

DISTRICT TOWNSHIP

**STORMWATER MANAGEMENT AND
EARTH DISTURBANCE
ORDINANCE**

ORDINANCE NO.

2007 - 3

**DISTRICT TOWNSHIP, BERKS COUNTY
PENNSYLVANIA**

**Adopted at a Public Meeting held on
July 12, 2007**

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ORDINANCE NO: 2007 – 3

AN ORDINANCE AMENDING THE STORMWATER MANAGEMENT AND EARTH DISTURBANCE ORDINANCE OF THE TOWNSHIP OF DISTRICT, BERKS COUNTY, PENNSYLVANIA, IN ITS ENTIRETY BY DELETING THE EXISTING STORMWATER MANAGEMENT AND EARTH DISTURBANCE ORDINANCE AND ESTABLISHING A NEW STORMWATER MANAGEMENT AND EARTH DISTURBANCE ORDINANCE, AUTHORIZING THE TOWNSHIP TO ESTABLISH A COMPREHENSIVE PROGRAM OF STORMWATER MANAGEMENT, INCLUDING REASONABLE REGULATION OF DEVELOPMENT AND ACTIVITIES CAUSING ACCELERATED EROSION, FUNDAMENTAL TO THE PUBLIC HEALTH, SAFETY AND WELFARE AND THE PROTECTION OF THE PEOPLE OF THE TOWNSHIP OF DISTRICT AND ALL OF THE PEOPLE OF THE COMMONWEALTH OF PENNSYLVANIA, THEIR RESOURCES AND THEIR ENVIRONMENT.

BE IT ENACTED AND ORDAINED by the Board of Supervisors of District Township, Berks County, Pennsylvania, that Stormwater Management and Earth Disturbance Ordinance of the Township of District is hereby amended in its entirety to read as follows:

ARTICLE I – GENERAL PROVISIONS

Section 101 Short Title

This Ordinance shall be known as the “District Township Stormwater Management and Earth Disturbance Ordinance.”

Section 102 Statement of Findings

The governing body of the Municipality 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, overtakes 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 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 and loss of natural infiltration, is fundamental to the public health, safety, welfare, and the protection of the people of the Municipality and all of the people of the Commonwealth, their resources, and the environment.
- D. Stormwater can be an important water resource by providing groundwater recharge for water supplies and baseflow of streams, which also protects and maintains surface water quality.
- E. 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 that minimizes impervious surfaces and sprawl, avoids sensitive areas (i.e., stream buffers, floodplains, steep slopes), and considers topography and soils to maintain the natural hydrologic regime.
- F. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.

- G. Nonstormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the Municipality.

Section 103 Purpose

The purpose of this Ordinance is to promote the public health, safety, and welfare within the Municipality by maintaining the natural hydrologic regime and minimizing the impacts described in Section 102 of this Ordinance through provisions designed to:

- A. Promote alternative project designs and layouts that minimize the impacts on surface and groundwater.
- B. Promote nonstructural best management practices (BMPs).
- C. Minimize increases in runoff stormwater volume.
- D. Minimize impervious surfaces.
- E. Manage accelerated stormwater runoff and erosion and sedimentation problems and stormwater runoff impacts 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 existing natural drainage systems as much as possible.
- H. Manage stormwater impacts close to the runoff source, requiring a minimum of structures and relying 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 baseflows and quality of streams and watercourses, where possible.
- K. Meet legal water quality requirements under state law, including regulations at 25 Pennsylvania Code Chapter 93.4.a requiring protection and maintenance of “existing uses” and maintenance of the level of water quality to support those uses in all streams, and the protection and maintenance of water quality in “special protection” streams.
- L. Address the quality and quantity of stormwater discharges from the development site.
- M. Provide a mechanism to identify stormwater controls necessary to meet NPDES permit requirements.
- N. Implement an illegal discharge detection and elimination program that addresses non-stormwater discharges into the Municipality’s separate storm sewer system.
- O. Preserve the flood-carrying capacity of streams.
- P. Prevent scour and erosion of stream banks and stream beds.
- Q. Provide performance standards and design criteria for watershed-wide stormwater management and planning.
- R. Provide proper operation and maintenance of all permanent stormwater management facilities and BMPs that are implemented in the Municipality.

Section 104 Statutory Authority

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

- A. Act of October 4, 1978, 32 P.S., P.L. 864 (Act 167) Section 680.1 et seq., as amended, the “Stormwater Management Act” (hereinafter referred to as “the Act”);
- B. Water Resources Management Act of 2002, as amended;
- C. Second Class Township Code, 53 P.S. Sections 66501 et seq., 66601 et seq.
- D. Pennsylvania Municipalities Planning Code, Act 247, as amended.

Section 105 Applicability/Regulated Activities

This Ordinance shall apply to all areas of District Township.

The following activities are defined as “regulated activities” and shall be regulated by this Ordinance unless exempted by Section 106:

- A. Land development,
- B. Subdivisions,
- C. Alteration of the natural hydrologic regime,
- D. Construction or reconstruction of or addition of new impervious or semipervious surfaces (i.e., driveways, parking lots, roads, etc.),
- E. Construction of new buildings or additions to existing buildings,
- F. Redevelopment,
- G. Diversion piping or encroachments in any natural or man-made channel,
- H. Nonstructural and structural stormwater management BMPs or appurtenances thereto,
- I. Earth disturbance activities of greater than five thousand (5,000) square feet.¹
- J. Any of the above regulated activities that were approved more than five (5) years prior to the effective date of this Ordinance and resubmitted for municipal approval.
- K. Prohibited or polluted discharges,
- L. Any other activities that may affect stormwater runoff.

Table 105-1 summarizes the applicability requirements of the ordinance. “Proposed Impervious Surface” in Table 105-1 includes new, additional, or replacement impervious surface/cover. Repaving existing surfaces without reconstruction does not constitute “replacement.”

¹ This Ordinance applies to any earth disturbance activity greater than or equal to five thousand (5,000) square feet that is associated with a development or redevelopment project. Earth disturbance activities of less than one (1) acre that are associated with redevelopment projects are exempt from the Section 407 stream bank erosion requirements. Earth disturbance activities and associated stormwater management controls are also regulated under existing state law and implementing regulations. This Ordinance shall operate in coordination with those parallel requirements; the requirements of this Ordinance shall be no less restrictive in meeting the purposes of this Ordinance than state law.

TABLE 105-1
ORDINANCE APPLICABILITY

Ordinance Article or Section	Type of Project	Proposed Impervious Surface				Earth Disturbance	
		0-1,000 sq.ft.	1,000-5,000 sq.ft.	5,000 sq.ft. – 1 acres	> 1 acre	5,000 sq.ft. – 1 acre	> 1 acre
Article III Drainage Plan Requirements	Development	N/A	Modified	Yes	Yes	Modified	Yes
	Redevelopment	N/A	Modified	Yes	Yes	Modified	Yes
Section 404 Nonstructural Project Design	Development	N/A	Yes	Yes	Yes	Yes	Yes
	Redevelopment	N/A	Yes	Yes	Yes	Yes	Yes
Section 405 Groundwater Recharge	Development	N/A	Yes	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Yes	Yes	Yes	N/A	Yes
Section 406 Water Quality Requirements	Development	Yes	Yes	Yes	Yes	Yes	Yes
	Redevelopment	Yes	Yes	Yes	Yes	Yes	Yes
Section 407 Stream Bank Erosion Requirements	Development	N/A	Exempt	Yes	Yes	N/A	Yes
	Redevelopment	N/A	Exempt	Exempt	Yes	N/A	Yes
Section 408 Stormwater Peak Rate Control and Management Districts	Development	N/A	Exempt	Yes	Yes	Yes	Yes
	Redevelopment	N/A	Exempt	Yes	Yes	Yes	Yes
Erosion & Sediment Pollution Control Plan Submission to the Conservation District	Earth Disturbance	See Earth Disturbance Requirements	See Earth Disturbance Requirements	See Earth Disturbance Requirements	See Earth Disturbance Requirements	Yes	Yes

Legend:

Yes - Drainage plan required with associated section provision.

N/A - Not applicable – exempt from drainage plan submission.

Exempt - Exempt from required section provision – Drainage plan submission may still be required if other section provisions are applicable (yes in box).

Modified - Modified drainage plan required

- Sites with less than one thousand (1,000) square feet of impervious surface, but between five thousand (5,000) square feet and one (1) acre of earth disturbance must submit a drainage plan to the Municipality which need only consist of the items in Sections 302.A.2 and 4; 302.B.7, 8, 11, and 22; and 302.D.1 and 3 and related supportive material needed to determine compliance with Sections 404 and 408.
- Sites with more than one thousand (1,000) square feet, but less than five thousand (5,000) square feet of impervious surface must submit a drainage plan; however, it need not consist of the items in Sections 407 and 408.

Section 106 Exemptions

A. Exemptions for Land Use Activities

The following land use activities are exempt from the drainage plan submission requirements of this Ordinance.

1. Use of land for gardening for home consumption.

2. Agriculture when operated in accordance with a conservation plan, nutrient management plan, or erosion and sedimentation control plan approved by the County Conservation District, including activities such as growing crops, rotating crops, tilling of soil, and grazing animals.
3. Forest management operations that are following the Department of Environmental Protection's (DEP) management practices contained in its publication "Soil Erosion and Sedimentation Control Guidelines for Forestry" and are operating under an approved erosion and sedimentation plan and must comply with the stream buffer requirements in Section 406.G.
4. Road replacement, development, or redevelopment that has less than one thousand (1,000) square feet of new, additional, or replaced impervious surface/cover, or in the case of earth disturbance only, less than five thousand (5,000) square feet of disturbance, is exempt from this Ordinance.

B. Exemptions for Land Development Activities

The following land development and earthmoving activities are exempt from the drainage plan submission requirements of this Ordinance.

1. A maximum of one thousand (1,000) square feet of new, additional, or replacement proposed impervious surface. Or in the case of earth disturbance resulting in less than one thousand (1,000) square feet of impervious cover (as noted above)
2. Up to a maximum of five thousand (5,000) square feet of disturbed earth. These criteria shall apply to the total development even if the development is to take place in phases. The date of the municipal Ordinance adoption shall be the starting point from which to consider tracts as "parent tracts" upon which future subdivisions and respective earth disturbance computations shall be cumulatively considered.

The activities exempted above are still encouraged to implement the voluntary stormwater management practices as indicated in Ordinance Appendix B.

C. Additional Exemption Criteria:

1. Exemption Responsibilities - An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect public health, safety, and property.
2. HQ and EV Streams - An exemption shall not relieve the Applicant from meeting the special requirements for watersheds draining to identified high quality (HQ) or exceptional value (EV) waters and Source Water Protection Areas (SWPA) and requirements for nonstructural project design sequencing (Section 404).
3. Drainage Problems - If a drainage problem is documented or known to exist downstream of or is expected from the proposed activity, then the Municipality may require the Applicant to comply with this Ordinance.

4. Emergency Exemption - Emergency maintenance work performed for the protection of public health, safety, and welfare. A written description of the scope and extent of any emergency work performed shall be submitted to the District Township within two (2) calendar days of the commencement of the activity. If District Township finds that the work is not an emergency, then the work shall cease immediately, and the requirements of this Ordinance shall be addressed as applicable.
5. Maintenance Exemption - Any maintenance to an existing stormwater management system made in accordance with plans and specifications approved by the municipal Engineer or District Township.
6. Even though the developer is exempt, he is not relieved from complying with other regulations.

Section 107 Repealer

Any ordinance or ordinance provision of the Municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 108 Severability

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

Section 109 Compatibility with Other Ordinances or Legal Requirements

Approvals issued pursuant to this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance.

To the extent that this Ordinance imposes more rigorous or stringent requirements for stormwater management, the specific requirements contained in this Ordinance shall be followed.

Nothing in this Ordinance shall be construed to affect any of the Municipality's requirements regarding stormwater matters that do not conflict with the provisions of this Ordinance. Conflicting provisions in other municipal ordinances or regulations shall be construed to retain the requirements of this Ordinance addressing state water quality requirements.

ARTICLE II – DEFINITIONS

Section 201 Interpretation

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

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

Section 202 Definitions

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

Agricultural Activities – The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing, mushroom growing, nursery, and sod operations and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

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

Applicant – A person who has filed an application for approval to engage in any regulated activity defined in Section 105 of this Ordinance.

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

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

Baseflow – 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 that utilizes woody and herbaceous plants and soils to remove pollutants before infiltration occurs.

BMP (Best Management Practice) – Methods, measures, or practices used to prevent or reduce surface runoff and/or water pollution including, but not limited to, structural and nonstructural stormwater management practices and operation and maintenance procedures. See also Non-structural Best Management Practice (BMP).

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

Channel – An open drainage feature through which stormwater flows. Channels include, but shall not be limited to, natural and man-made drainageways, swales, streams, ditches, canals, and pipes flowing partly full.

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

Cistern – An underground reservoir or tank for storing rainwater.

Conservation District – The Berks County Conservation District.

Conveyance – A facility or structure used for the transportation or transmission of something from one place to another.

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

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

Department – The Pennsylvania Department of Environmental Protection.

