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PART 1
General Provisions

Section 101. Short Title. This Chapter shall be known and may be cited as the Schuylkill River Watershed Stormwater Management Ordinance"). (Ordinance No. 191, January 5, 2009, Section 1)

Section 102. Statement of Findings. The Board of Supervisors of the Township of Tilden finds that:

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

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

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

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

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

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

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

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

(i) Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the Township.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 103. Purpose. The purpose of this Chapter is to promote the public health, safety, and welfare within the Schuylkill River Watershed by maintaining the natural hydrologic regime by minimizing the impacts described in Section 102 of this Chapter through provisions designed to:

(a) Promote alternative project designs and layout that minimizes impacts to surface and ground water.

(b) Promote nonstructural Best Management Practices (BMPs).

(c) Minimize increases in stormwater volume.

(d) Minimize impervious surfaces.

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

(f) Provide review procedures and performance standards for stormwater planning and management.

(g) Utilize and preserve the existing natural drainage systems.

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

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

(j) Maintain existing base flows and quality of streams and watercourses, where possible.

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

(l) Address the quality and quantity of stormwater discharges from the development site.

(m) Provide a mechanism to identify controls necessary to meet the NPDES permit requirements.

(n) Implement an illegal discharge detection and elimination program to address non-stormwater discharges into the Township's separate storm sewer system.

(o) Preserve and restore the flood-carrying capacity of streams.

(p) Prevent scour and erosion of streambanks and streambeds.

(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 Township.

(s) NPDES Requirements. Federal regulations approved October 1999 require operators of small municipal separate storm sewer systems (MS4s) to obtain NPDES Phase II permits from DEP by March 2003. (NPDES II is an acronym for the National Pollutant Discharge Elimination System Phase II Stormwater Permitting Regulations.) This program affects all municipalities in "urbanized areas" of the state. This definition applies to all Schuylkill River watershed municipalities identified in Table III-1 of the Schuylkill River Stormwater Management Plan Volume II as NPDES Phase II municipalities. Therefore, these identified municipalities will be subject to the NPDES Phase II requirements mandated by the Federal Clean Water Act as administered by DEP. For more information on NPDES II requirements, contact the DEP Regional Office.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 104. Statutory Authority.

(a) Primary Authority. The Township is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the "Storm Water Management Act" and the Pennsylvania Second Class Township Code, 53 P.S. Section 65101, et seq., as amended.

(b) Secondary Authority. The Township also is empowered to regulate land use

activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 105. Applicability/Regulated Activities. All Regulated Activities and all activities that may affect stormwater runoff, including Land Development and Earth Disturbance Activity, are subject to regulation by this Chapter. (Ordinance No. 191, January 5, 2009, Section 1)

Section 106. Repealer. Any ordinance or ordinance provision of this Township inconsistent with any of the provisions of this Chapter is hereby repealed to the extent of the inconsistency only. (Ordinance No. 191, January 5, 2009, Section 1)

Section 107. Severability. Should any section or provision of this Chapter be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of any of the remaining provisions of this Chapter. (Ordinance No. 191, January 5, 2009, Section 1)

Section 108. Compatibility With Other Ordinance Requirements. Approvals issued and actions taken under this Chapter do not relieve the Applicant of the responsibility to secure required permits or approvals for activities by any other code, law, regulation or ordinance. (Ordinance No. 191, January 5, 2009, Section 1)

PART 2

Definitions

Section 201. Interpretation. For the purposes of this Chapter, certain terms and words used herein shall be interpreted as follows:

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

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

(c) The word "person" includes an individual, firm, association, organization, partnership, trust, company, corporation, unit of government, or any other similar entity.

(d) The words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

(e) The words "used or occupied" include the words "intended, designed, maintained, or arranged to be used, occupied or maintained."

(Ordinance No. 191, January 5, 2009, Section 1)

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 and installation of conservation measures. For purposes of regulation by this Chapter construction of new buildings or impervious area is not considered an agricultural activity.

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

As-built drawings - Those maintained by the Contractor 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, or a copy of same, are turned over to the Township

Engineer at the completion of the project

Applicant - A person who has filed an application for approval to engage in any Regulated Activities as defined in Section 105 of this Chapter.

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

Base Flow – Portion of stream discharge derived from groundwater; the sustained discharge that does not result from direct runoff or from water diversions, reservoir releases, piped discharges, or other human activities.

Bioretention – A stormwater retention area which utilizes woody and herbaceous plants and soils to remove pollutants before infiltration occurs.

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

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

Channel Erosion - The widening, deepening, and headward cutting of small 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.

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

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

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 Chapter by contract or memorandum of understanding.

Design Professional (Qualified) – Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by the Chapter.

Design Storm - The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24-hours), used in the design and evaluation of stormwater management systems.

Designated Watershed (ACT 167) – A Watershed which is listed under the Pennsylvania Department of Environmental Protection's "Index of Designated Watersheds (Stormwater Management)" pursuant to the Stormwater Management Act P.L. 864, No. 167, October 4, 1978, and published in the Pennsylvania Bulletin on May 31, 1980 and August 9, 1980, as amended on November 19, 1991, April 21, 1992, June 21, 1994, April 16, 1996, April 15, 1997 and December 16, 1997).

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

Developer – A person that seeks to undertake any Regulated Activities at a project site in the Township.

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

Development Site - The specific tract of land where any Regulated Activities in the Township are planned, conducted or maintained.

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

Discharge – 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 (volume per unit of time). See also Peak Discharge.

Discharge Point – The point of discharge for a stormwater facility.

Disturbed Areas – Unstabilized land area where an earth disturbance activity is occurring or has occurred.

Ditch – An artificial waterway for irrigation or stormwater conveyance.

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 site would be directed towards it.

Drainage Conveyance Facility - A Stormwater Management Facility designed to transmit stormwater runoff and shall include channels, swales, pipes, conduits, culverts, storm sewers, etc.

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 Township 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 403.

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 channels, is worn away by water, wind, or chemical action.

Erosion and Sediment Control Plan - A plan for a project site which identifies BMPs to minimize accelerated erosion and sedimentation.

Exceptional Value Waters – Surface waters of high quality which 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 lower curve numbers or Rational "C" value, such as forested lands.

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

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

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

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

Forest Management/Timber Operations - Planning and activities necessary for the management of forest land with no change of land use proposed. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting and reforestation.

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

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

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

Groundwater - Water beneath the earth's surface, often between saturated soil and rock that supplies wells and springs.

Groundwater Recharge - Replenishment of existing natural underground water supplies without degrading groundwater quality.

HEC-HMS - The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) - Hydrologic Modeling System (HMS). This model was used to model the Schuylkill River watershed during the ACT 167 Plan development and was the basis for the Standards and Criteria of this Chapter.

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

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

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

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

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

Infill – Development that occurs on smaller parcels that remain undeveloped but are within or very close proximity to urban areas. The development 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 percolates downward to recharge groundwater.

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

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

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

Land Development – Any of the following activities:

(a) The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving:

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

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

(b) A subdivision of land;

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

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

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

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

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

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

Main Stem (Main Channel) - Any stream segment or other runoff conveyance facility used as a reach in the Schuylkill River hydrologic model.

Manning Equation (Manning formula) - A method for calculation of velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed

conduits so long as the flow is not under pressure.

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

Natural Condition – Existing conditions

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 water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

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

Nonstructural Best Management Practice (BMPs) – Methods of controlling stormwater runoff quantity and quality, 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).

Outfall - "Point source" as described in 40 CFR § 122.2 at the point where the Township's storm sewer system discharges to surface waters of the Commonwealth.

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

Parent Tract – The parcel of land from which a land development or subdivision originates, determined from the date of the Township's adoption of this Chapter.

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 the Pennsylvania State University.

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

Planning Commission - The planning commission of Tilden 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 Pa. Code § 92.1.

