider the Borough Engineer's review comments in determining whether to issue a permit.

5. The Borough shall not grant approval to any subdivision or land development for regulated activities specified in §23-105 of this Chapter if the drainage plan has been found to be inconsistent with this Chapter, as determined by the Borough Engineer. All required permits from PaDEP must be obtained prior to unconditional final approval of any subdivision or land development or the Borough shall grant conditional final approval subject to the receipt of the required PaDEP permits.

6. The Borough Council's approval of a drainage plan shall be valid for a period not to exceed 5 years, commencing on the date that the Borough signs the approved final land development plan, including the drainage plan. If stormwater management facilities included in the approved drainage plan have not been constructed within this 5-year time period, then the Borough may consider the drainage plan disapproved and may revoke any and all permits drainage plans that are considered disapproved by the Borough Council shall be resubmitted in accordance with §23-407 of this Chapter.

(*Ord. 2008-4, 12/9/2008, §405*)

#### **§23-406. Modification of Plans.**

1. A modification to a drainage plan under review by the Borough for a development site that involves a change in stormwater management facilities or techniques, or that involves the relocation or re-design of stormwater management facilities, or that is necessary because soil or other conditions are not as stated on the drainage plan as determined by the Borough, shall require a resubmission of the modified drainage plan in accordance with §23-405 of this Chapter, which will be subject to review as specified in §23-405 of this Chapter.

2. A modification to a drainage plan for which a formal action has not been taken by the Borough shall be submitted to the Borough, accompanied by the applicable Borough application fee.

3. A modification to a drainage plan already approved or disapproved by the Borough shall be submitted to the Borough, accompanied by the applicable Borough application fee.

(*Ord. 2008-4, 12/9/2008, §406*)

#### **§23-407. Resubmission of Disapproved Drainage Plans.**

A disapproved drainage plan may be resubmitted, with the revisions addressing the Borough's concerns documented in writing and addressed to the Borough Secretary in accordance with §23-404 of this Chapter and distributed accordingly, and shall be subject to review as specified in §23-405 of this Chapter. The applicable Borough application fee must accompany a resubmission of a disapproved drainage plan.

(*Ord. 2008-4, 12/9/2008, §407*)



---

**Part 5****Inspections****§23-501. Schedule of Inspections.**

1. The Borough or its designee shall inspect all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Borough.

2. During any stage of the work, if the Borough or its designee determines that the permanent stormwater management facilities are not being installed in accordance with the approved drainage plan, the Borough may take any appropriate action, in accordance with Part 9, and may issue a cease and desist order until appropriate corrective action is taken by the applicant.

3. A final inspection of all stormwater management facilities shall be conducted by the Borough or its designee to confirm compliance with the approved drainage plan prior to the issuance of any occupancy permit.

*(Ord. 2008-4, 12/9/2008, §501)*



**Part 6****Fees and Expenses****§23-601. Borough Drainage Plan Fees.**

Fees shall be established by the Borough to defray plan review and construction inspection costs incurred by the Borough. All fees shall be paid by the applicant at the time of drainage plan submission. A fee schedule shall be established by resolution of the Borough Council based on the size of the regulated activity and based on the Borough's costs for reviewing drainage plans and conducting inspections pursuant to §23-501. The Borough shall periodically update the fee schedule to ensure that review costs are adequately reimbursed.

(*Ord. 2008-4, 12/9/2008, §601*)

**§23-602. Expenses Covered by Fees.**

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

- A. Administrative costs.
- B. The review of the drainage plan by the Borough.
- C. The site inspections.
- D. The inspection of stormwater management facilities and drainage improvements during construction.
- E. The final inspection upon completion of the stormwater management facilities and drainage improvements presented in the drainage plan.
- G. Any additional work required to enforce any permit provisions regulated by this Chapter, correct violations, and assure proper completion of stipulated remedial actions.

(*Ord. 2008-4, 12/9/2008, §602*)

**§23-603. Performance Guarantee.**

1. For subdivisions and land developments, the applicant shall provide a financial guarantee to the Borough for the timely installation and proper construction of all stormwater management controls as (A) required by the approved drainage plan equal to or greater than the full construction cost of the required controls; or (B) in the amount and method of payment provided for in the Subdivision and Land Development Ordinance [Chapter 22].