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 Ordinance by contract or memorandum of understanding.

Design Professional (Qualified) – A Pennsylvania Registered Professional Engineer, Registered Landscape Architect, or Registered Professional Land Surveyor trained to develop stormwater management plans.

Design Storm – The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., twenty-four (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 soon after a rainfall event and become dry until the next rainfall event.

Developer – A person who seeks to undertake any regulated earth disturbance activities at a project site in the Municipality.

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

Development Site – The specific tract or parcel of land where any regulated activity set forth in Section 105 is planned, conducted, or maintained.

Diameter at Breast Height (DBH) – The outside bark diameter at breast height which is defined as four and one half (4.5) feet (1.37m) above the forest floor on the uphill side of the tree.

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

Discharge – 1. (verb) To release water from a project, site, aquifer, drainage basin, or other point of interest; 2. (noun) The rate and volume of flow of water such as in a stream, generally expressed in cubic feet per second (see 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 – A man-made waterway constructed for irrigation or stormwater conveyance purposes.

Downslope Property Line – That portion of the property line of the lot, tract, or parcels of land being developed, located such that overland or pipe flow from the project site would be directed towards it by gravity.

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

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

Drainage Permit – A permit issued by the Municipality after the drainage plan has been approved.

Drainage Plan – The documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in Section 302.

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

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

Encroachment – A structure or activity that changes, expands, or diminishes the course, current, or cross-section of a watercourse, floodway, or body of water.

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

Erosion and Sediment Control Plan – A plan that is designed to minimize accelerated erosion and sedimentation. Said plan must be submitted to and approved by the appropriate Conservation District before construction can begin.

Exceptional Value Waters – Surface waters of high quality 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 project 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 a lower curve number 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 as delineated by the 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 a watercourse and those portions of the adjoining floodplains that 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).

Fluvial Geomorphology – The study of landforms associated with river channels and the processes that form them.

Forest Management/Timber Operations – Planning and associated activities necessary for the management of forest lands. 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 – 1. (noun) A slope, usually of a road, channel, or natural ground specified in percent and shown on plans as specified herein. 2. (verb) To finish the surface of a roadbed, the top of an embankment, or the bottom of an excavation.

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

Groundwater – Water beneath the earth’s surface that supplies wells and springs and is often between saturated soil and rock.

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

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

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

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

Hydrologic Soil Group – A classification of soils by the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), 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 surfaces include, but are not limited to, streets, sidewalks, pavements, driveway areas, or roofs. Any surface areas designed to be gravel or crushed stone shall be regarded as impervious surfaces.

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

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

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

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

Inflow – The flow entering the stormwater management facility and/or BMP.

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

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

Invert – The lowest surface, the floor or bottom of a culvert, drain, sewer, channel, basin, BMP, or orifice.

Land Development – Any of the following activities:

- (i) The improvement of one (1) lot or two (2) or more contiguous lots, tracts, or parcels of land for any purpose involving:
 - a. A group of two (2) or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure,

or

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

- (ii) A subdivision of land;

- (iii) Development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

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

- (i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.
- (ii) 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.
- (iii) A rock formation, other stratum, or soil condition that 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.

Main Stem (Main Channel) – Any stream segment or other runoff conveyance used as a reach in watershed-specific hydrologic models.

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.

Maximum Design Storm – The maximum (largest) design storm that is controlled by the stormwater facility.

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

Municipality – District Township, Berks County, Pennsylvania.

Natural Condition – Pre-development condition.

Natural Hydrologic Regime – See Hydrologic Regime.

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

Nonpoint Source Pollution – Pollution that enters a waterbody from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

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

Nonstructural Best Management Practice (BMPs) – Methods of controlling stormwater runoff quantity and quality, 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 under the Clean Water Act, which is delegated to DEP in Pennsylvania.

NRCS – Natural Resource Conservation Service (previously SCS).

Open Channel – A conveyance channel that is not enclosed.

Outfall – “Point source” as described in 40 CFR § 122.2 at the point where the Municipality’s storm sewer system discharges to surface waters of the Commonwealth.

Outflow – The flow exiting the stormwater management facility and/or BMP.

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

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

Parking Lot Storage – Involves the use of parking areas as temporary impoundments with controlled release rates during rainstorms.

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

Penn State Runoff Model – The computer-based hydrologic model developed at Pennsylvania State University.

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

Planning Commission – The Planning Commission of District Township.

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

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

Pre-construction – Prior to commencing construction activities.

Pre-development Condition – Undeveloped/natural condition.

Pretreatment – Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily designed to meet the water quality volume requirements of Section 406.

Project Site – The specific area of land where any regulated activities in the Municipality are planned, conducted, or maintained.

Rational Formula – A rainfall-runoff relation used to estimate peak flow.

Reach – Any stream segment or other runoff conveyance used in the watershed-specific hydrologic models.

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

Reconstruction – Demolition and subsequent rebuilding of impervious surface.

Record Drawings – Original documents revised to suit the as-built conditions and subsequently provided by the Engineer to the client. The Engineer reviews the contractor's as-builts against his/her own records for completeness, then either turns these over to the client or transfers the information to a set of reproducibles, in both cases for the client's permanent records.

Redevelopment – Any development that requires demolition or removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as top-layer grinding and re-paving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment.

Regulated Activities – Actions or proposed actions that have an impact on stormwater runoff quality or quantity and that are specified in Section 105 of this Ordinance.

Regulated Earth Disturbance Activity – Defined under NPDES Phase II regulations as earth disturbance activity of one (1) acre or more with a point source discharge to surface waters or the Municipality's storm sewer system or five (5) acres or more regardless of the planned runoff. This includes earth disturbance on any portion of, part, or during any stage of a larger common plan of development.

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

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

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

Retention Basin – A structure in which stormwater is stored and not released during the storm event. Retention basins are designed for infiltration purposes and do not have an outlet. The retention basin must infiltrate stored water in four (4) days or less.

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 twenty-five (25) years.

Riser – A vertical pipe extending from the bottom of a pond that is used to control the discharge rate from the pond for a specified design storm.

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.

Roof Detention – The temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces using controlled-flow roof drains in building designs.

Runoff – Any part of precipitation that flows over the land surface.

SALDO – Subdivision and land development ordinance.

Sediment Basin – A barrier, dam, or retention or detention basin located and designed in such a way as to retain rock, sand, gravel, silt, or other material transported by water during construction.

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

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

Seepage Pit/Seepage Trench – An area of excavated earth filled with loose stone or similar coarse material into which surface water is directed for infiltration into the underground water.

Separate Storm Sewer System – A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) primarily used for collecting and conveying stormwater runoff.

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

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

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

Source Water Protection Areas (SWPA) – The zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

Special Protection Subwatersheds – Watersheds that have been designated by DEP as EV or HQ waters.

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

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

Storage Indication Method – A reservoir routing procedure based on solution of the continuity equation (inflow minus outflow equals the change in storage) with outflow defined as a function of storage volume and depth.

Storm Frequency – The number of times that a given storm “event” occurs or is exceeded on the average in a stated period of years (see Return Period).

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

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

Stormwater Management District – Those subareas of a watershed in which some type of detention is required to meet the plan requirements and the goals of Act 167.

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

Stormwater Management Site Plan – The plan prepared by the Applicant or his representative indicating how stormwater runoff will be managed at the particular site of interest according to this Ordinance.

Stream – A natural watercourse.

Stream Buffer – The land area adjacent to each side of a stream essential to maintaining water quality (see Buffer).

Stream Enclosure – A bridge, culvert, or other structure in excess of one hundred (100) feet in length upstream to downstream which encloses a regulated water of the Commonwealth.

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

Subdivision – The division or redivision of a lot, tract, or parcel of land by any means into two (2) or more lots, tracts, parcels, or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development; provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than ten (10) acres not involving any new street or easement of access or any residential dwelling shall be exempted.

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

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

Timber Operations – See Forest Management.

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

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

Undeveloped Condition – Natural condition (see also Pre-development Condition).

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

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

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

Watershed – Region or area drained by a river, watercourse, or other body of water, whether natural or artificial.

Wellhead – 1. A structure built over a well, 2. The source of water for a well.

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

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

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

Woods – A natural groundcover with more than one (1) viable tree of a DBH of six (6) inches or greater per fifteen hundred (1,500) square feet which existed within three (3) years of application; a cover condition for which SCS curve numbers have been assigned or to which equivalent Rational Method runoff coefficients have been assigned.

ARTICLE III – DRAINAGE PLAN REQUIREMENTS

Section 301 General Requirements

For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, 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 Municipality, obtained an NPDES Permit for Stormwater Discharges Associated with Construction Activities, if greater than 1 Acre of Land Disturbance, from the local Conservation District and/ or DEP, and an adequate Erosion and Sediment Control Plan review by the Conservation District.

Section 302 Drainage Plan Contents

The drainage plan shall consist of a general description of the project including sequencing items described in Section 404, calculations, maps, and plans. All drainage plan materials shall be submitted to the Municipality in a format that is clear, concise, legible, neat, and well organized; otherwise, the drainage plan shall not be accepted for review and shall be returned to the Applicant. The following items shall be included in the drainage plan:

A. General

1. General description of the project including those areas described in Section 404.B.
2. General description of proposed 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 letters of adequacy from the Conservation District.
5. A general description of proposed 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. If the SALDO has more stringent criteria than this Ordinance, then the more stringent criteria shall apply. The contents of the map(s) shall include, but not be limited to:

1. The location of the project relative to highways, municipal boundaries, or other identifiable landmarks.
2. Existing contours at intervals of two (2) feet. In areas of slopes greater than fifteen (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 fifty (50) feet of property lines.
6. An overlay showing soil names, boundaries and limitations (in Tabular Format).
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 (2) feet. In areas of steep slopes (greater than fifteen (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 one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.
13. A north arrow.
14. The total tract 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 existing man-made features beyond the property boundary that would be affected by the project.
17. Location of all open channels, as well as indicating where they are draining after they leave the site (storm sewer, defined drainage swale, stream channel, Waters of the Commonwealth, etc.).
18. Overland drainage patterns and swales.
19. A 20-foot wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.
20. The location of all erosion and sediment control facilities and all post-construction stormwater management facilities, BMPs, systems, etc.
21. A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities that would be located off site. All offsite facilities shall meet the performance standards and design criteria specified in this Ordinance.

22. A statement, signed by the Applicant, acknowledging that any revision to the approved Post-Construction Stormwater Management Plan must be approved by the Municipality and the Conservation District and/ or DEP (if greater than 1 acre of land disturbance), and that a revised erosion and sediment control plan must be submitted to the Conservation District for a determination of adequacy.
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 District Township Stormwater Management and Earth Disturbance Ordinance.”

C. Supplemental Information to be Submitted to the Municipality

1. A written description of the following information shall be submitted by the Applicant and shall include:
 - a. The overall stormwater management concept for the project designed in accordance with Section 404.
 - b. Stormwater runoff computations as specified in this Ordinance.
 - c. Stormwater management techniques to be applied both during and after development.
 - d. Expected project time schedule.
 - e. Development stages or project phases, if so proposed.
 - f. An operations and maintenance plan in accordance with Section 703 of this Ordinance.
2. An erosion and sediment control plan.
3. A description of the effect of the project (in terms of runoff volumes and peak flows) on adjacent properties and on any existing municipal stormwater collection system that may receive runoff from the project site.
4. A Declaration of Adequacy and Highway Occupancy Permit from the Pennsylvania Department of Transportation (PennDOT) District office when utilization of a PennDOT storm drainage system is proposed.

D. Stormwater Management Facilities

1. All PCSWM BMP facilities must be located on a plan and described in detail. The PCSWM Plan Package should include at a minimum Pre- and Post-Drainage Area Plans, an Overall PCSWM Plan, PCSWM Details Sheets, Landscaping or Conservation Plans, etc.
2. When infiltration measures such as seepage pits, beds, or trenches are used, the locations of existing and proposed septic tank, infiltration areas and wells must be shown. Minimum setback distances should be identified from water supply wells, septic areas, and any adjacent or downgradient buildings and/ or structures with below grade floors or inhabitable space.
3. All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.

Section 303 Plan Submission

The Municipality shall require receipt of a complete drainage plan, as specified in this Ordinance.

- A. Proof of application or documentation of required permit(s) or approvals for the programs listed below shall be part of the plan:
 - 1. NPDES Permit for Stormwater Discharges from Construction Activities
 - 2. DEP Joint Permit Application
 - 3. PennDOT Highway Occupancy Permit
 - 4. Chapter 105 (Dam Safety and Waterway Management)
 - 5. Chapter 106 (Floodplain Management)
 - 6. Any other permit under applicable state or federal regulations
- B. The plan shall be coordinated with the state and federal permit process and the municipal SALDO review process.
- C. For projects that require SALDO approval, the drainage plan shall be submitted by the Applicant as part of the preliminary plan submission where applicable for the regulated activity.
- D. For regulated activities that do not require SALDO approval, see Section 301, General Requirements.
- E. Any submissions to the agencies listed above that are found to be incomplete shall not be accepted for review and shall be returned to the Applicant with a notification in writing of the specific manner in which the submission is incomplete.