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

Pretreatment – Techniques employed in stormwater BMPs to provide storage or filtering to trap coarse materials and other pollutants before they enter the system, but not necessarily meet the water quality volume requirements of Section 306.

Project Site - The specific area of land where any Regulated Earth Disturbance activities in the Township are planned, conducted or maintained.

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

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

Reconstruction – Demolition of, and subsequent rebuilding of impervious surface.

Record Drawings - Original documents revised to suit the as-built conditions and subsequently provided by the Engineer to the Client. The Engineer takes the Contractor's as-builts, reviews them in detail with 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 – The demolition, construction, reconstruction, alteration, or improvement exceeding 2,000 square feet of land disturbance performed on sites where existing land use is commercial, industrial, institutional, or multifamily residential. Maintenance activities such as top-layer grinding and re-paving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment. Utility trenches in streets are not considered redevelopment unless more than 50% of the street width is removed and re-paved.

Regulated Activities – This term is defined by <u>any actions</u> that involve the alteration or development of land in a manner that may affect stormwater runoff. This means that any proposed earth disturbance (in excess of 5,000 square feet) are required to follow the entire Chapter, unless an exemption (Section 402) can be obtained.

Regulated Earth Disturbance Activity - Activity involving Earth Disturbance subject to regulation under 25 PA Code Chapters 92, Chapter 102, or the Clean Streams Law.

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

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

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

Retention Basin - A structure in which stormwater is stored and not released during the storm event. Retention basins do not typically have an outlet to other down stream conveyance features such as channels, storm sewer, or other surface waters. Generally, these features empty via recharge and must infiltrate stored water in no more than 4 days. These features may have an emergency spillway or other overflow device for large events.

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

Rooftop Detention - Temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces by incorporating controlled-flow roof drains into building designs.

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

SALDO – The Township Subdivision and Land Development Ordinance.

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

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, man-made channels or storm drains) primarily used for collecting and conveying stormwater runoff.

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

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

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

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

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

Special Protection Subwatersheds - Watersheds for which the receiving waters are exceptional value (EV) or high quality (HQ) waters.

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

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 convey intercepted runoff and stormwater from other sources, but excludes domestic sewage and industrial wastes.

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

Stormwater Management District - Those subareas 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 Plan - The plan for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the Tributaries to the Schuylkill River Watershed adopted by Berks County as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "The Tributaries to The Schuylkill River in Berks County Act 167 Stormwater Management Plan".

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 Chapter.

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 100 feet in length upstream to downstream which encloses a regulated water of this 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 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 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, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

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

Timber Operations - See Forest Management.

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

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

Township – The Township of Tilden, Berks County, Pennsylvania.

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 defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Waters of the Commonwealth - Any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this 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, spring or infiltration gallery 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, including swamps, marshes, bogs, fens, and similar areas.

(Ordinance No. 191, January 5, 2009, Section 1)

PART 3

STORMWATER MANAGEMENT

Section 301. General Requirements.

(a) Applicants proposing regulated activities in Schuylkill River Watershed which do not fall under the exemption criteria shown in Section 402 shall submit a drainage plan consistent with the Schuylkill River Watershed Stormwater Management Plan to the Township for review. These criteria shall apply to the total proposed development even if development is to take place in stages.

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

(c) The Drainage Plan must be designed consistent with the sequencing provisions of Section 304 to ensure maintenance of the natural hydrologic regime and to promote groundwater recharge and protect groundwater and surface water quality and quantity. The Drainage Plan designer must proceed sequentially in accordance with Part 3 of this Chapter.

(d) 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 Chapter.

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

(f) Where a development site is traversed by existing watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall conform to the stream buffer requirements contained in Section 306(f) of this Chapter.

(g) Any stormwater management facilities regulated by this Chapter that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PaDEP through the Joint Permit Application process, or, where deemed appropriate by PaDEP, the General Permit process. When there is a question 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 PaDEP.

(h) Any alteration that affects stormwater flow directly or indirectly toward a PennDOT facility shall be subject to PennDOT regulations.

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

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

(k) All stormwater runoff shall be treated for water quality

(l) Transference of runoff to or from an EV/HQ watershed is prohibited unless otherwise authorized by DEP, DRBC or SRBC.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 302. Permit Requirements by Other Government Entities. Permits must comply with any and all applicable local, county, state and federal regulations. (Ordinance No. 191, January 5, 2009, Section 1)

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

(a) No Regulated Earth Disturbance activities within the Township shall commence until the Township 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 5,000 square feet or more, under 25 Pa. Code § 102.4(b).

(c) In addition, under 25 Pa. Code Chapter 92, a DEP "NPDES Construction Activities" permit is required for Regulated Earth Disturbance activities.

(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 Township. The issuance of an NPDES Construction Permit (or permit coverage under the statewide General Permit (PAG-2) satisfies the requirements subsection 303.(a).

(e) A copy of the Erosion and Sediment Control plan and any required permit, as

required by DEP regulations, shall be available at 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 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.

(2) Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has achieved final stabilization

(Ordinance No. 191, January 5, 2009, Section 1)

Section 304. Nonstructural Project Design (Sequencing to Minimize Stormwater Impacts).

(a) For projects disturbing one (1) acre or more, the design of all Regulated Activities shall include evaluation of 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 of the site.

(1) An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes, and other Township requirements.

(2) 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 they designed the Regulated Activities that disturb one (1) acre or more included consideration of the following issues:

(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, flood plains, stream buffer zones, hydrologic soil groups A and B (areas conducive to infiltration), special geologic features, any existing recharge areas and any other requirements outlined in the Township Subdivision and Land Development Ordinance.

(2) Establish appropriate buffers for each of the delineated environmentally sensitive areas per the Township Zoning Ordinance (See Section 306(f) for stream buffers and Section 310(k) for special geologic feature buffers).

(3) Prepare a draft project layout avoiding sensitive areas identified in Section 304(b)(1).

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

(5) Evaluate Nonstructural Stormwater Management Alternatives

(i) Minimize earth disturbance

(ii) Minimize impervious surfaces

(iii) Break up large impervious surfaces.

(6) Satisfy infiltration objective (Section 305) and provide for stormwater pretreatment prior to infiltration. Pretreatment may not be necessary for rooftop runoff which enters the infiltration facility directly from a roof leader.

(7) Satisfy water quality (Section 306) and streambank erosion protection objective (Section 307).

(8) Determine what Management District the site falls into (Appendix D) and conduct an existing conditions runoff analysis.

(9) 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 the remaining site development has no surface or point discharge.

(10) Conduct a proposed conditions runoff analysis based on the final design and to meet the release rate and in turn the overbank flow and extreme event requirements (Section 308).

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

(Ordinance No. 191, January 5, 2009, Section 1)

Section 305. Ground Water Recharge (Infiltration/Recharge/Bioretention). Maximizing the ground water recharge capacity of the area being developed is required. Design of the infiltration stormwater management facilities shall give consideration to providing ground water recharge to compensate for the reduction in the percolation that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs which may be designed to compensate for the runoff from parking areas. These measures are

required to be consistent with Section 103, and take advantage of utilizing any existing recharge areas.

Infiltration may not be feasible on every site due to site-specific limitations such as soil type. If it cannot be physically accomplished, due to seasonal high water table, soil permeability rate, soil depth or setback distances from special geologic features, then the design professional shall be responsible to show that this cannot be physically accomplished. If it can be physically accomplished, then the volume of runoff to be infiltrated shall be determined from Sections 305(a)(3) depending on demonstrated site conditions and shall be the greater of the two volumes.

(a) Infiltration BMPs shall meet the following minimum requirements:

(1) Infiltration Requirements. Regulated activities will be required to infiltrate, where site conditions permit, a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be infiltrated shall be determined from Sections 305.A.3.a. or 305.A.3.b, depending upon demonstrated site conditions.

(2) 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:

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

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

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

(iv) Pretreatment shall be provided prior to infiltration.