2. For other regulated activities, the Borough may require a financial guarantee from the applicant.

3. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the applicant or its representative shall:

- A. Provide a certification of completion from an engineer, architect, surveyor or other qualified person verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.

B. Provide a set of as-built drawings.

4. After the Borough receives the certification, a final inspection shall be conducted by the Borough or its designee to certify compliance with this Chapter.

(*Ord. 2008-4, 12/9/2008, §603*)



**Part 7****Maintenance Responsibilities****§23-701. Stormwater Operations and Maintenance Plan.**

1. A stormwater operations and maintenance plan, consistent with the requirements set forth below, shall be submitted in conjunction with the drainage plan. The following items shall be included in the stormwater operations and maintenance plan:

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

(1) Clear identification of the location and nature of permanent stormwater controls and BMPs.

(2) The location of the project site relative to highways, Borough boundaries or other identifiable landmarks.

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

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

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

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

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

(8) Proposed final structures, roads, paved areas, and buildings.

(9) Proposed easements required under the provisions of §23-705 of this Chapter or, for all facilities to be offered for public dedication, identification of the property to be dedicated.

B. A description of how each permanent stormwater control and BMP will be operated and maintained, and the identity of the person(s) responsible for operations and maintenance.

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

D. A statement, signed by the landowner, acknowledging that the stormwater controls and BMPs are fixtures that can be altered or removed only after approval by the Borough.

2. The stormwater operations and maintenance plan for the project site shall establish responsibilities for the continuing operation and maintenance of all permanent stormwater controls and BMPs, as follows:

A. If a stormwater operations and maintenance plan includes structures or lots that are to be separately owned and in which streets, sewers, and other public improvements are to be dedicated to the Borough, stormwater controls and BMPs may also be dedicated to and maintained by the Borough.

B. If a stormwater operations and maintenance plan includes operations and maintenance by a single ownership, or if sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater controls and BMPs shall be the responsibility of the owner or private management entity.

3. The Borough shall make the final determination on the continuing operations and maintenance responsibilities. Unless acceptance of the operation and maintenance responsibility is required pursuant to a separate New Morgan Borough ordinance, the Borough reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater controls and BMPs.

(*Ord. 2008-4, 12/9/2008, §701*)

#### **§23-702. Borough Review of Stormwater Operations and Maintenance Plan.**

1. The Borough Engineer shall review the stormwater operations and maintenance plan for consistency with the purposes and requirements of this Chapter, and any permits issued by DEP. The review of the stormwater operations and maintenance plan shall occur in combination with the review of the drainage plan, as established in Part 4 of this Chapter.

2. In the event the Borough Engineer determines the stormwater operations and maintenance plan is consistent with this Chapter, the Borough Engineer shall forward an approval letter to the Borough Secretary who will then forward a copy to the applicant.

3. In the event the Borough Engineer determines the stormwater operations and maintenance plan is inconsistent with this Chapter, the Borough Engineer shall forward a disapproval letter to the Borough Secretary who will then forward a copy to the applicant. The disapproval letter shall cite the reason(s) and specific Chapter Sections for the disapproval. Disapproval may be due to inadequate information to make a reasonable judgment as to the plan's compliance. Any disapproved stormwater operations and maintenance plans may be revised by the applicant and resubmitted.

4. The Borough may require a set of as-built drawings of all stormwater controls and BMPs, and an explanation of any discrepancies with the stormwater operations and maintenance plan.

(*Ord. 2008-4, 12/9/2008, §702*)

#### **§23-703. Adherence to Approved Stormwater Operations and Maintenance Plan.**

It shall be unlawful to alter or remove any permanent stormwater control and BMP required by an approved stormwater operations and maintenance plan, or to allow a property to remain in a condition that does not conform to an approved stormwater operations and maintenance plan.

(*Ord. 2008-4, 12/9/2008, §703*)

**§23-704. Operations and Maintenance Agreement for Privately-Owned Stormwater Controls and BMPs.**

1. The property owner shall sign an operations and maintenance agreement with the Borough covering all stormwater controls and BMPs that are to be privately owned. The agreement shall be substantially the same as the agreement in Appendix 23-A of this Chapter.

2. Other items may be included in the agreement where determined necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater controls and BMPs. The agreement shall be subject to the review and approval of the Borough.