Section 304 Drainage Plan Review

- A. The municipal Engineer shall review the drainage plan for consistency with this Ordinance.
- B. The municipal Engineer shall review the drainage plan for any subdivision or land development against the municipal SALDO provisions not otherwise superseded by this Ordinance.
- C. The Conservation District, in accordance with established criteria and procedures, shall review the drainage plan for consistency with stormwater management and erosion and sediment pollution control requirements and provide comments to the Municipality. Such comments shall be considered by the Municipality prior to final approval of the drainage plan.
- D. For activities regulated by this Ordinance, the municipal Engineer shall notify the Applicant and the Municipality in writing, within thirty (30) calendar days, whether the drainage plan is consistent with this Ordinance.

1. If the municipal Engineer determines that the drainage plan is consistent with this Ordinance, the municipal Engineer shall forward a letter of consistency to the municipal Secretary who will then forward a copy to the Applicant.
 2. If the municipal Engineer determines that the drainage plan is inconsistent or noncompliant with this Ordinance, the municipal Engineer shall forward a letter to the municipal Secretary with a copy to the Applicant citing the reason(s) and specific Ordinance sections for the inconsistency or noncompliance. Inconsistency or noncompliance may be due to inadequate information to make a reasonable judgment as to compliance with this Ordinance. Any drainage plans that are inconsistent or noncompliant may be revised by the Applicant and resubmitted when consistent with this Ordinance. The municipal Secretary shall then notify the Applicant of the municipal Engineer's findings. Any inconsistent or noncompliant drainage plans may be revised by the Applicant and resubmitted consistent with this Ordinance.
- E. For regulated activities specified in Section 105 of this Ordinance that require a building permit, the municipal Engineer shall notify the municipal Building Permit Officer in writing, within a time frame consistent with the municipal Building Code and/or municipal SALDO, whether the drainage plan is consistent with this Ordinance. The municipal Building Permit Officer shall forward a copy of the consistency/inconsistency letter to the Applicant. Any drainage plan deemed inconsistent may be revised by the Applicant and resubmitted consistent with this Ordinance.
- F. For regulated activities under this Ordinance that require an NPDES Permit Application, the Applicant shall forward a copy of the municipal Engineer's letter stating that the drainage plan is consistent with this Ordinance to the Conservation District and/or DEP. In addition, a short summary of the proposed Post-Construction Stormwater Management design and proposed BMPs should also be forwarded to the Conservation District and/ or DEP. DEP and the Conservation District may consider the municipal Engineer's review comments in determining whether to issue a permit.
- G. The Municipality shall not grant preliminary or final approval to any subdivision or land development for regulated activities specified in Section 105 of this Ordinance if the drainage plan has been found by the municipal Engineer to be inconsistent with this Ordinance. All required permits from DEP must be obtained prior to approval of any subdivision or land development.
- H. No building permits for any regulated activity specified in Section 105 of this Ordinance shall be approved by the Municipality if the drainage plan has been found to be inconsistent with this Ordinance, as determined by the municipal Engineer and Conservation District, or without considering the comments of the municipal Engineer and Conservation District. All required permits from DEP must be obtained prior to issuance of a building permit.

- I. The Applicant shall be responsible for completing record drawings of all stormwater management facilities included in the approved drainage plan. The record drawings and an explanation of any discrepancies with the design plans shall be submitted to the municipal Engineer for final approval. In no case shall the Municipality approve the record drawings until the Municipality receives a copy of an approved Declaration of Adequacy and/or Highway Occupancy Permit from the PennDOT District office, NPDES Permit, and any other applicable permits or approvals from DEP or the Conservation District. The above permits and approvals must be based on the record drawings.
- J. The Municipality's approval of a drainage plan shall be valid for a period not to exceed five (5) years commencing on the date that the Municipality signs the approved drainage plan. If stormwater management facilities included in the approved drainage plan have not been constructed, or if constructed, record drawings of these facilities have not been approved within this five (5) year time period, then the Municipality may consider the drainage plan inconsistent or noncompliant and may revoke any and all permits. Drainage plans that are determined to be inconsistent or noncompliant by the Municipality shall be resubmitted in accordance with Section 306 of this Ordinance.

Section 305 Modification of Plans

- A. A modification to a submitted drainage plan under review by the Municipality for a development site that involves the following shall require a resubmission to the Municipality of a modified drainage plan consistent with Section 303 of this Ordinance and be subject to review as specified in Section 304 of this Ordinance:
 - 1. Change in stormwater management facilities or techniques,
 - 2. Relocation or redesign of stormwater management facilities, or
 - 3. Is necessary because soil or other conditions are not as stated on the drainage plan as determined by the municipal Engineer.
- B. A modification to an already approved or inconsistent or noncompliant drainage plan shall be submitted to the Municipality, accompanied by the applicable municipal review and inspection fee. A modification to a drainage plan for which a formal action has not been taken by the Municipality shall be submitted to the Municipality accompanied by the applicable municipal review and inspection fee.

Section 306 Resubmission of Inconsistent or Noncompliant Drainage Plans

An inconsistent or noncompliant drainage plan may be resubmitted with the revisions addressing the municipal Engineer's concerns documented in writing. It must be addressed to the municipal Secretary in accordance with Section 303 of this Ordinance, distributed accordingly, and be subject to review as specified in Section 304 of this Ordinance. The applicable municipal review and inspection fee must accompany a resubmission of an inconsistent or noncompliant drainage plan.

ARTICLE IV – STORMWATER MANAGEMENT

Section 401 General Requirements

- A. Applicants proposing regulated activities in the Municipality that do not fall under the exemption criteria shown in Section 106 shall submit a drainage plan consistent with this Ordinance and the respective Act 167 Stormwater Management Plan to the Municipality for review. The stormwater management criteria of this Ordinance shall apply to the total proposed development even if development is to take place in stages.
- B. The Applicant is required to find 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.
- C. The drainage plan must be designed consistent with the sequencing provisions of Section 404 to ensure maintenance of the natural hydrologic regime, to promote groundwater recharge, and to protect groundwater and surface water quality and quantity. The drainage plan designer must proceed sequentially in accordance with Article IV of this Ordinance.
- D. Stormwater drainage systems shall be designed in order to permit unimpeded flow along natural watercourses, except as modified by stormwater management facilities or open channels consistent with this Ordinance.
- E. Existing points of concentrated drainage that discharge onto adjacent property shall not be altered in any manner which could cause property damage without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this Ordinance.
- F. Areas of existing diffused drainage discharge, whether proposed to be concentrated or maintained as diffused drainage areas, shall be subject to any applicable discharge criteria in the general direction of existing discharge, except as otherwise provided by this Ordinance. 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 safely transport the concentrated discharge or otherwise prove that no erosion, sedimentation, flooding, or other impacts will result from the concentrated discharge.
- G. Where a development site is traversed by existing streams, drainage easements shall be provided conforming to the line of such streams. The terms of the easement shall conform to the stream buffer requirements contained in Section 406.G of this Ordinance.
- H. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or delineated wetlands shall be subject to approval by DEP through the Joint Permit Application or the Environmental Assessment Approval process, or where deemed appropriate, by the DEP General Permit process. When there is a question as to whether wetlands may be involved, it is the responsibility of the Applicant or his agent to show that the land in question cannot be classified as wetlands; otherwise, approval to work in the area must be obtained from DEP.

- I. Any proposed stormwater management facilities regulated by this Ordinance that would be located on state highway rights-of-way shall be subject to approval by PennDOT.
- J. Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc., is encouraged where soil conditions permit in order to reduce the size or eliminate the need for detention facilities or other structural BMPs.
- K. All stormwater runoff shall be pretreated for water quality prior to discharge to surface or groundwater.
- L. All regulated activities within the Municipality shall be designed, implemented, operated, and maintained to meet the purposes of this Ordinance, through these two elements:
 - 1. Erosion and sediment control during earth disturbance activities (e.g., during construction), and
 - 2. Water quality protection measures after completion of earth disturbance activities (i.e., after construction), including operations and maintenance.
- M. No regulated earth disturbance activities within the Municipality shall commence until the requirements of this Ordinance are met.
- N. Post-construction water quality protection shall be addressed as required by Section 406.
- O. Operations and maintenance of permanent stormwater BMPs shall be addressed as required by Article VII.
- P. All BMPs used to meet the requirements of this Ordinance shall conform to the state water quality requirements and any more stringent requirements as set forth by the Municipality.
- Q. Techniques described in Appendix D (Low Impact Development) of this Ordinance shall be considered because they reduce the costs of complying with the requirements of this Ordinance and the state water quality requirements.
- R. In selecting the appropriate BMPs or combinations thereof, the Applicant shall consider the following:
 - 1. Total contributing area.
 - 2. Permeability and infiltration rate of the site's soils.
 - 3. Slope and depth to bedrock.
 - 4. Seasonal high water table.
 - 5. Proximity to building foundations and wellheads.
 - 6. Erodibility of soils.
 - 7. Land availability and configuration of the topography.
 - 8. Peak discharge and required volume control.
 - 9. Stream bank erosion.

10. Effectiveness of the BMPs to mitigate potential water quality problems.
11. The volume of runoff that will be effectively treated.
12. The nature of the pollutant being removed.
13. Maintenance requirements.
14. Creation/protection of aquatic and wildlife habitat.
15. Recreational value.

Section 402 Permit Requirements by Other Governmental Entities

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

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

Section 403 Erosion and Sediment Control During Regulated Earth Disturbance Activities

- A. No regulated earth disturbance activities within the Municipality shall commence until the Municipality receives an approval from the Conservation District of an erosion and sediment control plan for construction activities.
- B. DEP has regulations that require an erosion and sediment control plan for any earth disturbance activity of five thousand (5,000) square feet or more, under 25 Pennsylvania Code § 102.4(b).
- C. In addition, under 25 Pennsylvania Code Chapter 92, a DEP Permit for Stormwater Discharges Associated with Construction Activities is required for land disturbances greater than 1 acre.
- D. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the Municipality.

- E. A copy of the erosion and sediment control plan and any required permit, as required by DEP regulations, shall be available on the project site at all times.
- F. Additional erosion and sediment control design standards and criteria are recommended to be applied where infiltration BMPs are proposed. They shall include the following:
 - 1. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity. Additional measures, such as placement of orange construction fencing around proposed Infiltration BMPs during construction to minimize or eliminate traffic overtop of these areas, and temporary sealing off of pipes and inlet connections to Infiltration BMPs to prevent sediment clogging should be given consideration.
 - 2. Infiltration BMPs shall not be constructed nor receive runoff until the entire drainage area contributory to the infiltration BMP has achieved final stabilization.

Section 404 Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts)

- A. The design of all regulated activities shall include the following to minimize stormwater impacts.
 - 1. The Applicant shall find practicable alternatives to the surface discharge of stormwater, such as those listed in Appendix E, Table E-4, the creation of impervious surfaces, and the degradation of waters of the Commonwealth and must maintain as much as possible the natural hydrologic regime of the site.
 - 2. An alternative is practicable if it is available and capable of implementation after taking into consideration existing technology and logistics in light of overall project purposes and other municipal requirements.
 - 3. All practicable alternatives to the discharge of stormwater are presumed to have less adverse impact on quantity and quality of waters of the Commonwealth unless otherwise demonstrated.
- B. The Applicant shall demonstrate that the regulated activities were designed in the following sequence. The goal of the sequence is to minimize the increases in stormwater runoff and impacts to water quality resulting from the proposed regulated activity:
 - 1. 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, stream buffers, hydrologic soil groups, wooded areas, and potential infiltration areas. Land development, any existing recharge areas, and other requirements outlined in the municipal SALDO shall also be included.
 - 2. Establish a stream buffer according to Section 406.G.
 - 3. Prepare a draft project layout avoiding sensitive areas identified in Section 404.B.1.

4. Identify site-specific existing conditions drainage areas, discharge points, recharge areas, and hydrologic soil groups A and B (areas conducive to infiltration). Infiltration should still be considered in well draining soils listed as hydrologic soil group C, but additional soils testing should be performed to verify onsite conditions and placement of these BMPs.
5. Evaluate nonstructural stormwater management alternatives:
 - a. Minimize earth disturbance.
 - b. Minimize impervious surfaces.
 - c. Break up large impervious surfaces.
6. Satisfy the groundwater recharge (infiltration) objective (Section 405) and provide for stormwater pretreatment prior to infiltration.
7. Provide for water quality protection in accordance with Section 406 water quality requirements.
8. Provide stream bank erosion protection in accordance with Section 407 stream bank erosion requirements.
9. Determine into what management district the site falls (Ordinance Appendix A) and conduct an existing conditions runoff analysis.
10. Prepare final project design to maintain existing conditions drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, and, to the maximum extent possible, to ensure that the remaining site development has no surface or point discharge.
11. Conduct a proposed conditions runoff analysis based on the final design that meets the management district requirements (Section 408).
12. Manage any remaining runoff prior to discharge through detention, bioretention, direct discharge, or other structural control.