(3) The size of the infiltration facility shall be based upon the following volume criteria:

(i) NRCS Curve Number equation.

The NRCS runoff equation shall be utilized to calculate infiltration requirements (I) in inches.

I (Infiltration requirement, in inches) = (200 / CN) – 2	Eqn: 305.1

Where:

CN = SCS (NRCS) curve number of existing conditions contributing to the infiltration facility.

This equation is displayed graphically in, and the infiltration requirement can be determined from Figure 305.1.

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

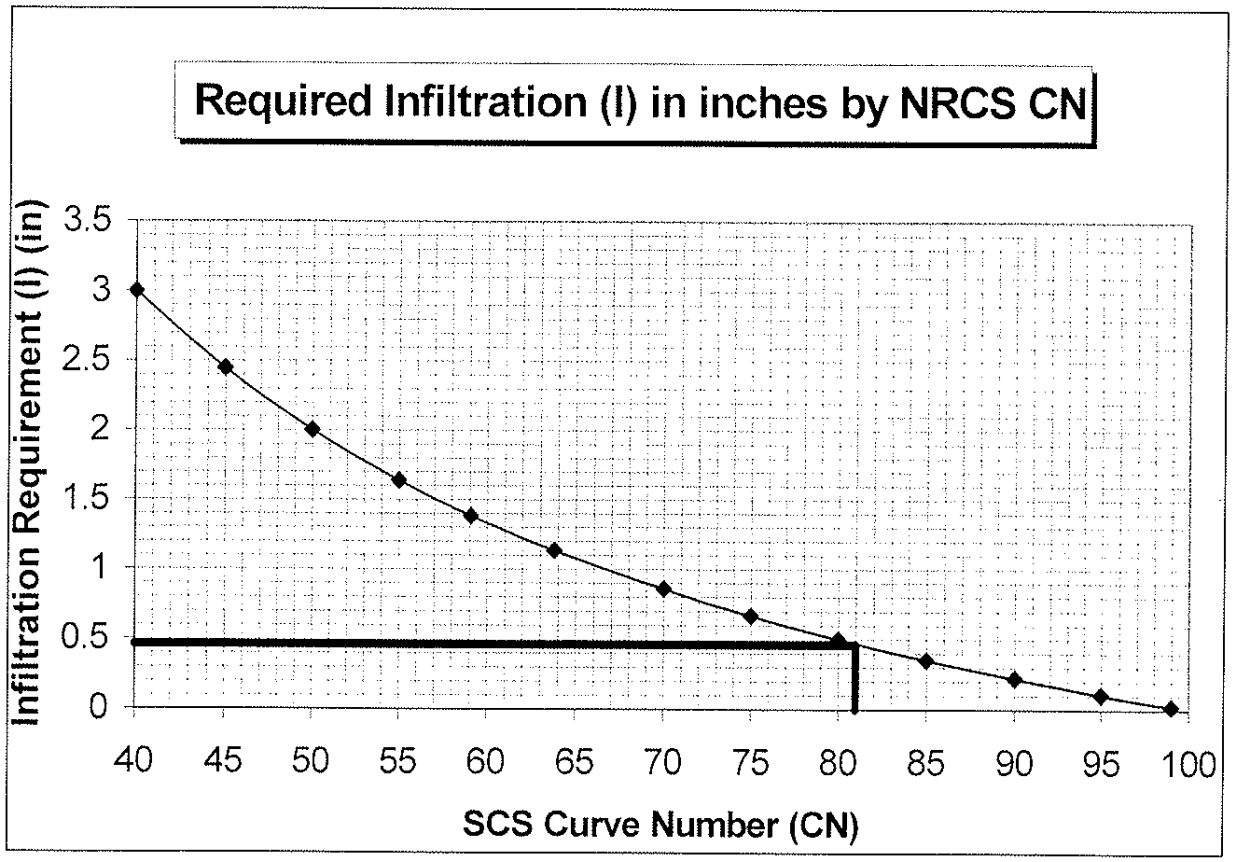


Figure 305.1. Infiltration requirement based upon NRCS Curve Number.

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

Re_v = (0.5 or I, whichever is greater)* impervious area (square feet) / (12 in/ft) = Cubic Feet Eqn: 305.2

Where:

I = infiltration requirements (in inches.)

(ii) Annual Recharge – Water Budget Approach.

If the goals of Sections 305.A.3.a cannot be achieved, then 0.5 inches of rainfall shall be infiltrated from all impervious areas, up to a an existing site conditions curve number of 81. Above a curve number of 81, Equation 305.1 or the curve in Figure 305.1 should be used to determine the infiltration requirement.

The retention (infiltration) volume (Re_v) required again would therefore be computed as:

Re_v = (0.5 or I, whichever is greater) * impervious area (sq.ft.) / (12in/ft) = Cubic Feet.

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

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

(2) Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes however, they are allowed provided all criteria within the PA DEP BMP Manual are satisfied, including reduction and safety factors.

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

(4) If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the Township that the soils are conducive to infiltrate on the lots identified.

(c) Carbonate Areas – The Applicant is required to investigate the ability of all areas on the site which are not underlain by carbonate rock to meet the infiltration

requirements of Section 305(a). If this investigation proves infeasible, infiltration can occur on areas underlain by carbonate rock by following the recommended procedure below in conjunction with Figure B-1 in Chapter Appendix B. *However, the Applicant is not required to use infiltration in carbonate areas even if the site falls into the "Recommended" range on Figure B-1 in Chapter Appendix B.* If infiltration is not proposed, the calculated infiltration volume (Section 305(a)) shall be treated by an acceptable BMP.

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

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

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

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

Soil thickness is to be measured from the bottom of any proposed infiltration BMP. The effective soil thickness in Figure B-1 in Chapter Appendix B is the measured soil thickness multiplied by the thickness factor based on soil permeability, as follows:

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

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

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

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 30,000) are not designated as a stormwater hotspot; it is important to ensure that highway stormwater management plans adequately protect groundwater.

(e) Caution shall be exercised where infiltration is proposed in Source Water Protection Areas as defined by the Township or local Water Authority.

(f) Infiltration facilities shall be used in conjunction with other innovative or traditional stormwater control facilities that are found within the PADEP State BMP Manual

(g) 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.

(h) The infiltration requirement in High Quality or Exceptional Value waters shall be subject to the Department's Chapter 93 Antidegradation Regulations.

(i) Dependant upon certain landuse or hotspots 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 Township.

(j) The Township 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.

(k) For projects that disturb one (1) acre or more, unless otherwise specified in the Zoning Ordinance, the following setbacks for infiltration facilities shall apply:

- 50 feet from individual water supply wells and 100 feet from community or municipal water supply wells
- 10 feet downslope or 100 feet upslope from building foundations
- 50 feet from septic system drainfields
- 50 feet from a geologic contact with carbonate bedrock, unless a preliminary site investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area;
- 100 feet from the property line unless documentation is provided to show all setbacks from wells, foundations and drainfields on the neighboring property will be met.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 306. Water Quality Requirements. The applicant shall comply with the following water quality requirements of this Part.

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

To achieve this goal, the following criterion is established:

The following calculation formula is to be used to determine the water quality storage volume, (WQv), in acre-feet of storage for the Schuylkill River watershed:

$$WQ_v=[(P)(R_v)(A)]/12 \qquad \text{Eqn: 306.1}$$

WQ_v = Water Quality Volume (acre-feet)

P = 1 inch
A = Total contributing drainage area to the water quality BMP (acres)
$R_v = 0.05 + 0.009(I)$ where I is the percent of the area that is impervious surface ((impervious area/A)*100)

This volume requirement can be accomplished by the permanent volume of a wet basin or the detained volume from other BMPs.

Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall provide for protection from clogging and unwanted sedimentation.