(Ord. 2008-4, 12/9/2008, §704)

**§23-705. Stormwater Management Easements.**

1. Stormwater management easements are not required for stormwater management facilities that are not designated in the drainage plan or recognized in the drainage plan calculations.

2. For publicly-owned stormwater management facilities:

A. When a stormwater management facility is to be offered for dedication to the Borough, the property to be dedicated shall be defined on the drainage plan. The property shall be sufficient in area, as determined in Borough's sole discretion, to completely encompass the stormwater management facility and the area necessary to conduct operation and maintenance activities.

B. The property proposed for dedication should, if at all possible, include access to a roadway. Otherwise, an access easement for ingress and egress to the property shall be provided and shown on the drainage plan.

3. For all privately-owned and publicly-maintained stormwater management facilities, easements shall be provided by the property owner sufficient in area, as determined in Borough's sole discretion, for (A) preservation of the stormwater management facility, (B) maintenance of the stormwater management facility; and (C) ingress to and egress from the facility for inspections and maintenance.

4. For all privately-owned and privately-maintained stormwater management facilities, easements shall be provided by the property owner sufficient in area, as determined in Borough's sole discretion, for (A) preservation of the stormwater management facility; and (B) ingress to and egress from the facility for inspections.

(Ord. 2008-4, 12/9/2008, §705)

**§23-706. Recording of Approved Stormwater Operations and Maintenance Plan and Related Agreements.**

1. The owner of any land upon which permanent stormwater controls and BMPs will be placed, constructed, or implemented, as described in the stormwater operations and maintenance plan, shall record the following documents in the Office of the Recorder of Deeds for Berks County, within 90 days of endorsement of the stormwater operations and maintenance plan by the Borough:

A. The stormwater operations and maintenance plan, or a summary thereof.

B. Operations and maintenance agreements under §23-704.

C. Easements under §23-705.

2. The Borough may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with this Section.

*(Ord. 2008-4, 12/9/2008, §706)*

**§23-707. Borough Stormwater Operation and Maintenance Fund.**

Persons installing stormwater controls or BMPs shall be required to pay a specified amount to the Borough Stormwater Operation and Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The Borough shall adopt, by resolution, an applicable fee schedule. The Borough may also require applicants to pay a fee to the Borough Stormwater Maintenance Fund to cover stormwater related problems that may arise from the land development and earth disturbance.

*(Ord. 2008-4, 12/9/2008, §707)*

**Part 8****Prohibitions****§23-801. Prohibited Discharges and Connections.**

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 waters of this Commonwealth is prohibited.

2. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (A) as provided in subsection .3 below; and (B) discharges allowed under a State or Federal permit.

3. The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth in the sole discretion of the Borough:

- A. Discharges from firefighting activities.
- B. Potable water sources including water line flushing.
- C. Irrigation drainage.
- D. Air conditioning condensate.
- E. Springs.
- F. Water from crawl space pumps.
- G. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used.
- H. Flows from riparian habitats and wetlands.
- I. Uncontaminated water from foundations or from footing drains.
- J. Lawn watering.
- K. Dechlorinated swimming pool.
- L. Uncontaminated groundwater.
- M. Water from individual residential car washing.
- N. Routine external building wash down (which does not use detergents or other compounds).

4. In the event that the Borough determines that any of the discharges identified in subsection .3 significantly contribute to pollution of the waters of this Commonwealth, the Borough will notify the responsible person(s) to cease the discharge.

(Ord. 2008-4, 12/9/2008, §801)

**§23-802. Roof Drains.**

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs to the maximum extent practicable.

(Ord. 2008-4, 12/9/2008, §802)

**§23-803. Alteration of Stormwater Management BMPs.**

No person shall modify, remove, fill, landscape, or alter any stormwater management BMPs, facilities, areas, or structures, without the written approval of the Borough.

*(Ord. 2008-4, 12/9/2008, §802)*

**Part 9****Enforcement and Penalties****§23-901. Right-of-Entry.**

1. Upon presentation of proper credentials, duly authorized representatives of the Borough may enter at reasonable times upon any property within the Borough to inspect the implementation, condition, or operation and maintenance of the stormwater controls or BMPs in regard to any aspect governed by this Chapter.