Section 405 Groundwater Recharge

Maximizing the groundwater recharge capacity of the area being developed is required. Design of the infiltration facilities shall consider groundwater recharge to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs that may be designed to compensate for the runoff from parking areas. These measures are required to be consistent with Section 103 and to 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 it cannot be physically accomplished, then the design professional shall be responsible to show that this cannot be physically accomplished. Appropriate soils testing and/or geotechnical evaluation should be included as part of any documentation for infiltration BMPs. If it can be physically accomplished, then the volume of runoff to be infiltrated shall be determined from Section 405.A.2.

A. Infiltration BMPs shall meet the following minimum requirements:

1. 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:
 - a. A minimum depth of twenty-four (24) inches, between the bottom of the BMP and the top of the limiting zone (e.g., SHWT, groundwater, bedrock, etc.).
 - b. An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests conducted by the Applicant's design professional.
 - c. The infiltration facility shall be capable of completely infiltrating the recharge (infiltration) volume (Rev) within three (3) days (72 hours) or less.
 - d. Pretreatment shall be provided prior to infiltration.
2. The size of the infiltration facility shall be based upon the Net Two Year Volume Approach, where the recharge (infiltration) volume (Rev) to be captured and infiltrated shall be the volume difference between the pre-development 2-year, 24-hour storm event and post-development 2-year, 24-hour storm event.

The recharge volume calculated using this section is the minimum volume the Applicant must control through an infiltration BMP facility. However, if a site has areas of soils where additional volume of recharge can be achieved, the Applicant is encouraged to infiltrate as much of the stormwater runoff from the site as possible.

B. Soils Testing – If on-lot infiltration is proposed as part of a project, the Applicant's design professional must demonstrate to the satisfaction of the Municipality that the soils are conducive to infiltration at the proposed location of infiltration facilities. Soils testing shall be completed as follows:

1. Soils testing must be conducted by a qualified design professional and at a minimum shall address depth to limiting zone, soil permeability, and subgrade stability. Soils testing must be observed by a representative of the Municipality.
2. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of sub-grade stability; infiltration may not be ruled out without conducting these tests.
3. Conduct field testing including: test pits to determine soil horizons and depth to limiting zone and permeability tests, at the elevation of the proposed infiltration facility surface, to determine the appropriate hydraulic conductivity rate. Double ring infiltrometer or hydraulic conductivity tests should be used to determine soil permeability (percolation tests are not recommended for design purposes). Site evaluation and soils testing should be conducted in accordance with Appendix C of the Pennsylvania Stormwater Best Management Practices Manual.

4. The proposed infiltration facilities shall be designed for the required recharge (Re_v) volume based on the field determined capacity at the surface elevation of the proposed infiltration facility.
- C. Stormwater Hotspots – Below 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. The Environmental Protection Agency's (EPA) NPDES stormwater program requires some industrial sites to prepare and implement a stormwater pollution prevention plan.

Examples of hotspots:

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

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

- Residential streets and rural highways
- Residential development
- Institutional development
- Office developments
- Non-industrial rooftops
- 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 thirty thousand (30,000) are not designated as stormwater hotspots, it is important to ensure that highway stormwater management plans adequately protect groundwater.

- D. Extreme caution shall be exercised where infiltration is proposed in SWPAs as defined by the local Municipality or water authority.

- E. Infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.
- F. Extreme caution shall be exercised where salt or chloride (municipal 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. Specific consideration should be given to the particular type of salt or deicing material to be used within this watershed in regards to its potential long-term effects on the soils, especially in areas that contain clay soil.
- G. The infiltration requirement in HQ or EV waters shall be subject to the Department's Chapter 93 Anti-degradation Regulations.
- H. An impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Municipality.
- I. The Municipality 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.
- J. Infiltration Design Criteria
 - 1. All infiltration systems shall have appropriate positive overflow controls to prevent storage within one (1) foot of the finished surface or grade.
 - 2. All infiltration systems shall have a minimum setback of fifteen (15) feet from principal structures, ten (10) feet from property lines, 100 feet from wells, and 50 feet from septic system drain fields. Care should be taken to prevent any seepage into subgrade structures.
 - 3. Surface inflows shall be treated to prevent the direct discharge of sediment and pollutants into the infiltration system; accumulated sediment reduces stormwater storage capacity and ultimately clogs the infiltration mechanism.
 - 4. No sand or other particulate matter may be applied to a porous paving surface for winter ice conditions.
 - 5. During site construction, all recharge system components shall be protected from compaction due to heavy equipment operation or storage of fill or construction material. Recharge areas shall be protected from sedimentation. All areas designated for recharge shall not receive runoff until the contributory drainage area has achieved final stabilization.
 - 6. The following procedures and materials shall be required during the construction of all subsurface facilities:
 - a. Excavation for the infiltration facility shall be performed with equipment which will not compact the bottom of the seepage bed/trench, or like facility.

- b. The bottom of the bed and/or trench shall be scarified prior to the placement of aggregate.
 - c. Only clean aggregate, free of fines, shall be allowed.
 - d. The top and sides of all seepage beds, trenches, or like facilities shall be covered with drainage filtration fabric. Fabric shall meet the specifications of PennDOT Publication 408, Section 735 Construction Class 1.
 - e. Perforated distribution pipes connected to centralized catch basins and/or manholes with provision for the collection of debris shall be provided in all facilities. The perforated pipes shall distribute stormwater throughout the entire seepage bed/trench, or like facility.
7. All infiltration facilities which service more than one (1) lot and are considered a common facility shall have an easement provided to the Township for future access if necessary.
8. No more than 50% of the required infiltration volume may be provided in detention basin bottoms. The remaining 50% of infiltration volumes shall be provided at or near the proposed impervious coverage.

Section 406 Water Quality Requirements

The Applicant shall comply with the following water quality requirements of this Article.

- A. No regulated earth disturbance activities within the Municipality shall commence until approval by the Municipality of a plan that demonstrates compliance with post-construction state water quality requirements.
- B. The BMPs shall be designed, implemented, and maintained to meet state water quality requirements and any other more stringent requirements as determined by the Municipality.
- C. To control post-construction stormwater impacts from regulated earth disturbance activities, state water quality requirements can be met by BMPs, including site design, which provide for replication of pre-construction stormwater infiltration and runoff conditions so that post-construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002, September 28, 2002), this may be achieved by the following:
 - 1. Infiltration: replication of pre-construction stormwater infiltration conditions,
 - 2. Treatment: use of water quality treatment BMPs to ensure filtering out of the chemical and physical pollutants from the stormwater runoff, and
 - 3. Stream bank and Stream bed Protection: management of volume and rate of post-construction stormwater discharges to prevent physical degradation of receiving waters (e.g., from scouring).

- D. Developed areas shall provide adequate storage and treatment facilities necessary to capture and treat stormwater runoff. If site conditions allow for infiltration, the water quality volume and the recharge volume are the same volume and may be managed in a single facility. If infiltration can not be physically accomplished, the water quality volume should be calculated using the Net Two Year Volume Approach described in Section 405.A.2. In this case, the water quality volume may be captured and treated by methods other than infiltration BMPs.

This volume requirement can be accomplished by the permanent volume of a wet basin or the detained volume from other BMPs. Where appropriate, wet basins shall be utilized for water quality control and shall follow the guidelines of the BMP manuals referenced in Ordinance Appendix F.

The water quality volume shall take a minimum of 24 hours to be discharged from a BMP facility. Release of the water quality volume 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.

- E. For areas within defined special protection subwatersheds that include EV and HQ waters, the temperature and quality of water and streams shall be maintained through the use of temperature sensitive BMPs and stormwater conveyance systems.
- F. To accomplish the above, the Applicant shall submit original and innovative designs to the municipal Engineer for review and approval. Such designs may achieve the water quality objectives through a combination of different BMPs.
- G. If a perennial or intermittent stream passes through the site, the Applicant shall create a stream buffer extending a minimum of fifty (50) feet to either side of the top-of-bank of the channel. The buffer area shall be maintained with and encouraged to use appropriate native vegetation (refer to Appendix B of the Pennsylvania Stormwater Best Management Practices Manual, latest version, for plant lists). If the applicable rear or side yard setback is less than fifty (50) feet or a stream traverses the site, the buffer width may be reduced to twenty-five (25) percent of the setback and/or to a minimum of ten (10) feet. If an existing buffer is legally prescribed (i.e., deed, covenant, easement, etc.) and it exceeds the requirements of this Ordinance, the existing buffer shall be maintained. This does not include lakes or wetlands.
- H. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office must be provided to the Municipality. The issuance of an NPDES Construction Permit (or permit coverage under the statewide General Permit (PAG-2)) satisfies the requirements of Section 406.A.

Section 407 Stream Bank Erosion Requirements

- A. In addition to the control of water quality volume (in order to minimize the impact of stormwater runoff on downstream stream bank 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 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 twenty-four (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).
- B. The minimum orifice size in the outlet structure to the BMP shall be three (3) inches in diameter where possible, and a trash rack shall be installed to prevent clogging. On sites with small drainage areas contributing 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 three (3) inches can be utilized, provided that the design will prevent clogging of the intake.

Section 408 Stormwater Peak Rate Control

- A. Peak runoff control shall be designed so that proposed condition does not exceed the designated existing condition as follows:
1. Sacony Creek Watershed*

<u>Design Storm Proposed Condition</u>	<u>Design Storm Existing Condition</u>	<u>Equivalent Release Rate</u>
2-year	1-year	-
10-year	2.33-year	50%
50-year	10-year	50%

*See Appendix A for Sacony Creek Watershed area map.

2. Remainder of District Township – Development sites must control proposed conditions runoff rates to 50% of the existing conditions runoff rates for the 2-year, 5-year, 10-year, 25-year, 50-year and 100-year storm events.
- B. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the site. In this case, peak discharge in any direction may be a 100% release rate provided that the overall site discharge meets the weighted average release rate.
- C. 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.

- D. 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 peak rate control standards noted above. In other words, unimpacted areas bypassing the stormwater management facilities would not be subject to the peak rate control standards.
- E. Alternate Criteria for Redevelopment Sites - For redevelopment sites, one of the following minimum design parameters shall be accomplished, whichever is most appropriate for the given site conditions as determined by District Township;
 - 1. Meet the full requirements specified by Sections 408.A through 408.D or
 - 2. Reduce the total impervious surface on the site by at least twenty percent (20%); based upon a comparison of existing impervious surface to proposed impervious surface.

Section 409 Calculation Methodology

- A. Stormwater runoff from all development sites with a drainage area of greater than five (5) acres shall be calculated using a generally accepted calculation technique that is based on the NRCS Soil Cover Complex Method. Table 409-1 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. Note that successors to the methods listed in Table 409-1 are also acceptable, such as WinTR55 for TR-55 and WinTR20 for TR-20. The Municipality may allow the use of the Rational Method to estimate peak discharges from drainage areas that contain less than five (5) acres.

TABLE 409-1
ACCEPTABLE COMPUTATION METHODOLOGIES FOR
STORMWATER MANAGEMENT PLANS

Method	Developed By	Applicability
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary.
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.
HEC-1/ HEC-HMS	US Army Corps of Engineers	Applicable where use of a full hydrologic computer is desirable or necessary.
PSRM	Penn State University	Applicable where use of a hydrologic 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 five (5) acres, or as approved by the Municipality and/or municipal Engineer.
Other Methods	Varies	Other computation methodologies approved by the Municipality and/or municipal Engineer.

- B. All calculations consistent with this Ordinance using the Soil Cover Complex Method shall use the appropriate design rainfall depths for the various return period storms according to the region in which they are located as presented in Table E-1 in Appendix E of this Ordinance. 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 twenty-four (24) hours.
- C. The following criteria shall be used for runoff calculations:
1. For development sites not considered redevelopment, the ground cover used in determining the existing conditions flow rates shall be as follows:
 - a. Wooded sites shall use a ground cover of "woods in good condition." A site shall be considered to be a wooded site where a biological community dominated by trees and other woody plants exists that covers an area of 10,000 square feet or more, and contains at least 100 trees with at least 50% of those trees having a dbh of 2" or greater. (Duerksen, Christopher J., with Suzanne Richman, Tree Conservation Ordinances, Planning Advisory Service Report Number 446, American Planning Association, Chicago, Illinois, and Scenic America, District, D.C., August, 1993.)
 - b. The undeveloped portion of the site including agriculture, bare earth, and fallow ground shall be considered as "meadow in good condition," unless the natural ground cover generates a lower curve (CN) number or Rational "c" value (i.e., woods) as listed in Tables E-2 or E-3 in Appendix E of this Ordinance.
 - c. Offsite land use conditions used to determine storm flows for designing storm facilities shall be based on existing land uses assuming winter or poor land cover conditions.
 2. For development considered redevelopment sites, the ground cover used in determining the existing conditions flow rates for the developed portion of the site shall be based upon actual land cover conditions.
- D. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods presented in the appropriate curves from the PennDOT Storm-Duration-Frequency Chart (Region 4 is included as Figure E-3-A. The user should refer to the Atlas 14, Volume 2, Storm-Duration-Frequency Chart). Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of *Urban Hydrology for Small Watersheds*, NRCS, TR-55 (as amended or replaced from time to time by NRCS). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation.
- E. Runoff curve numbers (CN) for both existing and proposed conditions to be used in the Soil Cover Complex Method shall be obtained from Table E-2 in Appendix E of this Ordinance.
- F. Runoff coefficients (c) for both existing and proposed conditions for use in the Rational Method shall be obtained from Table E-3 in Appendix E of this Ordinance.