(b) For areas within defined Special Protection subwatersheds which include Exceptional Value (EV) and High Quality (HQ) waters, Cold Water Fishery (CWF) the temperature and quality of water and streams shall be maintained.

(c) To accomplish the above, the Applicant shall use innovative or traditional stormwater control facilities that are found within the PADEP State BMP Manual.

(d) 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 appropriate native vegetation (Reference to Appendix B-Pennsylvania Native Plant List of the PA DEP State BMP Manual). If the applicable rear or side yard setback is less than fifty (50) feet, the buffer width may be reduced to twenty-five (25) percent of the setback 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 Chapter, the existing buffer shall be maintained. This does not include lakes or wetlands.

(e) Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office must be provided to the Township. The issuance of an NPDES Construction Permit (or permit coverage under the statewide General Permit (PAG-2) satisfies the requirements of subsection 306(a).

(Ordinance No. 191, January 5, 2009, Section 1)

Section 307. Streambank Erosion Requirements. In addition to control of the water quality volume, in order to minimize the impact of stormwater runoff on downstream streambank erosion, the primary requirement is to design a BMP to detain the proposed conditions 2-year, 24-hour design storm to the existing conditions 1-year peak flow using the SCS Type II distribution. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the proposed conditions 1-year storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the 1-year storm is captured. (i.e., the maximum water surface elevation is achieved in the facility). Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility).

The minimum orifice size in the outlet structure to the BMP shall be a three (3) inch diameter orifice and a trash rack shall be installed to prevent clogging. On sites with small contributing drainage areas to this BMP that do not provide enough runoff volume to allow a 24-hour attenuation with the 3 inch orifice, the calculations shall be submitted showing this condition. Orifice sizes less than 3 inches can be utilized provided that the design will prevent clogging of the intake. (Ordinance No. 191, January 5, 2009, Section 1)

Section 308. Stormwater Management Districts.

(a) The Schuylkill River Watershed has been divided into stormwater management districts as shown on the Management District Map in Appendix D.

In addition to the requirements specified in Table 308.1 below, the groundwater recharge (Section 305), water quality (Section 306), and streambank erosion control (Section 307), requirements shall be implemented.

Standards for managing runoff from each subarea in the Schuylkill River Watershed for the 2-year through 100-year design storms are shown in Table 308.1. Development sites located in each of the Districts must control proposed conditions runoff rates to existing conditions runoff rates for the design storms in accord with Table 308.1.

TABLE 308.1 – Water Quantity Requirements

Management District	Proposed Condition Design Storm		Existing Condition Design Storm	
A	2-year	Reduce To	1-year	
	5- year		5-year	
	10-year		10-year	
	25-year		25-year	
	50-year		50-year	
	100-year		100-year	
B	2-year	Reduce To	1-year	
	5-year		2-year	
	10-year		5-year	
	25-year		10-year	
	50-year		25-year	
	100-year		50-year	
				Equivalent Release Rate
C	2-year	Reduce To	2-year	**100%**
	5-year		5-year	**100%**
	10-year		10-year	**100%**
	25-year		25-year	**100%**
	50-year		50-year	**100%**
	100-year		100-year	**100%**

**The minimum performance standard for development sites in Districts ____C____ is that stormwater management controls must be provided to limit the post-development peak rate of stormwater runoff to a rate that is equal to or less than the existing peak rate of stormwater runoff. This minimum performance criteria was set through a policy directive of the Pennsylvania Department of Environmental Protection. However, in the previous development of the Act 167 Plan, this district was originally established as a conditional no-detention district such that development sites which could discharge directly to the main channel of the Schuylkill River and its major tributaries, or indirectly to the main channel through an existing stormwater drainage system (i.e., storm sewer or open channel) could do so without control of the post-development peak rate of runoff.*

All areas, regardless of the release rate, must still meet the requirements of the groundwater recharge criteria (Section 305), water quality criteria (Section 306), and streambank erosion criteria (Section 307).

(b) General - Proposed condition rates of runoff from any regulated activity shall not exceed the peak release rates of runoff prior to development for the design storms specified on the Stormwater Management District Watershed Map (Chapter Appendix D)

and Section 308, of this Chapter.

(c) District Boundaries - The boundaries of the Stormwater Management Districts are shown on an official map that is available for inspection at the Township office. A copy of the official map at a reduced scale is included in the Chapter Appendix D. The exact location of the Stormwater Management District boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours (or most accurate data required) provided as part of the Drainage Plan.

(d) Sites Located in More Than One District - For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall meet the Management District Criteria for which the discharge is located, as indicated in Section 308. 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 discharge site. In this case, peak discharge in any direction shall follow Management District A criteria provided that the overall site discharge meets the Management District Criteria for which the discharge is located.

(e) 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.

(f) Site Areas - Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area utilizing stormwater management measures shall be subject to the Management District Criteria. In other words, unimpacted areas bypassing the stormwater management facilities would not be subject to the Management District Criteria.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 309. Calculation Methodology.

(a) Stormwater runoff from all development sites shall be calculated using a generally accepted calculation technique. Table 309-1 summarizes acceptable computation methods and the method selected by the design professional shall be based on the individual limitations and suitability of each method for a particular site.

TABLE 309-1
Acceptable Computation Methodologies For Stormwater Management Plans

METHOD	METHOD DEVELOPED BY	APPLICABILITY
TR-20 (OR COMMERCIAL COMPUTER PACKAGE BASED ON TR-20)	USDA NRCS	APPLICABLE WHERE USE OF FULL HYDROLOGY COMPUTER MODEL IS DESIRABLE OR NECESSARY.
TR-55 (OR COMMERCIAL COMPUTER PACKAGE BASED ON TR-55)	USDA NRCS	APPLICABLE FOR LAND DEVELOPMENT PLANS WITHIN LIMITATIONS DESCRIBED IN TR-55.
HEC-1 / HEC-HMS	US ARMY CORPS OF ENGINEERS	APPLICABLE WHERE USE OF FULL HYDROLOGIC COMPUTER MODEL IS DESIRABLE OR NECESSARY.
PSRM	PENN STATE UNIVERSITY	APPLICABLE WHERE USE OF A HYDROLOGIC COMPUTER MODEL IS DESIRABLE OR NECESSARY; SIMPLER THAN TR-20 OR HEC-1.
RATIONAL METHOD (OR COMMERCIAL COMPUTER PACKAGE BASED ON RATIONAL METHOD)	EMIL KUICHLING(1889)	FOR VERY SMALL, HIGHLY IMPERVIOUS AREAS, AND NOT FOR CALCULATING WATER QUALITY, INFILTRATION, OR CAPTURE VOLUMES.
OTHER METHODS	VARIES	OTHER COMPUTATION METHODOLOGIES APPROVED BY THE TOWNSHIP.

**Note: Successors to the above methods are also acceptable. These successors include WinTR55 for TR-55 and WinTR20 for TR-20 and SWMM*

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

(c) For the purposes of existing conditions flow rate determination, undeveloped land shall be considered as "meadow" in good condition, unless the natural ground cover generates a lower curve number or Rational 'C' value (i.e., forest), as listed in Table B-1 or B-2 in Appendix B of this Chapter.

(d) All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods from the NOAA Atlas 14 Precipitation-Frequency Atlas of the United States (2004, revised 2006).

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. NRCS lag equation divided by 0.6 as acceptable method for Tc in undeveloped areas.

(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 B-1 in Appendix B of this Chapter.

(f) Runoff coefficients (c) for both existing and proposed conditions for use in the Rational method shall be obtained from Table B-2 in Appendix B of this Chapter.

(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 consistent with Table B-3 in Appendix B of the Chapter. Full flow shall be assumed for closed conduits.

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

(i) The design of any stormwater detention facilities intended to meet the performance standards of this Chapter shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 310. Other Requirements.

(a) All wet basin designs shall incorporate biologic minimization controls consistent with the West Nile Guidance found in Appendix F.