2. Stormwater control and BMP owners and operators shall allow persons working on behalf of the Borough ready access to all parts of the premises for the purposes of determining compliance with this Chapter.

3. Persons working on behalf of the Borough shall have the right to temporarily locate on any stormwater control or BMP in the Borough such devices as are necessary to conduct monitoring and/or sampling of the discharges from such stormwater control or BMP.

4. Unreasonable delays (>24 hours) in allowing the Borough access to a stormwater control or BMP is a violation of this Part.

(Ord. 2008-4, 12/9/2008, §901)

**§23-902. Public Nuisance.**

1. The violation of any provision of this Chapter is hereby deemed a public nuisance.

2. Each day that a violation continues shall constitute a separate violation.

(Ord. 2008-4, 12/9/2008, §902)

**§23-903. Enforcement Generally.**

1. Whenever the Borough finds that a person has violated a prohibition or failed to meet a requirement of this Chapter, the Borough may order compliance by written notice to the responsible person. Such notice may require without limitation:

- A. The performance of monitoring, analyses, and reporting.
- B. The elimination of prohibited connections or discharges.
- C. Cessation of any violating discharges, practices, or operations.
- D. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property.
- E. Payment of a fine to cover administrative and remediation costs.
- F. The implementation of stormwater controls and BMPs.
- G. Operation and maintenance of stormwater controls and BMPs.

2. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work will be done by the Borough or designee and the expense thereof

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 Chapter. All such penalties shall be deemed cumulative and shall not prevent the Borough from pursuing any and all other remedies available in law or equity.

(*Ord. 2008-4, 12/9/2008, §902*)

#### **§23-904. Suspension and Revocation of Permits and Approvals.**

1. Any building, land development or other permit or approval issued by the Borough may be suspended or revoked, in whole or in part, by the Borough for:

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

B. A violation of any provision of this Chapter.

C. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life or property of others.

2. A suspended permit or approval may be reinstated by the Borough, in whole or in part, when:

A. The Borough or designee has inspected and approved the corrections to the stormwater controls and BMPs, or the elimination of the hazard or nuisance.

B. The Borough is satisfied that the violation of this Chapter, law, or rule and regulation has been corrected.

3. A permit or approval which has been revoked in whole or in part, by the Borough cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Chapter.

(*Ord. 2008-4, 12/9/2008, §904*)

#### **§23-905. Penalties.**

1. Any person violating the provisions of this Chapter, upon conviction thereof in an action brought before a magisterial district judge in the manner provided for the enforcement of summary offenses under the Pennsylvania Rules of Criminal Procedure, shall be sentenced to pay a fine of not less than \$100 nor more than \$1,000 plus costs together with reasonable attorney fees and, in default of payment of said fine and costs, to a term of imprisonment not to exceed 90 days. Each day that a violation of this Part continues or each Section of this Part which shall be found to have been violated shall constitute a separate offense. [*Ord. 2015-4*]

2. The Borough may institute injunctive, mandamus, or any other appropriate action or proceeding at law in equity for the enforcement of this Chapter with the court of competent jurisdiction to obtain restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

(*Ord. 2008-4, 12/9/2008, §905; as amended by Ord. 2015-4, 9/8/2015*)

#### **§23-906. Notification.**

In the event that a person fails to comply with the requirements of this Chapter, or fails to conform to the requirements of any permit issued hereunder, the Borough



will provide notification of the violation. After notice is provided, failure to correct violations in a timely manner may result in additional violations.

(*Ord. 2008-4, 12/9/2008, §906*)

**§23-907. Enforcement.**

The Borough Council is hereby authorized and directed to enforce all of the provisions of this Chapter. All inspections regarding compliance with the drainage plan shall be the responsibility of the Borough Engineer or other qualified persons designated by the Borough.

(*Ord. 2008-4, 12/9/2008, §907*)

**§23-908. Modification of Chapter Provisions.**

1. The provisions of this Chapter are intended as minimum standards for the protection of the public health, safety, and welfare. The Borough reserves the right to modify or to extend them conditionally in individual cases as may be necessary in the public interest; provided, however, that such variation shall not have the effect of nullifying the intent and purpose of this Chapter, and that the applicant shows, to the satisfaction of the Borough, that the applicable regulation is unreasonable, or will cause undue hardship, or that an alternative proposal will allow for equal or better results. The list of such modifications shall be listed on the drainage plan.