- G. 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 in accordance with Table E-5 in Appendix E.
- H. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Ordinance using any generally accepted hydraulic analysis technique or method.
- I. The design of any stormwater detention facilities intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. The design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The Municipality may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

Section 410 Other Requirements

- A. All wet basin designs shall incorporate biologic controls consistent with the West Nile Guidance found in Appendix G.
- B. Any stormwater management facility (i.e., detention basin) required or regulated by this Ordinance designed to store runoff and requiring a berm or earthen embankment shall be designed to provide an emergency spillway to handle flow up to and including the 100-year proposed conditions. The height of embankment must provide a minimum one (1) foot of freeboard above the maximum pool elevation computed when the facility functions for the 100-year proposed conditions inflow. Should any stormwater management facility require a dam safety permit under DEP Chapter 105, the facility shall be designed in accordance with Chapter 105 and meet the regulations of Chapter 105 concerning dam safety. Chapter 105 may be required to pass storms larger than the 100-year event.
- C. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures) and any work involving wetlands governed by DEP Chapter 105 regulations (as amended or replaced from time to time by DEP) shall be designed in accordance with Chapter 105 and will require a permit from DEP.
- D. Any other drainage conveyance facility that does not fall under Chapter 105 regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the 25-year design storm with a minimum one (1.0) foot of freeboard measured below the lowest point along the top of the roadway. Any facility that constitutes a dam as defined in DEP Chapter 105 regulations may require a permit under dam safety regulations. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.

- E. Any drainage conveyance facility and/or channel not governed by Chapter 105 regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the 25-year design storm. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from that structure. Roadway crossings must be able to convey runoff from a 100-year design storm. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.
- F. Storm sewers must be able to convey proposed conditions runoff from a 25-year design storm without surcharging inlets, where appropriate.
- G. Adequate erosion protection shall be provided along all open channels and at all points of discharge.
- H. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Municipality reserves the right to disapprove any design that would result in construction in or continuation of a stormwater problem area.

Section 411 Standards for Detention Basins

- A. The following criteria shall be used for the design of detention and wet basins. Any reference to detention basin shall also include wet basins.
 - 1. When detention basins are provided, they shall be designed to utilize the natural contours of the land wherever possible. When such design is impracticable, the construction of the basin shall utilize slopes as flat as possible to blend the structure into the terrain. All basins shall have maximum side slope of three (3) horizontal to one (1) vertical (3:1).
 - 2. A routed hydrograph and calculations shall be furnished for each storm through the detention basin.
 - 3. Emergency overflow facilities (i.e., emergency spillway) shall be provided for all detention facilities which shall pass a one hundred (100) year storm under orifice block conditions.
- B. In the design of detention basins, the following items listed below shall be submitted to the Township for review. Any reference to detention basin shall also include retention basin.
 - 1. Design computations for the sizing of the outlet device.
 - 2. A stage-storage curve for said detention/retention basin.
 - 3. Flood routing and/or storage requirement calculations.
 - 4. A plan showing the berm embankment and outlet structure. The plan shall indicate top of berm elevations, width of the top of the berm, side slopes, emergency spillway elevation, and elevations of the outlet structure, including riser, dimensions and spacing of anti-seep collars.
 - 5. A cross-section through the outlet structure, emergency spillway and berm embankment.

6. A detailed plan of the trash rack and anti-vortex device (if required).
7. The maximum side slope of earthen detention embankments shall be three (3) horizontal to one (1) vertical (3:1). The top and/or toe (whichever is closer to a property line) of any slope shall be located a minimum of twenty-five feet (25') from any property line. Whenever possible, the side slopes and basin shape shall conform to the natural topography.
8. The minimum top width of the detention basin berm shall be ten feet (10'). A cutoff trench (key-way) of impervious material shall be provided under all embankments that require fill material. The cutoff trench shall be a minimum of eight feet (8') wide, two feet (2') deep and minimum of two feet (2') over the pipe, and have maximum side slopes of one (1) horizontal to one (1) vertical (1:1).
9. In order to insure proper drainage on the floor of the basin, a minimum grade of two percent (2%) shall be maintained for areas of sheet flow. For channel flow, a minimum grade of one percent (1%) shall be maintained. Under certain circumstances, such as continuous seasonal flow, the Township may require a low flow channel to be constructed. Wet basins may be designed with a flat bottom upon approval by the Township Engineer.
10. All detention basin embankments shall be placed in a maximum of eight inch (8") lifts to a minimum of ninety-five percent (95%) of maximum dry density as established by ASTM D-1557. Prior to proceeding to the next lift, the compaction shall be checked by the Township Engineer or the Soils Engineer. The developer's contractor shall obtain the services of a qualified laboratory technician to conduct compaction tests on the leading and the trailing edge of the berm along with the top of the berm. All tests shall be furnished to the Township for review.
11. Whenever possible, the emergency spillway for detention basins shall be constructed on undisturbed ground. Emergency spillways shall be constructed of reinforced concrete checker blocks or other permanent material approved by the Township Engineer. All emergency spillways shall be constructed so that the detention basin berm is protected against erosion. The minimum capacity of all emergency spillways shall be the peak flow rate from the one hundred (100) year design storm after development. The construction material of the emergency spillway shall extend along the upstream and downstream berm embankment slopes. Construction material on the upstream slope of the emergency spillway shall extend to a minimum of two feet (2') below the spillway crest elevation. The downstream slope of the spillway shall as a minimum extend to the toe of the berm embankment. The emergency spillway shall not discharge over earthen fill and/or easily erodible material.
12. A minimum freeboard of one foot (1') shall be provided between the one hundred (100) year design stormwater elevation and the invert of the emergency spillway, and between the design flow through the emergency spillway and the top of the berm.

13. Anti-seep collars shall be installed around the pipe barrel within the normal saturation zone of the detention basin berms. The anti-seep collars and their connections to the pipe barrel shall be watertight. The anti-seep collars shall extend a minimum of two feet (2') beyond the outside of the principal pipe barrel. The maximum spacing between collars shall be fourteen (14) times the minimum projection of the collar measured perpendicular to the pipe. A minimum of two (2) anti-seep collars shall be installed on each pipe outlet.
14. All outlet pipes through the basin berm shall be reinforced concrete pipe having O-ring joints. All outlet structures shall be concrete.
15. Energy dissipating devices shall be placed at all basin outlets.
16. Easements of all basins shall be provided.
17. Permanent detention basins outlet structures shall be designed to incorporate multiple stage outlet release devices.
18. A cross-section through the basin from the proposed pipe termination into the basin to the termination of the outlet pipe shall be provided.
19. At the discretion of the Township, the perimeter of the detention/retention pond shall be enclosed with a standard chain link security fence or approved equal with a minimum height of four feet (4') with locking gates. Each basin shall be provided with two gates, one wide enough for maintenance vehicles and a second gate for pedestrian access. The security fence and gate shall be subject to the approval of the Township.
20. Permanent plantings for wet ponds shall be designed by a wetland biologist to have a mixture of plants that thrive in wet areas.

Section 412 Stormwater Collection and Conveyance Standards

- A. Drainage easements shall be provided to accommodate all storm drainage requirements and shall be a minimum of twenty feet (20') in width. Easements shall be provided for all watercourses and storm drainage piping that are not located within street rights-of-way.
- B. Storm sewers, as required, shall be placed in the cartway of curbed streets and parallel to the roadway shoulders of streets without curbs. When located in undedicated land with approval by the Board of Supervisors, storm sewers shall be placed within an easement not less than twenty feet (20') wide.
- C. Storm Drainage Pipes. The minimum diameter of all storm drainage pipes shall be fifteen inches (15") or an equivalent thereto. All storm drainage piping shall be laid in a straight line. Storm drainage piping shall not be permitted under buildings or structures. The minimum grade of piping shall be one-half of one percent (0.5%). All pipe shall be reinforced concrete with O-rings joints, or smooth bore high density polyethylene pipe. All structures exposed to the surface shall be reinforced concrete.

- D. When proposed, manholes and inlets (catch basins) shall not be spaced more than four hundred feet (400') apart for pipes of less than or equal to twenty-four inch (24") diameter and five hundred feet (500') apart for pipes of greater than twenty-four inch (24") diameter. Additional, manholes or inlets shall be placed at all changes in alignment, grade or pipe size, and at all points of convergence of two (2) or more influent storm sewer lines. Inlets may be substituted for manholes where they will serve a useful purpose. In addition, the following standards shall apply:
1. Manholes and inlets must conform to the standards established by the Pennsylvania Department of Transportation and must be supplied by a PennDOT Bulletin 15 approved supplier. Such requirement shall be listed on the plan.
 2. At street intersections, inlets shall be placed to prevent the flow of water across intersections.
 3. Inlets shall be spaced to limit the gutter spread to within the parking lane, not more than eight feet (8') during the ten (10) year storm. Capacity of the inlets shall not exceed four (4) cubic feet per second (cfs) for four foot (4') inlets and five (5) cfs for six foot (6') inlets in non-ponding areas.
 4. Inlets with a depth greater than five feet (5') must be provided with ladder rungs and noted on the plan as such.
 5. When there is a change in pipe size in the inlet, the elevation of the top of pipes shall be the same or the smaller pipe higher. A minimum drop of two inches (2") shall be provided at the inlet pipe invert elevation and the outlet pipe elevation.
 6. Inlets shall contain a marker which discourages the discharge of anything other than stormwater into the inlet.
 7. Inlets in paved areas shall be equipped with bicycle safe grates. Inlets in non-paved areas shall be equipped with standard grates.
 8. Manhole covers shall have the word "STORM" cast on the top of the cover.
- E. Properly designed, graded and lined drainage swales may be permitted in lieu of storm sewers in commercial, industrial and residential areas where approved by the Township. Swale lining must meet the County Soil Conservation design standards. All drainage channels shall have a maximum side slope grade of three (3) horizontal to one (1) vertical (3:1). All drainage swales shall be provided with a minimum six-inch (6") freeboard, measured from the top of the design storm flow to the top of the swale.
- F. Curb requirements shall vary according to street hierarchy and intensity of the proposed development. Curbing may also be required for any one or more of the following reasons:

1. For stormwater management.
 2. To stabilize the pavement/cartway edge.
 3. To delineate parking areas.
 4. To delineate vehicular access lanes.
 5. At intersections, corners and tight radii.
- G. The maximum encroachment of water on the roadway pavement shall not exceed four inches (4") in depth at the curb line during a ten (10) year frequency storm. Inlets shall be provided to control the encroachment of water on the pavement.
- H. Pipe underdrains and/or pavement base drains shall be provided in areas delineated as having a "seasonal high water table" and in areas deemed necessary by the Township Engineer during the construction phase of the project. The installation of the underdrain system shall be approved by the township Engineer and paid for by the developer. Pipe underdrains and pavement base drains shall be constructed in accordance with PennDOT Pub. 408, Section 610, as amended.
- I. Pipe end sections and/or head walls shall be utilized at all terminated pipe segments.
- J. All drainage structures located within a State highway right-of-way shall be reviewed and approved by the Pennsylvania Department of Transportation (PennDOT). A letter from PennDOT indicating such approval shall be submitted to the Township prior to municipal approval.
- K. Energy dissipaters shall be provided shall be provided at all pipe end treatments.
- L. At the discretion of the Township, in situations in which the design standards and requirements do not apply to the site conditions, the Township Engineer shall suggest or provide additional and/or alternative design methods to meet the objectives of this Ordinance.

ARTICLE V – INSPECTIONS

Section 501 Inspections

- A. The municipal Engineer or his municipal designee shall inspect all phases of the installation of the permanent BMPs and/or stormwater management facilities as deemed appropriate by the municipal Engineer.
- B. During any stage of the work, if the municipal Engineer or his municipal designee determines that the permanent BMPs and/or stormwater management facilities are not being installed in accordance with the approved stormwater management plan, the Municipality shall revoke any existing permits or other approvals and issue a cease and desist order until a revised drainage plan is submitted and approved, as specified in this Ordinance, and until the deficiencies are corrected.
- C. A final inspection of all BMPs and/or stormwater management facilities shall be conducted by the municipal Engineer or his municipal designee to confirm compliance with the approved drainage plan prior to the issuance of any occupancy permit.

ARTICLE VI – FEES AND EXPENSES

Section 601 Municipality Drainage Plan Review and Inspection Fee

Fees shall be established by the Municipality to defray plan review and construction inspection costs incurred by the Municipality. All fees shall be paid by the Applicant at the time of drainage plan submission. A review and inspection fee schedule shall be established by resolution of the municipal Governing Body for reviewing drainage plans and conducting inspections pursuant to Section 501. For drainage plans that are part of a subdivision or land development plan, reviewed inspection fees shall be reimbursed as part of the subdivision or land development process as established in the SALDO. The Municipality shall periodically update the review and inspection fee schedule to ensure that review costs are adequately reimbursed.