(b) Any stormwater management facility (i.e., detention basin) designed to store runoff and requiring a berm or earthen embankment required or regulated by this Chapter shall be designed to provide an emergency spillway sized for the proposed 100-year peak discharge inflow rate assuming no storage below the spillway invert elevation, and may be subject to PaDEP Chapter 105 regulations.

(c) Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), water encroachments, and any work involving wetlands governed by PaDEP Chapter 105 regulations (as amended or replaced from time to time by PaDEP), are subject to PaDEP Chapter 105 regulations.

(d) Any proposed roadway drainage facilities shall be designed according to PennDOT Design Manual Part II.

(e) Storm sewers must be able to convey proposed conditions runoff from a 10-year design storm without flooding inlets, where appropriate.

(f) Adequate erosion protection shall be provided along all open channels, and at all points of discharge (DEP erosion and Erosion, Sediment and Pollution Control Manual).

(g) The Township reserves the right to disapprove any design that would result in the construction in or continuation of a stormwater problem area.

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

(Ordinance No. 191, January 5, 2009, Section 1)

PART 4

DRAINAGE PLAN REQUIREMENTS

Section 401. General Requirements. For any of the activities regulated by this Chapter, 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 Township unless the project qualifies for an exemption from the requirements to submit a Drainage Plan. (Ordinance No. 191, January 5, 2009, Section 1)

Section 402. Exemptions.

(a) General Exemptions. The following land use activities are exempt from the drainage plan submission requirements of this Chapter:

(1) Use of land for gardening for home consumption.

(2) Agricultural plowing and tilling are exempt from the rate control and SWM site plan preparation requirements of this Chapter provided the activities are performed according to the requirements of 25 PA Code, Chapter 102.

(3) Forest Management and timber operations are exempt from the rate control and SWM site plan preparation requirements of this Chapter provided the activities are performed according to the requirements of 25 PA Code, Chapter 102.

(b) Stormwater Quantity Control Exemption. Any Regulated Activity that meets the impervious area exemption criteria in Table 402-1 shall not be required to implement the stormwater quantity controls, specified in Section 308 of this Chapter. These criteria shall apply to the total development even if development is to take place in phases. The date of the adoption of this Chapter shall be the starting point from which to consider tracts as "parent tracts" in which future subdivisions and respective impervious area computations shall be cumulatively considered. Impervious areas existing on the "parent tract" prior to adoption of this Chapter shall not be considered in cumulative impervious area calculations for exemption purposes.

TABLE 402-1
Impervious Area Exemption Criteria

TOTAL PARCEL SIZE	IMPERVIOUS AREA EXEMPTION (sq.ft.)
0 to <0.125 ac	1,000 sq. ft.
0.125 to <0.5 a ac	2,500 sq. ft.
0.5 to <1 ac	5,000 sq. ft.
1 to <2 ac	7,500 sq. ft.
2 to <3 ac	10,000 sq. ft.
3 to <4 ac	12,500 sq. ft.
≥ 4 ac	15,000 sq. ft.

Submissions for projects that utilize the exemption under section 402(b) shall still be required to meet the groundwater recharge (Section 305), water quality (Section 306), and streambank erosion (Section 307) controls of this Chapter. Drainage plans in accordance with Sections 403(a)(2), 403(b)(7), (8), (11), (15), and (22) and 403(d)(2) must still be submitted. Any exemption must first be approved by the Township.

(c) Additional Exemption Requirement:

(1) Exemption responsibilities – An exemption shall not relieve the Applicant from implementing such measures as are necessary to protect the public health, safety, and property. An exemption shall not relieve the Applicant from providing adequate stormwater management for Regulated Activities to meet the requirements of this Chapter.

(2) HQ and EV streams - This exemption shall not relieve the Applicant from meeting the special requirements for watersheds draining to high quality (HQ) or exceptional value (EV) waters, identified and Source Water Protection Areas (SWPA) and requirements for nonstructural project design sequencing (Section 304), groundwater recharge (Section 305), water quality (Section 306), and streambank erosion (Section 307).

(3) Drainage Problems - If a drainage problem is documented or known to exist downstream of, or expected from the proposed activity, then the Township may require a drainage plan submittal.

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

(Ordinance No. 191, January 5, 2009, Section 1)

Section 403. Drainage Plan Contents. The Drainage Plan shall consist of a general description of the project including sequencing items described in Section 304, calculations, maps and plans. A note on the maps shall refer to the associated computations and erosion and sediment control plan by title and date. The cover sheet of the computations and erosion and sediment control plan shall refer to the associated maps by title and date. All Drainage Plan materials shall be submitted to the Township 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 304.

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

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

(4) An Erosion and Sediment Control Plan, including all reviews and approvals by the Conservation District.

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

(6) Regulated activities that create disconnected Impervious Areas smaller than 1,000 square feet are exempt from the Peak Rate Control and the SWM Site Plan preparation requirements of this Chapter.

(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 Township Subdivision and Land Development Ordinance (SALDO) has more stringent criteria, 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, municipalities or other identifiable landmarks.

(2) Existing contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-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 and boundaries.

(7) Limits of earth disturbance, including the type and amount of impervious area that would be added.

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

(9) Final contours at intervals of two feet. In areas of steep slopes (greater than 15 percent), five-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 tenth of a foot and bearings to the nearest second.

(15) Existing and proposed land use(s).

(16) A key map showing all off site existing man-made features which may be affected by stormwater runoff or stormwater management controls for the project.

(17) Location of all open channels.

(18) Overland drainage patterns and swales.

(19) A fifteen 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.

(21) A note on the plan indicating the location and responsibility for maintenance of stormwater management facilities that would be located on/off-site. All on/off-site facilities shall meet the performance standards and design criteria specified in this Chapter.

(22) A statement, signed by the landowner, acknowledging that any revision to the approved Drainage Plan must be approved by the Township and the Conservation District.

(23) The following signature block for the Design Engineer:

"I, (Design Engineer), on this date (date of signature), hereby certify that the Drainage Plan meets all design standards and criteria of the Schuylkill River Watershed Act 167 Stormwater Management Chapter."

(c) Supplemental Information

(1) A written description of the following information shall be submitted:

(i) The overall stormwater management concept for the project designed in accordance with Section 304.

(ii) Stormwater runoff computations as specified in this Chapter.

(iii) Stormwater management techniques to be applied both during and after development.

(iv) Expected project time schedule.

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

(vi) An operation and maintenance plan in accordance with Section 702 of this Chapter.

(2) An erosion and sediment control plan.

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

(d) Stormwater Management Facilities.

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

(2) When infiltration facilities such as seepage pits, beds or trenches are used, the locations of existing and proposed septic tank infiltration areas and wells must be shown.

(3) All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.

(e) Responsibilities for Operations and Maintenance of Stormwater Controls and BMPs.

(1) No Regulated Earth Disturbance activities within the Township shall commence until approval by the Township of a Stormwater Control and BMP Operations and Maintenance Plan which describes how the permanent (e.g., post-construction) stormwater controls and BMPs will be properly operated and maintained.

(2) The following items shall be included in the Stormwater Control and BMP Operations and Maintenance Plan:

(i) 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, and shall be submitted on 36-inch x 48-inch sheets. The contents of the maps(s) shall include, but not be limited to:

- Clear identification of the location and nature of permanent stormwater controls and BMPs,

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

- Existing and final contours at intervals of two feet, or others as appropriate,

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

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

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

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

- Proposed final structures, roads, paved areas, and buildings, and

- A fifteen-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 of 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 Township.

(f) 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 which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the Township, stormwater controls and BMPs may also be dedicated to and maintained by the Township;

(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.

(g) The Township shall make the final determination on the continuing operations and maintenance responsibilities. The Township reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater controls and BMPs.

(h) Township Review of Stormwater Control and BMP Operations and Maintenance Plan.