2. In granting waivers/modifications, the Borough may impose such conditions as will, in its sole judgment, secure substantially the objectives of the standards and requirements of this Chapter.

(*Ord. 2008-4, 12/9/2008, §908*)

**§23-909. Appeals.**

Any person aggrieved by any decision of Borough may appeal to the County Court of Common Pleas in the County where the activity has taken place within 30 days of the Borough decision.

(*Ord. 2008-4, 12/9/2008, §909*)



## Appendix 23-A

# STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT

**THIS AGREEMENT**, is made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 200\_\_\_\_, by and between \_\_\_\_\_ (hereinafter the "Landowner") and New Morgan Borough, Berks County, Pennsylvania (hereinafter "Borough");

### WITNESSETH

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

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

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

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

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

- **BMP** - "Best Management Practice;" activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Borough Stormwater Management Ordinance, including but not limited to infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grassed swales, forested buffers, sand filters and detention basins.
- **Infiltration Trench** - A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,
- **Seepage Pit** - An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,
- **Rain Garden** - A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or underground aquifer, and

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

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

1. The BMPs shall be constructed by the Landowner in accordance with the Plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Borough and in accordance with the specific maintenance requirements noted on the Plan.
3. The Landowner hereby grants permission to the Borough, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Borough shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Borough, the Borough or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Borough to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Borough is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Borough.
5. In the event the Borough, 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 Borough for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Borough.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Borough's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Borough. In the event that a claim is asserted against the Borough, its designated representatives or employees, the Borough shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Borough's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

8. The Borough shall inspect the BMP(s) at a minimum of once every three years to ensure their continued functioning.

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

WITNESS the following signatures and seals:

(SEAL)

For the Borough:

\_\_\_\_\_  
Council President

For the Landowner:

\_\_\_\_\_

ATTEST:

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

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

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

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

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

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



**FIGURE B-1**  
**Recommendation Chart for Infiltration Stormwater Management BMP's in Carbonate Bedrock**

SITE RISK FACTORS		CARBONATE BEDROCK											
		Less than 2 Feet	2 to 4 Feet				Over 4 Feet to 8 Feet				Over 8 Feet		
	Effective Soil Thickness												
	Special Geologic Features*	Low/Med High Buffer	Low Buffer	Medium Buffer	High Buffer	Low Buffer	Medium Buffer	High Buffer	Low Buffer	Medium Buffer	High Buffer	Medium Buffer	High Buffer
			Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
DESIGN FACTORS	SITE INVESTIGATION RECOMMENDED	(Unacceptable)											
	Infiltration Loading Rates (% increase) **	0-100% 100-300%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%	100-300% 300-500%
PROGRAM SUMMARY GUIDANCE ***			1	1	1	1	2	1	2	1	2	1	1

Appendix 23-B

 RECOMMENDED
  NOT RECOMMENDED

\* Special Geologic Feature Buffer widths are as follows:  
 Low Buffer is less than 50 feet  
 Medium Buffer is 50 feet to 100 feet  
 High Buffer is greater than 100 feet

\*\* Rates greater than 500% not recommended.

\*\*\* Assumes adequately permeable soils and lack of natural constraints as required for all infiltration systems.

1 Infiltration systems may be allowed at the determination of the Engineer and/or Geologist, provided that a Detailed Site Investigation is undertaken which confirms nature of rock, location of Special Geologic Features, and adequacy of the buffer between the SGF and the proposed stormwater system(s).

2 In these Special Geologic Features: Low Buffer situations, infiltration systems may be allowed at the determination of the Engineer and/or Geologist, provided that a Detailed Site Investigation is undertaken and a 25 foot buffer from SGFs is maintained.