Section 602 Expenses Covered by Fees

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

- A. Administrative costs.
- B. The review of the drainage plan by the Municipality and the municipal Engineer.
- 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.
- F. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

ARTICLE VII – MAINTENANCE RESPONSIBILITIES

Section 701 Performance Guarantee

- A. For subdivisions and land developments, the Applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as:
 - 1. Required by the approved drainage plan equal to or greater than the full construction cost of the required controls, or
 - 2. The amount and method of payment provided for in the SALDO.
- B. For other regulated activities, the Municipality may require a financial guarantee from the Applicant.

Section 702 Responsibilities for Operations and Maintenance of Stormwater Controls and BMPs

- A. No regulated earth disturbance activities within the Municipality shall commence until approval by the Municipality of a stormwater control and BMP operations and maintenance plan that describes how the permanent (e.g., post-construction) stormwater controls and BMPs will be properly operated and maintained.
- B. The following items shall be included in the stormwater control and BMP operations and maintenance plan:
 - 1. Map(s) of the project area, in a form that meets the requirements for recording at the offices of the Recorder of Deeds of Berks County, shall be submitted on 24-inch x 36-inch sheets. The contents of the maps(s) shall include, but not be limited to:
 - a. Clear identification of the location and nature of permanent stormwater controls and BMPs,
 - b. The location of the project site relative to highways, municipal boundaries, or other identifiable landmarks,
 - c. Existing and final contours at intervals of two (2) feet, or others as appropriate,
 - d. Existing streams, lakes, ponds, or other bodies of water within the project site area,
 - e. Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved,
 - f. The locations of all existing and proposed utilities, sanitary sewers, and water lines within fifty (50) feet of property lines of the project site,
 - g. Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added,
 - h. Proposed final structures, roads, paved areas, and buildings, and

- i. A 15-foot wide access easement around all stormwater controls and BMPs that would provide ingress to and egress from a public right-of way.
 2. A description of how each permanent stormwater control and BMP will be operated and maintained, and the identity and contact information associated with the person(s) responsible for operations and maintenance,
 3. The name of the project site, the name and address of the owner of the property, and the name of the individual or firm preparing the plan, and
 4. A statement, signed by the landowner, acknowledging that the stormwater controls and BMPs are fixtures that can be altered or removed only after approval by the Municipality.
- C. The stormwater control and BMP 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:
1. If a 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 Municipality, stormwater controls and BMPs may also be dedicated to and maintained by the Municipality;
 2. If a 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.
- D. The Municipality shall make the final determination on the continuing operations and maintenance responsibilities. The Municipality reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater controls and BMPs.

Section 703 Municipal Review of a Stormwater Control and BMP Operations and Maintenance Plan

- A. The Municipality shall review the stormwater control and BMP operations and maintenance plan for consistency with the purposes and requirements of this Ordinance and any permits issued by DEP.
- B. The Municipality shall notify the Applicant in writing whether or not the stormwater control and BMP operations and maintenance plan is approved.
- C. The Municipality may require a "record drawing" of all stormwater controls and BMPs and an explanation of any discrepancies with the operations and maintenance plan.

Section 704 Adherence to an Approved Stormwater Control and BMP Operations and Maintenance Plan

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

Section 705 Operations and Maintenance Agreement for Privately Owned Stormwater Controls and BMPs

- A. The Applicant shall sign an operations and maintenance agreement with the Municipality covering all stormwater controls and BMPs that are to be privately owned. The maintenance agreement shall be transferred with transfer of ownership. The agreement shall be substantially the same as the agreement in Appendix H of this Ordinance.
- B. 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 Municipality.

Section 706 Stormwater Management Easements

- A. Stormwater management easements are required for all areas used for off-site stormwater control.
- B. Stormwater management easements shall be provided by the Applicant or property owner if necessary for access for inspections and maintenance or the preservation of stormwater runoff conveyance, infiltration, and detention areas and other stormwater controls and BMPs by persons other than the property owner. The purpose of the easement shall be specified in any agreement under Section 705.

Section 707 Maintenance Agreement for Privately Owned Stormwater Facilities

- A. Prior to final approval of the site's drainage plan, the Applicant shall sign and record the maintenance agreement contained in Appendix H which is attached and made part hereof covering all stormwater control facilities that are to be privately owned.
- B. Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The maintenance agreement shall be subject to the review and approval of the municipal Solicitor and Governing Body.

Section 708 Recording of an Approved Stormwater Control and BMP Operations and Maintenance Plan and Related Agreements

- A. The owner of any land upon which permanent stormwater controls and BMPs will be placed, constructed, or implemented, as described in the stormwater control and BMP operations and maintenance plan, shall record the following documents in the Office of the Recorder of Deeds for Berks County, within ninety (90) days of approval of the stormwater control and BMP operations and maintenance plan by the Municipality:

1. The operations and maintenance plan, or a summary thereof,
 2. Operations and maintenance agreements under Section 705, and
 3. Easements under Section 706
- B. The Municipality may suspend or revoke any approvals granted for the project site upon discovery of failure on the part of the owner to comply with this section.

Section 709 Municipal Stormwater Control and BMP Operation and Maintenance Fund

- A. Persons installing stormwater controls or BMPs shall be required to pay a specified amount to the Municipal Stormwater Control and BMP Operation and Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:
1. If the stormwater control or BMP is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the Municipality for a period of ten (10) years, as estimated by the municipal Engineer. After that period of time, inspections will be performed at the expense of the Municipality.
 2. If the stormwater control or BMP is to be owned and maintained by the Municipality, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The municipal Engineer will establish the estimated costs utilizing information submitted by the Applicant.
 3. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The municipal Engineer shall determine the present worth equivalents, which shall be subject to the approval of the Governing Body.

ARTICLE VIII – PROHIBITIONS

Section 801 Prohibited Discharges

Note: The following language taken from DEP's NPDES program and model NPDES ordinance is required to be incorporated into this Ordinance.

- A. No person in the Municipality shall allow, or cause to allow, stormwater discharges into the Municipality's separate storm sewer system which are not composed entirely of stormwater, except (1) as provided in subsection B below, and (2) discharges allowed under a state or federal permit.
- B. Discharges that may be allowed based on a finding by the Municipality that the discharge(s) do not significantly contribute to pollution to surface waters of the Commonwealth, are:
 - 1. Discharges from fire fighting activities
 - 2. Potable water sources including dechlorinated water line and fire hydrant flushings
 - 3. Irrigation drainage
 - 4. Routine external building washdown (which does not use detergents or other compounds)
 - 5. Air conditioning condensate
 - 6. Water from individual residential car washing
 - 7. Spring water from crawl space pumps
 - 8. Uncontaminated water from foundation or from footing drains
 - 9. Flows from riparian habitats and wetlands
 - 10. Lawn watering
 - 11. Pavement washwaters 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
 - 12. Dechlorinated swimming pool discharges
 - 13. Uncontaminated groundwater
- C. In the event that the Municipality determines that any of the discharges identified in Section 801.B significantly contribute to pollution of waters of the Commonwealth, or is so notified by DEP, the Municipality will notify the responsible person to cease the discharge.
- D. Upon notice provided by the Municipality under Section 801.C, the discharger will have a reasonable time, as determined by the Municipality, to cease the discharge consistent with the degree of pollution caused by the discharge.
- E. Nothing in this section shall affect a discharger's responsibilities under state law.

Section 802 Prohibited Connections

- A. The following connections are prohibited, except as provided in Section 801.B above:
 - 1. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter the separate storm sewer system and any connections to the storm drain system from indoor drains and sinks; and
 - 2. Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system that has not been documented in plans, maps, or equivalent records and approved by the Municipality.

Section 803 Roof Drains

- A. Roof drains shall not be connected to streets, sanitary or storm sewers, or roadside ditches in order to promote overland flow and infiltration/percolation of stormwater where advantageous to do so.
- B. When it is more advantageous to connect directly to streets or storm sewers, connections of roof drains to streets or roadside ditches may be permitted on a case by case basis as determined by the Municipality.
- C. Roof drains shall discharge to infiltration areas or vegetative BMPs to the maximum extent practicable.

Section 804 Alteration of BMPs

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

ARTICLE IX – ENFORCEMENT AND PENALTIES

Section 901 Right-of-Entry

- A. Upon presentation of proper credentials, duly authorized representatives of the Municipality may enter at reasonable times upon any property within the Municipality to inspect the implementation, condition, or operation and maintenance of the stormwater controls or BMPs in regard to any aspect governed by this Ordinance.
- B. Stormwater control and BMP owners and operators shall allow persons working on behalf of the Municipality ready access to all parts of the premises for the purposes of determining compliance with this Ordinance.
- C. Persons working on behalf of the Municipality shall have the right to temporarily locate on any stormwater control or BMP in the Municipality such devices as are necessary to conduct monitoring and/or sampling of the discharges from such stormwater control or BMP.
- D. Unreasonable delays in allowing the Municipality access to a stormwater control or BMP is a violation of this Article.

Section 902 Public Nuisance

- A. The violation of any provision of this Ordinance is hereby deemed a public nuisance.
- B. Each day that a violation continues shall constitute a separate violation.

Section 903 Enforcement Generally

- A. Whenever the Municipality finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the Municipality may order compliance by written notice to the responsible person. Such notice may, without limitation, require the following remedies:
 - 1. Performance of monitoring, analyses, and reporting;
 - 2. Elimination of prohibited connections or discharges;
 - 3. Cessation of any violating discharges, practices, or operations;
 - 4. Abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
 - 5. Payment of a fine to cover administrative and remediation costs;
 - 6. Implementation of stormwater controls and BMPs; and
 - 7. Operation and maintenance of stormwater controls and BMPs.
- B. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work will be done by the Municipality or designee, and the expense thereof shall be charged to the violator.

- C. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Municipality from pursuing any and all other remedies available in law or equity.

Section 904 Suspension and Revocation of Permits and Approvals

- A. Any building, land development, or other permit or approval issued by the Municipality may be suspended or revoked by the Municipality for:
1. Noncompliance with or failure to implement any provision of the permit;
 2. A violation of any provision of this Ordinance; or
 3. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution, or which endangers the life, health, or property of others.
- B. A suspended permit or approval shall be reinstated by the Municipality when:
1. The municipal Engineer or designee has inspected and approved the corrections to the stormwater controls and BMPs or the elimination of the hazard or nuisance, and/or
 2. The Municipality is satisfied that the violation of the Ordinance, law, or rule and regulation has been corrected.
- C. A permit or approval that has been revoked by the Municipality cannot be reinstated. The Applicant may apply for a new permit under the procedures outlined in this Ordinance.

Section 905 Penalties

- A. Enforcement against violations of the provisions of this Ordinance shall be by action brought before a district justice in the same manner provided for the enforcement of summary offenses under Pennsylvania Rules of Criminal Procedure. Upon conviction, a violator shall be subject to a fine of not more than \$1,000 for each violation, recoverable with costs, or imprisonment to the extent allowed by law for the punishment of summary offenses, or both. Each day that a violation continues shall be a separate offense.
- B. In addition, the Municipality, through its Solicitor, may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

Section 906 Notification

In the event that a person fails to comply with the requirements of this Ordinance or fails to conform to the requirements of any permit issued hereunder, the Municipality shall provide written notification of the violation. Such notification shall state the nature of the violation(s) and establish a time limit for correction of these violation(s). Failure to comply within the time specified shall subject such person to the penalty provisions of this Ordinance. All such penalties

shall be deemed cumulative and shall not prevent the Municipality from pursuing any and all remedies. It shall be the responsibility of the owner of the real property on which any regulated activity is proposed to occur, is occurring, or has occurred to comply with the terms and conditions of this Ordinance.

Section 907 Enforcement

The municipal Governing Body is hereby authorized and directed to enforce all of the provisions of this Ordinance. All inspections regarding compliance with the drainage plan shall be the responsibility of the municipal Engineer or other qualified persons designated by the Municipality.

- A. A set of design plans approved by the Municipality shall be on file at the site throughout the duration of the construction activity. Periodic inspections may be made by the Municipality or designee during construction.
- B. It shall be unlawful for any person, firm, or corporation to undertake any regulated activity under Section 104 on any property except as provided for in the approved drainage plan and pursuant to the requirements of this Ordinance. It shall be unlawful to alter or remove any control structure required by the drainage plan pursuant to this Ordinance or to allow the property to remain in a condition that does not conform to the approved drainage plan.
- C. At the completion of the project and as a prerequisite for the release of the performance guarantee, the owner or his representatives shall:
 - 1. 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.
 - 2. Provide a set of as-built (record) drawings.
- D. After receipt of the certification by the Municipality, a final inspection shall be conducted by the municipal Engineer or designated representative to certify compliance with this Ordinance.
- E. Prior to revocation or suspension of a permit and at the request of the Applicant, the Governing Body will schedule a hearing to discuss the noncompliance if there is no immediate danger to life, public health, or property. The expense of a hearing shall be the Applicant's responsibility.
- F. Occupancy Permit: An occupancy permit shall not be issued unless the certification of completion pursuant to Section 907.C.1 has been secured. The occupancy permit shall be required for each lot owner and/or Applicant for all subdivisions and land developments in the Municipality.