(1) The Township shall review the Stormwater Control and BMP Operations and Maintenance Plan for consistency with the purposes and requirements of this Chapter, and any permits issued by DEP.

(2) The Township shall notify the Applicant in writing whether the Stormwater Control and BMP Operations and Maintenance Plan is approved.

(3) The Township may require a "Record Drawing" of all stormwater controls and BMPs, and an explanation of any discrepancies with the Operations and Maintenance Plan.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 404. Plan Submission. The Township shall require receipt of a complete plan, as specified in this Chapter.

For any activities that require an NPDES Permit for Stormwater Discharges from Construction Activities, a PaDEP Joint Permit Application, a PennDOT Highway Occupancy Permit, or any other permit under applicable state or federal regulations or are regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of PaDEP's Rules and Regulations, the proof of application for said permit(s) or approvals shall be part of the plan. The plan shall be coordinated with the state and federal permit process and the Township SALDO review process.

(a) For projects which 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.

(b) For these regulated activities that do not require SALDO approval, See Section 401, General Requirements.

(c) Six (6) copies of the Drainage Plan shall be submitted and distributed as follows:

(1) Two (2) copies to the Township accompanied by the requisite Township Review Fee, as specified in this Chapter.

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

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

(4) One (1) copy to the County Planning Commission/Department.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 405. Drainage Plan Review.

(a) The Township shall review the Drainage Plan with the standards set forth in the Township's Stormwater Management Ordinance for consistency with the adopted Schuylkill River Watershed Act 167 Stormwater Management Plan. Any submittal found incomplete shall not be accepted for review and shall be returned to the Applicant.

(b) For activities regulated by this Chapter, the Township shall notify the Applicant in writing, within ninety (90) calendar days, whether the Drainage Plan is consistent with the Stormwater Management Plan.

(1) Should the Drainage Plan be determined to be consistent with the Stormwater Management Plan, the Township Engineer shall forward an approval letter to the Township Secretary who will then forward a copy to the Applicant.

(2) Should the Drainage Plan be determined to be inconsistent with the Stormwater Management Plan, the Township Engineer shall forward a disapproval letter to the Township Secretary who will then forward a copy to the Applicant. The disapproval letter shall cite the reason(s) and specific Ordinance sections for the disapproval. Disapproval may be due to inadequate information to make a reasonable judgment as to compliance with the stormwater management plan. Any disapproved Drainage Plans may be revised by the Applicant and resubmitted consistent with this Chapter.

(c) For Regulated Activities specified in Section 104 of this Chapter, which require a building permit, the Township Engineer shall notify the Township Secretary in writing, within a time frame consistent with the Township Building Code and/or Township Subdivision Ordinance, whether the Drainage Plan is consistent with the Stormwater Management Plan and forward a copy of the approval/disapproval letter to the Applicant. Any disapproved drainage plan may be revised by the Applicant and resubmitted consistent with this Chapter.

(d) For regulated activities under this Chapter that require an NPDES Permit Application, the Applicant shall forward a copy of the Township Engineer's letter stating that the Drainage Plan is consistent with the stormwater management plan to the Conservation District. PaDEP and the Conservation District may consider the Township Engineer's review comments in determining whether to issue a permit.

(e) The Township shall not grant approval or grant preliminary approval to any subdivision or land development for Regulated Activities specified in Section 105 of this Chapter if the Drainage Plan has been found to be inconsistent with the Stormwater Management Plan, as determined by the Township. All required permits from PaDEP must be obtained prior to approval of any subdivision or land development.

(f) 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 Township for final approval. The Township may withhold approval of the record drawings until the Township receives a copy of an approved Highway Occupancy Permit from the PennDOT District Office, NPDES Permit, and any other applicable permits or approvals, from PaDEP or the Conservation District. The above permits and approvals must be based on the record drawings.

(g) The Township's approval of a Drainage Plan shall be valid for a period not to exceed five (5) years, commencing on the date that the Township signs the approved Drainage Plan. If stormwater management facilities included in the approved Drainage plan have not been constructed, or if constructed, and record drawings of these facilities have not been approved within this five (5) year time period, then the Township may consider the Drainage plan disapproved and may revoke any and all permits or approvals. Drainage Plans that are considered disapproved by the Township shall be resubmitted in accordance with Section 407 of this Chapter.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 406. Modification of Plans.

(a) A modification to a Drainage Plan under review by the Township for a development site that involves a change in stormwater management facilities or techniques, or that involves the relocation or re-design of stormwater management facilities, or that is necessary because soil or other conditions are not as stated on the Drainage Plan as determined by the Township, shall require a resubmission of the modified Drainage Plan consistent with Section 404 of this Chapter and be subject to review as specified in Section 405 of this Chapter.

(b) A modification to an already approved or disapproved Drainage Plan shall be submitted to the Township, accompanied by the applicable Township Review and Inspection Fee. A modification to a Drainage Plan for which a formal action has not been taken by the Township shall be submitted to the Township, accompanied by the applicable Township Review and Inspection Fee.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 407. Resubmission of Disapproved Drainage Plans. A disapproved Drainage Plan may be resubmitted, with the revisions addressing the Township's concerns documented in writing and addressed to the Township Secretary in accordance with Section 404 of this Chapter and distributed accordingly and be subject to review as specified in Section 405 of this Chapter. The applicable Township Review and Inspection Fee must accompany a resubmission of a disapproved Drainage Plan. (Ordinance No. 191, January 5, 2009, Section 1)

PART 5

Inspections

Section 501. Schedule of Inspections.

(a) The Township or their designee shall inspect all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Township.

(b) During any stage of the work, if the Township or it's designee determines that the permanent stormwater management facilities are not being installed in accordance with the approved Stormwater Management Plan, the Township shall revoke any existing building permits and issue a cease and desist order until a revised Stormwater Management Plan is submitted and approved except as directed by the Township or Conservation District, as specified in this Chapter.

(c) A final inspection of all stormwater management facilities shall be conducted by the Township or it's designee and to confirm compliance with the approved Stormwater Management Plan prior to the issuance of any Occupancy Permit.

(Ordinance No. 191, January 5, 2009, Section 1)

PART 6

Fees and Expenses

Section 601. Township Drainage Plan Review and Inspection Fee. Fees shall be established by the Township to defray plan review and construction inspection costs incurred by the Township. All fees shall be paid by the Applicant at the time of Drainage Plan submission. Review and Inspection Fee Schedule shall be established by resolution of the Board of Supervisors based on the size of the Regulated Activity and based on the Township's costs for reviewing Drainage Plans and conducting inspections pursuant to Section 501. The Township shall periodically update the Review and Inspection Fee Schedule to ensure that review costs are adequately reimbursed. (Ordinance No. 191, January 5, 2009, Section 1)

Section 602. Expenses Covered by Fees. The fees required by this Chapter shall at a minimum cover:

(a) Administrative costs.

(b) The review of the Drainage Plan by the Township.

(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 Chapter, correct violations, and assure proper completion of stipulated remedial actions.

(Ordinance No. 191, January 5, 2009, Section 1)

PART 7

MAINTENANCE RESPONSIBILITIES

Section 701. Performance Guarantee.

(a) For subdivisions and land developments the Applicant shall provide a financial guarantee to the Township 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) in the amount and method of payment provided for in the Subdivision and Land Development Ordinance.

(b) For other regulated activities, the Township may require a financial guarantee from the Applicant.

(c) At the completion of the project, and as a prerequisite for the release of the performance guarantee, the Applicant 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 record drawings.

(d) After the Township receives the certification, a final inspection shall be conducted by the Township or designee to certify compliance with this Chapter.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 702. Adherence to 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. (Ordinance No. 191, January 5, 2009, Section 1)

Section 703. Operations and Maintenance Agreement for Privately Owned Stormwater Controls and BMPs.

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

(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 Township.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 704. Stormwater Management Easements.

(a) Stormwater management easements are required for all areas used for off-site stormwater control, unless a waiver is granted by the Township.