Appendix 23-D

**STORMWATER MANAGEMENT DISTRICT  
WATERSHED MAP**





# LEGEND

BOROUGH BOUNDARY

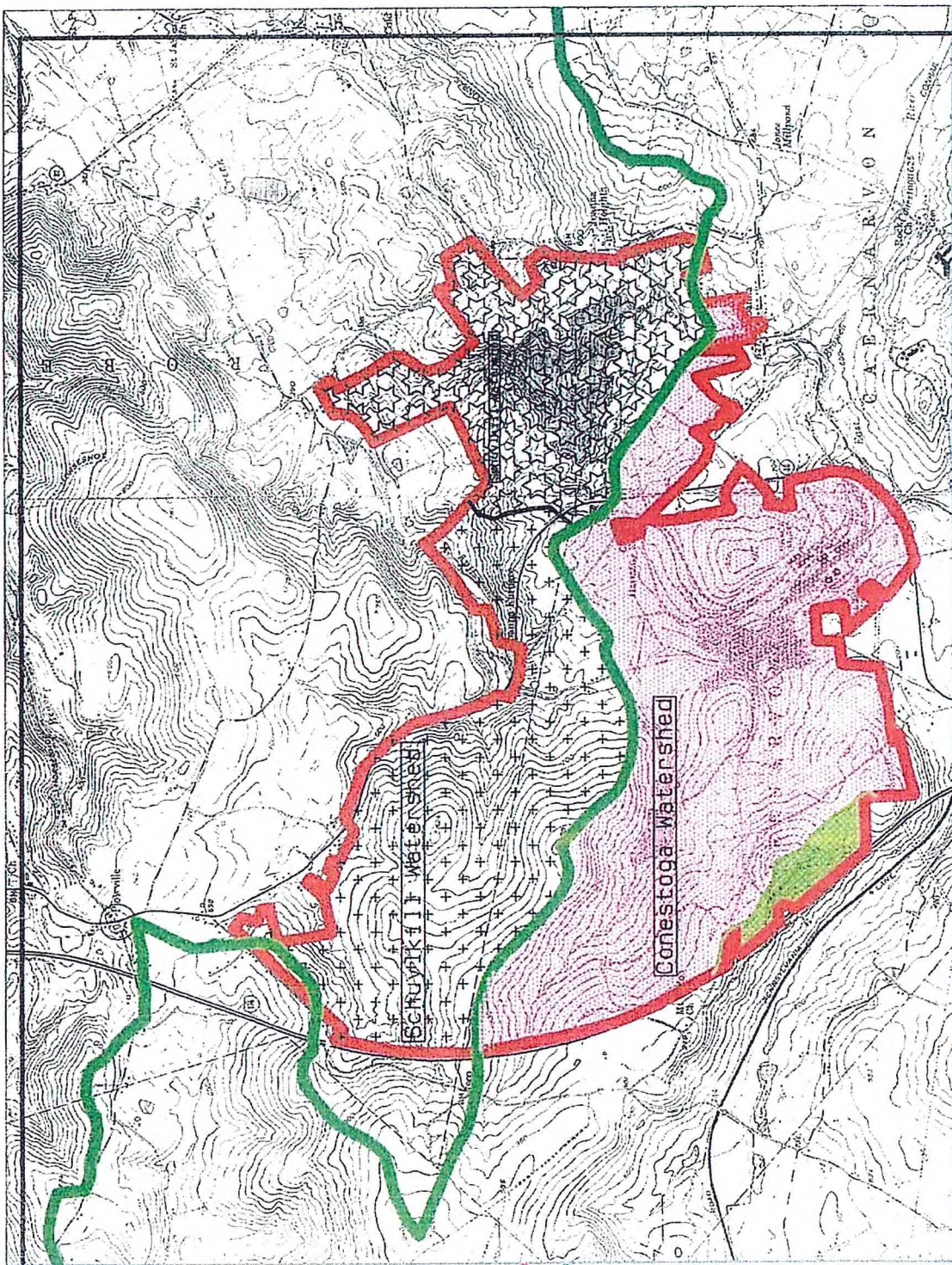
WATERSHED BOUNDARY

Conestoga River Watershed  
30% Release Rate

Conestoga River Watershed  
50% Release Rate

Schuylkill River Watershed  
Management District "A"

Schuylkill River Watershed  
Management District "B"



**VERKES ASSOCIATES, INC.**

JAIL PRICESVILLE, PA. 17033-1000 • 717-651-1111 • FAX 717-651-1112  
GENERALIST CONSULTING ENGINEERS • LANDSCAPE ARCHITECTS  
DIN • PLANNING

PLAN PREPARED FOR  
**NEW MORGAN BOROUGH**  
BERKS COUNTY • PENNSYLVANIA

**SCHUYLKILL RIVER AND  
CONESTOGA RIVER WATERSHED  
167 PLAN RELEASE RATE MAP  
IN NEW MORGAN BOROUGH**

12770-7  
SHEET 1 OF 1





## Appendix 23-E

### LOW IMPACT DEVELOPMENT (LID) PRACTICES

#### ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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 leads ultimately to the degradation of water quality as well as expenditure of additional resources for detaining and managing concentrated runoff at some downstream location.