Section 908 Appeals

- A. Any person aggrieved by any action of District Township or its designee may appeal to the District Township Board of Supervisors within thirty (30) days of that action.

- B. Any person aggrieved by any decision of the District Township Board of Supervisors may appeal to the County Court of Common Pleas of Berks County where the activity has taken place within thirty (30) days of the municipal decision.

ENACTED and ORDAINED at a regular meeting of the
Board of Supervisors

District Township

on the _____ of _____

_____, 20____.

This Ordinance shall take effect immediately.

Edward Overberger, Supervisor

Daniel Metzker, Supervisor

Stuart Cox, Supervisor

ATTEST:

Secretary

I hereby certify that the foregoing Ordinance was advertised in the _____
_____, 20____, a newspaper of general circulation in District
Township and was duly enacted and approved as set forth at a regular meeting of the
District Township Board of Supervisors held on _____, 20____.

Secretary

ORDINANCE APPENDIX A
SACONY CREEK WATERSHED MAP

ORDINANCE APPENDIX B

Voluntary stormwater management procedures for projects with less than one thousand (1,000) square feet of proposed impervious area or less than five thousand (5,000) square feet of earth disturbance

VOLUNTARY STORMWATER MANAGEMENT PROCEDURES FOR PROJECTS MEETING THE LAND COVER EXEMPTION CRITERIA

What are the Act 167 stormwater management requirements?

Pennsylvania Act 167 was authorized on October 4, 1978 (32 P.S., P.L. 864) and gave Pennsylvania Municipalities the power to regulate activities that affect stormwater runoff and surface and groundwater quantity and quality.

Who is affected by these requirements?

The Act 167 stormwater management requirements affect all NEW development in the Municipality. Individual home construction projects on single-family lots that result in less than one thousand (1,000) square feet of impervious area (including the building footprint driveway, sidewalks, and parking areas) or less than five thousand (5,000) square feet of earth disturbance are not required to submit formal drainage plans to the Municipality or County; however, they are still encouraged to address water quality and groundwater recharge criteria specified in this Ordinance (Sections 405 and 406).

Do I require professional services to meet these requirements?

This brochure has been developed to assist the individual homeowner in meeting the voluntary water quality and groundwater recharge goals of this Ordinance. If the guidelines presented in this brochure are followed, the individual homeowner will not require professional services to comply with these water quality and groundwater recharge goals.

What do I need to send to the Municipality?

Even though a formal drainage plan is not required for individual lot owners, a brief description of the proposed infiltration facilities, including types of material to be used, total impervious areas and volume calculations as shown above, and a simple sketch plan showing the following information shall be submitted to the contractor prior to construction:

- Location of proposed structures, driveways, or other paved areas with approximate size in square feet.
- Location of any existing or proposed on-site septic system and/or potable water wells showing rough proximity to infiltration facilities.

Determination of Recharge Volume

The amount of recharge volume that should be provided can be determined using Ordinance Section 405.

Example Recharge Volume:

STEP 1 – Determine Total Impervious Surfaces.

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev) Using Ordinance Section 405.

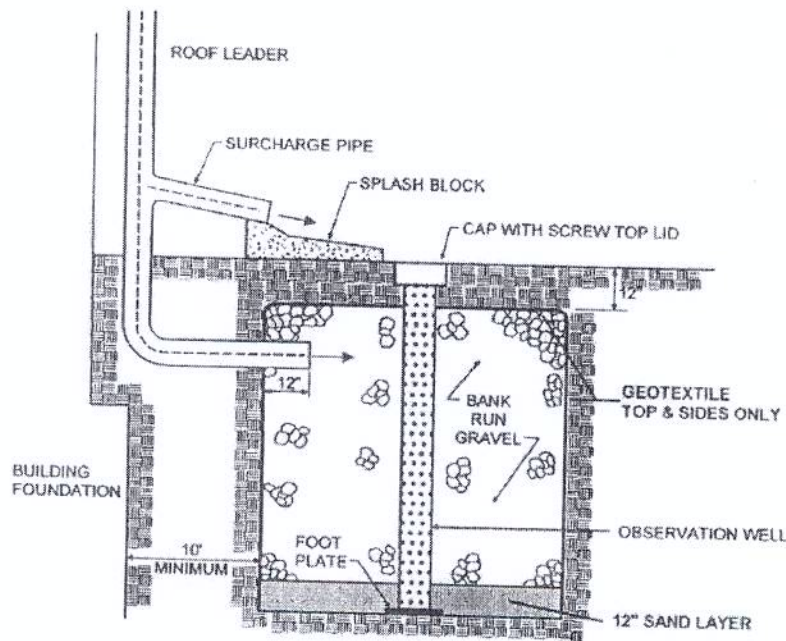
STEP 3 – Sizing of Select Infiltration Method

The following pages show several methods of infiltrating stormwater runoff from residential areas. Their appropriateness depends on the amount of infiltration volume required and the amount of land available. More than one method can be implemented on a site, depending on site constraints. Dry wells should be used only for receiving runoff from roof drains. Infiltration trenches are appropriate for receiving runoff from driveways, sidewalk, or parking areas. Other methods may be appropriate, but these should be discussed with the Municipal Engineer prior to installation.

Dry Wells

Dry wells are effective methods of infiltrating runoff from roof leaders. These facilities should be located a minimum of ten (10) feet from the building foundation to avoid seepage problems. A dry well can be either a structural prefabricated chamber or an excavated pit filled with aggregate. Construction of a dry well should be performed after all other areas of the site are stabilized to avoid clogging. During construction, compaction of the subgrade soil should be avoided, and construction should be performed with only light machinery. Depth of dry wells in excess of three and one half (3½) feet should be avoided. Gravel fill should be an average one and one half to three (1.5 – 3.0) inches in diameter. Dry wells should be inspected at least four (4) times annually as well as after large storm events.

FIGURE B-1
TYPICAL DRY WELL CONFIGURATION



Source: Maryland Stormwater Design Manual

Example Sizing:

STEP 1 – Determine Total Impervious Surfaces

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev) Using Ordinance Section 405.

STEP 3 – Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Volume of facility must account for assumed 40% void ratio in gravel bed.

EXAMPLE

STEP 1: Suppose proposed impervious surface = 500 square feet; provide stormwater management under voluntary stormwater management procedures.

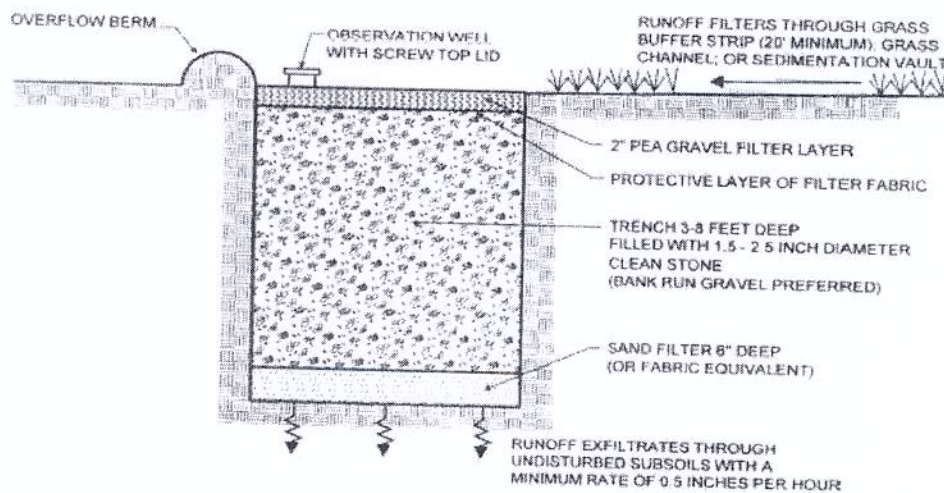
STEP 2: Required Recharge (Infiltration) Volume (Rev) is determined using Ordinance Section 405. Suppose Rev = 90 cubic feet.

STEP 3: Facility volume = Rev / 0.40 (accounting for void ratio in bed). Therefore, the proposed facility volume = 90 / 0.40 = 225 cubic feet.

Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

FIGURE B-2
TYPICAL INFILTRATION TRENCH CONFIGURATION



Source: Maryland Stormwater Design Manual

Example Sizing:

STEP 1 – Suppose proposed impervious surface = 500 square feet; provide stormwater management under voluntary stormwater management procedures.

STEP 2 – Required Recharge (Infiltration) Volume (Rev) is determined using Ordinance Section 405. Suppose Rev = 90 cubic feet.

STEP 3 – Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Required facility volume = Rev / 0.40 (accounting for void ratio in bed). Therefore, the proposed facility volume = $90 / 0.40 = 225$ cubic feet.

Set D = 3 ft; determined required surface area of trench

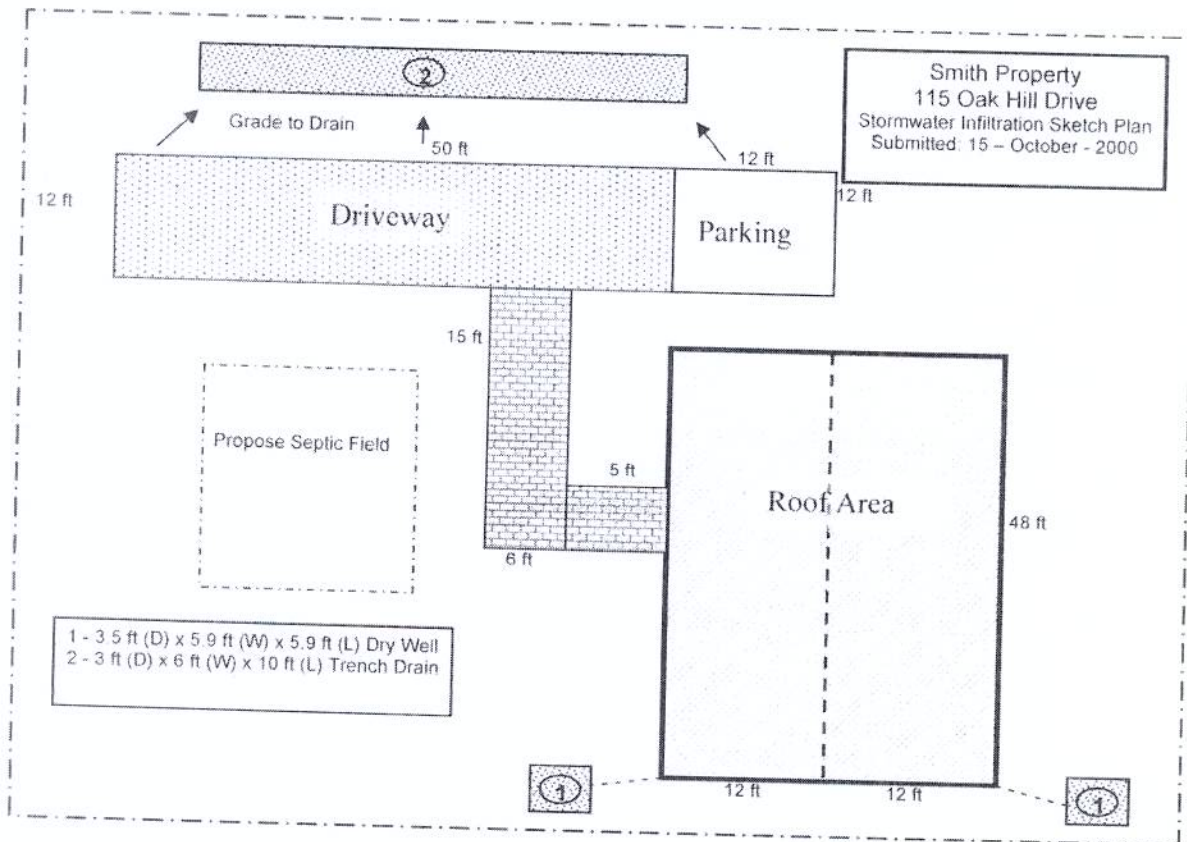
$225 \text{ cu. ft.} / 3 = 75 \text{ sq. ft.}$

The width of the trench should be greater than 2 times its depth ($2 \times D$); therefore, in this example a trench width of 7 feet is selected;

Determine trench length: $L = 75 \text{ sq. ft.} / 7 \text{ ft.} = 10.8 \text{ ft.}$

Final trench dimensions: 3 ft. (D) x 7 ft. (W) x 10.8 ft. (L)

FIGURE B-3
SAMPLE SITE SKETCH PLAN



Source: Maryland Stormwater Design Manual

ORDINANCE APPENDIX C

RESERVED

ORDINANCE APPENDIX D

LOW IMPACT DEVELOPMENT (LID) PRACTICES

LOW IMPACT DEVELOPMENT (LID) PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

The recommended alternative approach is to promote practices that will minimize 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 of 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 are typically located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimize the amount of grading on site.
- **Protecting Natural Depression Storage Areas.** Depressional storage areas either have no surface outlet or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filling or draining, thereby obliterating their ability to reduce surface runoff volumes and trap pollutants. The volume and release rate characteristics of depressions should be protected in the design of the development site. The depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

- **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 a 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 connection 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. Municipal planners and traffic designers should encourage narrower neighborhood streets that 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 impervious cover associated with 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 occurs with street length, which also will reduce costs of the development. Cluster development groups the construction activity in less-sensitive areas without substantially affecting the gross density of development.