(b) Stormwater management easements shall be provided by the property owner if necessary for (1) access for inspections and maintenance, or (2) 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 703.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 705. Recording of 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 30 days of approval of the Stormwater Control and BMP Operations Plan by the Township:

(1) The Operations and Maintenance Plan, or a summary thereof,

(2) Operations and Maintenance Agreements under Section 703, and

(3) Easements under Section 704.

(b) The Township may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with this Section.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 706. Township 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 Township 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 Township for a period of ten (10) years, as estimated by the Township Engineer.

(2) If the stormwater control or BMP is to be owned and maintained by the Township, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The Township 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 Township Engineer shall determine the present worth equivalents, which shall be subject to the approval of the Board of Supervisors.

(b) If a stormwater control or BMP is proposed that also serves as a recreation facility (e.g., ballfield, lake), the Township may reduce or waive the amount of the maintenance fund deposit based upon the value of the land for public recreation purpose.

(c) If at some future time a stormwater control or BMP (whether publicly or privately owned) is eliminated due to the installation of storm sewers or other storage facility, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of the deposit remaining after the costs of abandonment are paid will be returned to the depositor.

(d) If stormwater controls or BMPs are accepted by the Township for dedication, the Township may require persons installing stormwater controls or BMPs to pay a specified amount to the Township Stormwater Control and BMP Operation and Maintenance Fund, to help defray costs of operations and maintenance activities. The amount may be determined as follows:

(1) If the stormwater control or BMP is to be owned and maintained by the Township, the amount shall cover the estimated costs for operations and maintenance for ten (10) years, as determined by the Township.

(2) The amount shall then be converted to present worth of the annual series values.

(e) Long-Term Maintenance – The Township shall require applicants to pay a fee to the Township Stormwater Maintenance Fund to cover long term maintenance of stormwater control and best management practices.

(f) Stormwater Related Problems - The Township may require applicants to pay a fee to the Township Stormwater Maintenance Fund to cover stormwater related problems

which may arise from the land development and earth disturbance. The Township Engineer will establish the estimated cost of utilizing information submitted by the Applicant.

(Ordinance No. 191, January 5, 2009, Section 1)

PART 8

PROHIBITIONS

Section 801. Prohibited Discharges and Connections.

(a) Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter the waters of this Commonwealth is prohibited.

(b) No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (1) as provided in Subsection (c) below, and (2) discharges allowed under a state or federal permit.

(c) The following discharges are authorized unless they are determined to be significant contributors to pollution to the waters of this Commonwealth:

- Discharges from fire fighting activities	- Flows from riparian habitats and wetlands
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Air conditioning condensate	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Water from crawl space pumps	- Water from individual residential car washing
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used	- Routine external building wash down (which does not use detergents or other compounds)

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

(Ordinance No. 191, January 5, 2009, Section 1)

Section 802. Roof Drains. Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs and to the maximum extent practicable satisfy the criteria for Disconnected Impervious Areas. (Ordinance No. 191, January 5, 2009, Section 1)

Section 803. Alteration of SWM BMPs. No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures, without the written approval of the Township. (Ordinance No. 191, January 5, 2009, Section 1)

PART 9

ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry.

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

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

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

(d) Unreasonable delays (>24 hrs.) in allowing the Township access to a stormwater control or BMP is a violation of this Part.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 902. Public Nuisance.

(a) The violation of any provision of this Chapter is hereby deemed a Public Nuisance.

(b) Each day that a violation continues shall constitute a separate violation.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 903. Enforcement Generally.

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

(1) The performance of monitoring, analyses, and reporting;

(2) The elimination of prohibited connections or discharges;

(3) Cessation of any violating discharges, practices, or operations;

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

(Ordinance No. 191, January 5, 2009, Section 1)

Section 904. Suspension and Revocation of Permits and Approvals.

(a) Any building, land development or other permit or approval issued by the Township may be suspended or revoked, in whole or in part, by the Township for:

(1) Non-compliance with or failure to implement any provision of the permit;

(2) A violation of any provision of this Chapter; 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 or property of others.

(b) A suspended permit or approval may be reinstated by the Township, in whole or in part, when:

(1) The Township 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 Township is satisfied that the violation of this Chapter, law, or rule and regulation has been corrected.

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

(Ordinance No. 191, January 5, 2009, Section 1)

Section 905. Penalties.

(a) Any person violating the provisions of this Chapter shall be subject to a fine of not less than $600.00 nor more than $1,000.00 for each violation, recoverable with costs. Each day that the violation continues shall constitute a separate offense and the applicable fines are cumulative.

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

(Ordinance No. 191, January 5, 2009, Section 1)

Section 906. Notification. In the event that a person fails to comply with the requirements of this Chapter, or fails to conform to the requirements of any permit issued hereunder, the Township will provide notification of the violation. After notice is provided, failure to correct violations in a timely manner may result in additional violations. (Ordinance No. 191, January 5, 2009, Section 1)

Section 907. Enforcement. The Board of Supervisors is hereby authorized and directed to enforce all of the provisions of this Chapter. All inspections regarding compliance with the drainage plan shall be the responsibility of the Township Engineer or other qualified persons designated by the Township.

(a) No person shall modify, remove, fill, landscape or alter any SWM BMPs, facilities, areas, or structures, without the written approval of the Township.

(b) Upon presentation of proper credentials, the Township may enter at reasonable times upon any property within the Township to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Chapter.

(c) It shall be unlawful for a person to undertake any Regulated Activity except as provided in an approved SWM Site Plan, unless specifically exempted from the requirement to submit a SWM Site Plan by this Chapter.

(d) The Developer shall be responsible for providing as-built plan of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted by the Developer to the Township.

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

(f) After receipt of the completion certificate by the Township, the Township may conduct a final inspection.

(g) Inspections regarding compliance with the SWM Site Plan are a responsibility of the Township.

(h) The Township may withhold an occupancy permit until a certificate of completion has been provided by the Developer.

(Ordinance No. 191, January 5, 2009, Section 1)

Section 908. Appeals.

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

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

(Ordinance No. 191, January 5, 2009, Section 1)

PART 10

APPENDICES

Section 1001. Appendix A – Stormwater Controls and Best Management Practices Operations and Maintenance Agreement. (Ordinance No. 191, January 5, 2009, Section 1)

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 the Township of Tilden, 874 Hex Highway, Hamburg, Berks County, Pennsylvania 19526 (hereinafter "Township");

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

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

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

BMP – "Best Management Practice;" activities, facilities, designs, measures or procedures used to manage stormwater impacts from land development, to protect and maintain water quality and groundwater recharge and to otherwise meet the purposes of the Township 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 Township requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the Township Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his successors and assigns. And

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 Township and in accordance with the specific maintenance requirements noted on the Plan.

3. The Landowner hereby grants permission to the Township, 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 Township shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Township, the Township 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 Township to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Township 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 Township.

5. In the event the Township, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Township for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Township.

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Township'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 Township. In the event that a claim is asserted against the Township, its designated representatives or employees, the Township 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 Township's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

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

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

IN WITNESS WHEREOF, the parties have caused this Agreement to be duly executed on the date first indicated hereinabove.

(Landowner)
_____, INC.

By:_____
President (Vice)

Attest:_____
Secretary

TILDEN TOWNSHIP

By: _____
Chairman (Vice)

Attest:_____
Secretary

B78601

COMMONWEALTH OF PENNSYLVANIA :
: ss.
COUNTY OF BERKS :

On this _____ day of _____, 2008, before me, a Notary Public in and for the County and State aforesaid, personally appeared _____ and _____, who acknowledged themselves to be the President and Secretary of _____, a Pennsylvania corporation, and that as such officers and being authorized to do so, executed the foregoing STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT for the purposes therein contained by signing the name of the Corporation by themselves as such officers.