The recommended alternative approach is to promote practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities. To simulate pre-development hydrologic conditions, 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:

- **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 minimizes the amount of grading on site.
- **Protecting Natural Depression Storage Areas.** Depressional 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.

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

- **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.
- **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.

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





## Appendix 23-F

### West Nile Virus Guidance

(Reproduced from the Monroe County, PA Conservation District, which researched the potential of West Nile Virus problems from BMPs.)

**Monroe County Conservation District Guidance:  
Stormwater Management and West Nile Virus  
Source: Brodhead McMichaels Creeks Watershed Act 167 Stormwater  
Management Ordinance 2/23/04**

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

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

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

#### **Mosquitoes**

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

Pennsylvania. Along with *C. pipiens*, three other species have been identified as vectors of West Nile Virus while four more have been identified as potential vectors.

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

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

### **Stormwater Facilities**

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

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

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

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

### **Conclusion**

The Conservation District understands the pressure faced by Municipalities when dealing with multifaceted issues such as stormwater management and encourages the incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, groundwater recharge and

constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed appropriately, the runoff mitigation benefits to the community from these design options will far out weigh their potential to become breeding grounds for mosquitoes.



## Appendix 23-G

### REFERENCES

#### BMP Manuals

##### **California**

California Stormwater BMP Handbook: New Development and Redevelopment (January 2003) <http://www.eabmphandbooks.org/Development.asp>

##### **Georgia**

Georgia Stormwater Management Manual Volume 2: Technical Handbook (August 2001) <http://www.georgiastormwater.com/>

##### **Maryland**

2000 Maryland Stormwater Design Manual  
[http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater\\_design/index.asp](http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater_design/index.asp)

##### **Massachusetts**

Stormwater Management, Volume Two: Stormwater Technical Handbook (Massachusetts, 1997)  
<http://www.state.ma.us/dep/hrp/stormwtr/stormpub.htm>

##### **Minnesota**

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

##### **New Jersey**

Revised Manual for New Jersey: Best Management Practices for Control of Non-point Source Pollution from Stormwater (Fifth Draft May 2000)  
<http://www.state.nj.us/dep/watershedmgt/bmpmanual.htm>

##### **New York**

New York State Stormwater Management Design Manual (2001)  
<http://www.dec.state.ny.us/website/dow/swmanual/swmanual.html>

##### **Pennsylvania**

Pennsylvania Association of Conservation Districts, Pennsylvania Handbook of Best Management Practices for Developing Areas, November 14, 1997.

Pennsylvania Department of Environmental Protection, Pennsylvania Stormwater Best Management Practices Manual, December 30, 2006  
<http://www.depweb.state.pa.us/watershedmgmt/cwp/view.asp?a=1437&Q=518682&PM=1>

## **Washington**

Stormwater Management Manual for Western Washington (August 2001)

<http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>

## **Federal**

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA)

<http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm>

USEPA Infiltration Trench Fact Sheet (September 1999)

<http://cfpub.epa.gov/npdcs/stormwater/menuofbmps/post.cfm>

## **Riparian Buffer References**

Alliance for the Chesapeake Bay, Pennsylvania Department of Environmental Protection, September 2000. *Forest Buffer Toolkit*, Stream ReLeaf Program.

Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips Along Streams to Improve Water Quality*. Publication # AGRS-67.

Fike, Jean, June 1999. *Terrestrial & Palustrine Plant Communities of Pennsylvania*, Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Prepared by CH2MHill.

Palone, R. S. and A. H. Todd (eds), 1997. *Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers*. Chesapeake Bay Program and Northeastern Area State and Private Forestry. Natural Resources Conservation Service Cooperative State Research Education and Extension Services.

The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). *Stream Corridor Restoration Principles, Processes, and Practices*. GPO Item No. 0120-A; SuDocs No. A57.6/2:EN3/PT.653. ISBN-0-934213-59-3. Published October 1998. Revised August 2000.