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

ORDINANCE APPENDIX E

STORMWATER MANAGEMENT DESIGN CRITERIA

TABLE E-1
Precipitation-Frequency Atlas of the United States

TABLE E-2
RUNOFF CURVE NUMBERS

TABLE E-3
RATIONAL RUNOFF COEFFICIENTS

TABLE E-4
NONSTRUCTURAL STORMWATER MANAGEMENT MEASURES

TABLE E-1

Precipitation-Frequency Atlas of the United States

Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.34	0.54	0.67	0.92	1.15	1.37	1.50	1.88	2.29	2.71	3.13	3.48	4.06	4.61	6.22	7.75	9.84	11.80
2	0.40	0.64	0.81	1.11	1.40	1.67	1.82	2.27	2.77	3.26	3.78	4.19	4.87	5.50	7.38	9.13	11.56	13.81
5	0.47	0.76	0.96	1.36	1.74	2.09	2.29	2.84	3.48	4.10	4.76	5.23	6.01	6.70	8.80	10.64	13.29	15.77
10	0.52	0.84	1.06	1.53	2.00	2.41	2.65	3.31	4.08	4.80	5.55	6.08	6.95	7.67	9.91	11.81	14.58	17.21
25	0.58	0.93	1.18	1.75	2.33	2.85	3.14	3.96	4.96	5.81	6.69	7.28	8.29	9.01	11.41	13.34	16.22	19.01
50	0.63	1.00	1.27	1.91	2.58	3.20	3.52	4.49	5.70	6.67	7.63	8.27	9.39	10.09	12.59	14.49	17.43	20.32
100	0.67	1.06	1.35	2.06	2.84	3.55	3.92	5.06	6.51	7.59	8.63	9.30	10.56	11.20	13.76	15.63	18.56	21.53
200	0.71	1.12	1.42	2.20	3.09	3.90	4.32	5.65	7.38	8.59	9.70	10.41	11.80	12.36	14.95	16.75	19.64	22.66
500	0.75	1.19	1.50	2.38	3.42	4.39	4.87	6.50	8.66	10.06	11.23	11.97	13.56	13.96	16.54	18.19	20.96	24.04
1000	0.79	1.24	1.55	2.52	3.67	4.76	5.30	7.17	9.74	11.27	12.48	13.24	14.99	15.23	17.75	19.26	21.90	25.00

Source: Atlas 14, Volume 2, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center, Silver Springs, Maryland 20910. NOAA's Atlas 14 can be found on the internet at <http://hdsc.nws.noaa.gov/hdsc/pfds/>.

TABLE E-2

RUNOFF CURVE NUMBERS

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

* Includes multi-family housing unless justified lower density can be provided.

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

Source: NRCS (SCS) TR-55

TABLE E-3

RATIONAL RUNOFF COEFFICIENTS

HYDROLOGIC SOIL GROUP	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
LAND USE DESCRIPTION												
Cultivated Land												
Winter Conditions	.14	.23	.34	.21	.32	.41	.27	.37	.48	.34	.45	.56
Summer Conditions	.10	.16	.22	.14	.20	.28	.19	.26	.33	.23	.29	.38
Fallow Fields												
Poor Conditions	.12	.19	.29	.17	.25	.34	.23	.33	.40	.27	.35	.45
Good Conditions	.08	.13	.16	.11	.15	.21	.14	.19	.26	.18	.23	.31
Forest/Woodland	.08	.11	.14	.10	.14	.18	.12	.16	.20	.15	.20	.25
Grass Areas												
Good Conditions	.10	.16	.20	.14	.19	.26	.18	.22	.30	.21	.25	.35
Average Conditions	.12	.18	.22	.16	.21	.28	.20	.25	.34	.24	.29	.41
Poor Conditions	.14	.21	.30	.18	.28	.37	.25	.35	.44	.30	.40	.50
Impervious Areas	.90	.91	.92	.91	.92	.93	.92	.93	.94	.93	.94	.95
Weighted Residential												
Lot Size 1/8 Acre	.29	.33	.36	.31	.35	.40	.34	.38	.44	.36	.41	.48
Lot Size 1/4 Acre	.26	.30	.34	.29	.33	.38	.32	.36	.42	.34	.38	.46
Lot Size 1/3 Acre	.24	.28	.31	.26	.32	.35	.29	.35	.40	.32	.36	.45
Lot Size 1/2 Acre	.21	.25	.28	.24	.27	.32	.27	.32	.37	.30	.34	.43
Lot Size 1 Acre	.18	.23	.26	.21	.24	.30	.24	.29	.36	.28	.32	.41

FIGURE E-3.A
PENNDOT REGION 4 STORM INTENSITY-DURATION-FREQUENCY CURVE

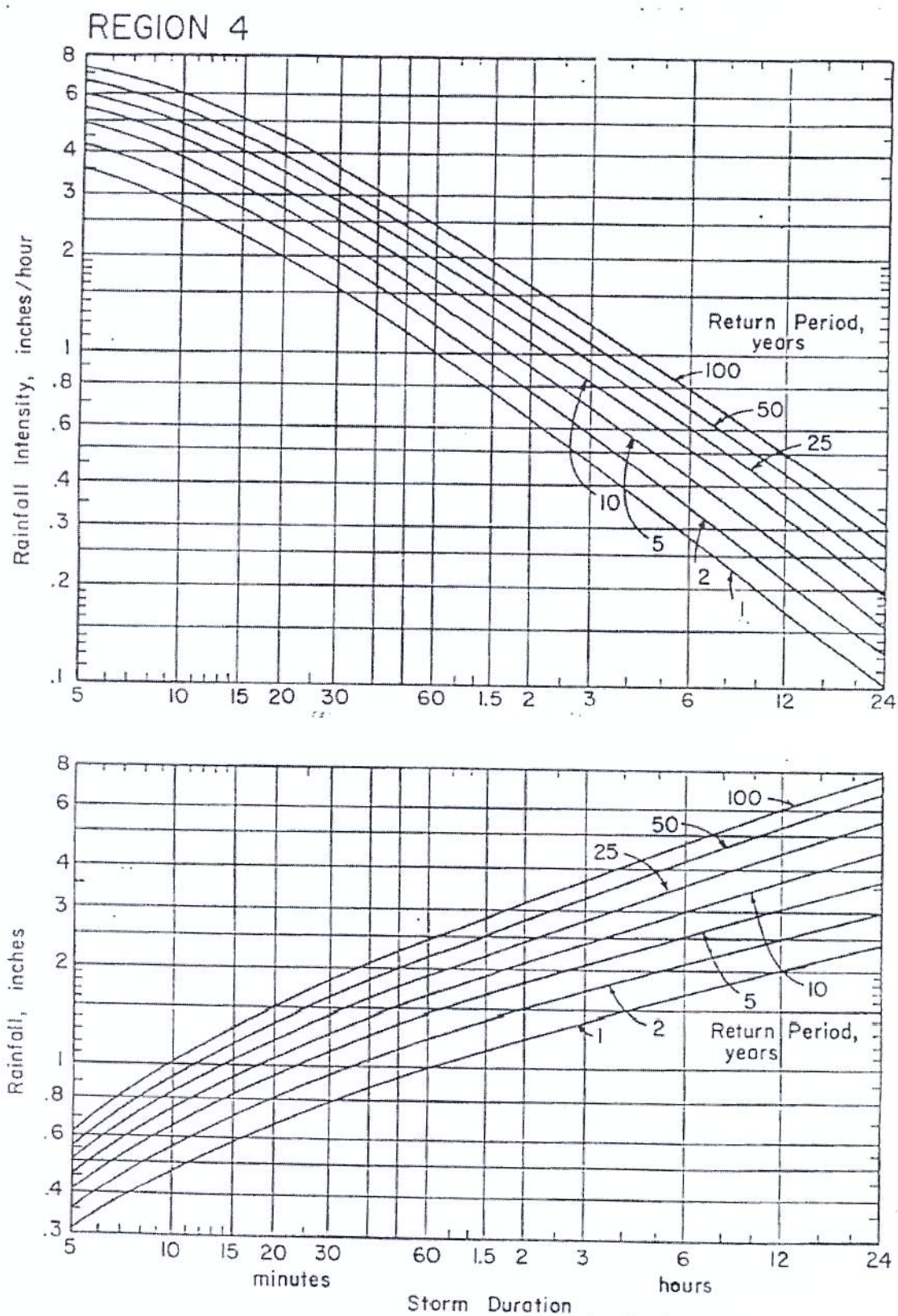


TABLE E-4

NONSTRUCTURAL STORMWATER MANAGEMENT MEASURES

Nonstructural Stormwater Measure	Description
Natural Area Conservation	Conservation of natural areas such as forest, wetlands, or other sensitive areas in a protected easement, thereby retaining their existing hydrologic and water quality characteristics.
Disconnection of Rooftop Runoff	Rooftop runoff is disconnected and then directed over a pervious area where it may either infiltrate into the soil or filter over it. This is typically obtained by grading the site to promote overland flow or by providing bioretention on single-family residential lots.
Disconnection of Nonrooftop Runoff	Disconnect surface impervious cover by directing it to pervious areas where it is either infiltrated or filtered through the soil.
Buffers	Buffers effectively treat stormwater runoff. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to the buffer and treating the runoff through overland flow across a grassy or forested area.
Grass Channel (Open Section Roads)	Open grass channels are used to reduce the volume of runoff and pollutants during smaller storms.
Environmentally Sensitive Rural Development	Environmental site design techniques are applied to low-density or rural residential development.

Source: Maryland Department of the Environment, "Maryland Stormwater Design Manual," Baltimore, MD, 2000

TABLE E-5

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

Surface Description	n		
	-		
Dense Growth	0.4	-	0.5
Pasture	0.3	-	0.4
Lawns	0.2	-	0.3
Bluegrass Sod	0.2	-	0.5
Short Grass Prairie	0.1	-	0.2
Sparse Vegetation	0.05	-	0.13
Bare Clay-Loam Soil (eroded)	0.01	-	0.03
Concrete/Asphalt – very shallow depths (less than ¼ inch)	0.10	-	0.15
- small depths(¼ inch to several inches)	0.05	-	0.10

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

Reach Description	n
	-
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027 ⁽¹⁾
High Density Polyethylene (HDPE) Pipe	
Corrugated	0.021-0.029 ⁽²⁾
Smooth Lined	0.012-0.020 ⁽²⁾
(1) Depending upon type, coating and diameter	
(2) Values recommended by the American Concrete Pipe Association, check Manufacturer's recommended value.	

ORDINANCE APPENDIX F

REFERENCES

REFERENCES

BMP Manuals

California

California Stormwater BMP Handbook: New Development and Redevelopment (January 2003)
– separate file available at <http://www.cabmphandbooks.org/Development.asp>

Georgia

Georgia Stormwater Management Manual Volume 2: Technical Handbook (August 2001)-
separate file (<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%20design/index.asp)

Massachusetts

Stormwater Management, Volume Two: Stormwater Technical Handbook
(Massachusetts, 1997) – separate file available at
<http://www.state.ma.us/dep/brp/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 Nonpoint
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 Stormwater Best Management Practices Manual, January 2005 (draft).
Pennsylvania Association of Conservation Districts, Pennsylvania Handbook of Best
Management Practices for Developing Areas, November 14, 1997.

District

Stormwater Management Manual for Western District (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/npdes/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.

ORDINANCE APPENDIX G

West Nile Virus Guidance

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

Monroe County Conservation District Guidance:
Stormwater Management and West Nile Virus
Source: Brodhead McMichaels Creeks Watershed Act 167
Stormwater Management Ordinance 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.

ORDINANCE APPENDIX H

STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT

STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 200____, by and between _____, (hereinafter the "Landowner"), and _____, _____ County, Pennsylvania, (hereinafter "Municipality");

WITNESSETH

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

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

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

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

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

BMP – "Best Management Practice"-activities, facilities, designs, measures, or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge, and to otherwise meet the purposes of the municipal Stormwater Management Ordinance, including but not limited to infiltration trenches, seepage pits, filter strips, bioretention, wet ponds, permeable paving, rain gardens, grassed swales, forested buffers, sand filters, and detention basins.

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

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

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific maintenance requirements noted on the Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents, and employees to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event that the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
5. In the event that the Municipality, pursuant to this Agreement, performs work of any nature or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within ten (10) days of receipt of an invoice from the Municipality.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability on 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 interest shall release the Municipality's employees and designated representatives from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality. In the event that a claim is asserted against the Municipality, its designated representatives, or employees, the Municipality shall promptly notify the Landowner, and the Landowner shall defend, at his own expense, any suit based on the claim.

If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

8. The Municipality shall inspect the BMP(s) at a minimum of once every three (3) years to ensure their continued functioning.

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

(SEAL)

For the Landowner:

ATTEST:

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

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

NOTARY PUBLIC

(SEAL)