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

_____
Notary Public

COMMONWEALTH OF PENNSYLVANIA :
: ss.
COUNTY OF BERKS :

On this _____ day of _____, 2008, before me, a Notary Public in and for the County and State aforesaid, personally appeared _____ and _____, who acknowledged themselves to be the Chairman and Secretary (Assistant) of the Board of Supervisors of Tilden Township, a Pennsylvania second class township, and that as such officers and being authorized to do so, executed the foregoing STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES OPERATIONS AND MAINTENANCE AGREEMENT for the purposes therein contained by signing the name of the Township by themselves as such officers.

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

_____
Notary Public

Section 1002. Appendix B – Stormwater Management Design Criteria. (Ordinance No. 191, January 5, 2009, Section 1)

TABLE B-1
RUNOFF CURVE NUMBERS
Source: NRCS (SCS) TR-55

TABLE B-2
RATIONAL RUNOFF COEFFICIENTS

TABLE B-3
MANNING ROUGHNESS COEFFICIENTS

FIGURE B-1
RECOMMENDATION CHART FOR INFILTRATION STORMWATER MANAGEMENT BMPS IN CARBONATE AREAS

TABLE B-1
Runoff Curve Numbers
(From NRCS (SCS) TR-55)

LAND USE DESCRIPTION		HYDROLOGIC SOIL GROUP			
		A	B	C	D
Open Space		44	65	77	82
Meadow / Orchard		30	58	71	78
Agricultural		59	71	79	83
Forest		36	60	73	79
Commercial	(85% Impervious)	89	92	94	95
Industrial	(72% Impervious)	81	88	91	93
Institutional	(50% Impervious)	71	82	88	90
Residential					
Average Lot Size	% impervious				
1/8 acre or less*	65	77	85	90	92
1/8 - 1/3 acre	34	59	74	82	87
1/3 - 1 acre	23	53	69	80	85
1 - 4 acres	12	46	66	78	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.

TABLE B-2
RATIONAL RUNOFF COEFFICIENTS
By Hydrologic Soils Group and Overland Slope (%)

LAND USE	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
CULTIVATED LAND	0.08[A]	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14[B]	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
PASTURE	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
MEADOW	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
FOREST	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
RESIDENTIAL												
LOT SIZE 1/8 ACRE	0.25	0.28	0.31	0.27	0.30	0.25	0.30	0.33	0.38	0.33	0.36	0.42
	0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
LOT SIZE 1/4 ACRE	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
LOT SIZE 1/3 ACRE	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
LOT SIZE 1/2 ACRE	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
	0.25	0.29	0.32	0.28	0.32	0.36	0.31	0.35	0.42	0.34	0.38	0.48
LOT SIZE 1 ACRE	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
INDUSTRIAL	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
COMMERCIAL	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
STREETS	0.70	0.71	0.71	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
OPEN SPACE	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
PARKING	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

[A] RUNOFF COEFFICIENTS FOR STORM RECURRENCE INTERVALS LESS THAN 25 YEARS.

[B] RUNOFF COEFFICIENTS FOR STORM RECURRENCE INTERVALS OF 25 YEARS OR MORE.

SOURCE : RAWLS, W.J., S.L. WONG AND R.H. MCCUEN, 1981, "COMPARISON OF URBAN FLOOD FREQUENCY PROCEDURES", PRELIMINARY DRAFT, U.S.

OF AGRICULTURE, SOIL CONSERVATION SERVICE, BALTIMORE, MD.

TABLE B-3

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 1/4 inch)	0.10	-	0.15
- small depths (1/4 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.

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

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

RECOMMENDED

NOT RECOMMENDED

* Special Geologic Feature Buffer widths are as follows:

Low Buffer is less than 50 feet

Medium Buffer is 50 feet to 100 feet

High Buffer is greater than 100 feet

** Rates greater than 500% not recommended.

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

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

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

Source: Little Lehigh Creek Watershed ACT 167 – Stormwater Management Ordinance. May 2004

Section 1003. Appendix C – Sample Drainage Plan Application. (Ordinance No. 191, January 5, 2009, Section 1)

(To be attached to the subdivision or land development plan review application)

Application is hereby made for review of the Stormwater Management and Erosion and Sedimentation Control Plan and related data as submitted herewith in accordance with the Tilden Township Stormwater Management and Earth Disturbance Ordinance.

_____Final Plan _____Preliminary Plan _____Sketch Plan

Date of Submission _____Submission No._____

1. Name of subdivision or development_____

2. Name of Applicant _____ Telephone No._____

   (if corporation, list the corporation's name and the names of two officers of the corporation)
   _____Officer 1
   _____Officer 2

   Address_____
   Zip_____

   Applicants interest in subdivision or development
   (if other than property owner give owners name and address)

3. Name of property owner _____Telephone No._____

   Address_____
   Zip_____

4. Name of engineer or surveyor _____Telephone No._____

   Address_____
   Zip_____

5. Type of subdivision or development proposed:

____ Single-Family Lots	____ Townhouses	____ Commercial(Multi-Lot)
____ Two Family Lots	____ Garden Apartments	____ Commercial (One-Lot)
____ Multi-Family Lots	____ Mobile-Home Park	____ Industrial (Multi-Lot)
____ Cluster Type Lots	____ Campground	____ Industrial (One-Lot)
____ Planned Residential Development	____ Other (_____)	

6. Lineal feet of new road proposed_____ L.F.

7. Area of proposed and existing impervious area on entire tract.

   a. Existing (to remain) _____ S.F. _____% of Property
   b. Proposed _____ S.F. _____% of Property

8. Stormwater

   a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for existing conditions conditions for the designated design storm?_____

   b. Design storm utilized (on-site conveyance systems) (24 hr.)_____
      No. of Subarea_____
      Watershed Name_____

      Explain:_____
      _____
      _____

   c. Does the submission and/or district meet the release rate criteria for the applicable subarea?
      _____

   d. Number of subarea(s) from Chapter Appendix D of the Schuylkill River Watershed Stormwater Management Plan._____

   e. Type of proposed runoff control_____

   f. Does the proposed stormwater control criteria meet the requirement/guidelines of the Stormwater Ordinances?_____

      If not, what variances/waivers are requested?_____
      _____

      Reasons_____

f. Does the plan meet the requirements of Part 3 of the Stormwater Ordinances?___

If not, what variances/waivers are requested?_____

Reasons Why _____

_____

g. Was TR-55, June 1986 utilized in determining the time of concentration?_____

_____

h. What hydrologic method was used in the stormwater computations?_____

_____

i. Is a hydraulic routing through the stormwater control structure submitted?_____

_____

j. Is a construction schedule or staging attached?_____

k. Is a recommended maintenance program attached?_____

9. Erosion and Sediment Pollution Control (E&S):

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

b. Total area of earth disturbance _____S.F.

10. Wetlands

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

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

c. Have the wetland lines been surveyed?_____

d. Total acreage of wetland within the property _____

e. Total acreage of wetland disturbed_____

f. Supporting documentation_____

11. Filing

a. Has the required fee been submitted?_____

Amount_____

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

c. Name of individual who will be making the inspections_____

d. General comments about stormwater management at the development_____
_____
_____

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF APPLICATION:

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF__[*County Name*]__.

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

_____Property Owner

My Commission Expires_____20_____
Notary Public_____

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

SIGNATURE OF APPLICANT_____

//

(Information Below This Line To Be Completed By The Township)

Tilden Township official submission receipt:

Date complete application received _____Plan Number_____

Fees _____ date fees paid _____ received by_____

Official submission receipt date _____

Received by_____

_____
Tilden Township

Section 1004. Appendix D – Stormwater Management District Watershed Map. (Ordinance No. 191, January 5, 2009, Section 1)

Section 1005. Appendix E – Low Impact Development (LID) Practices. (Ordinance No. 191, January 5, 2009, Section 1)

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

The recommended alternative approach is to promote practices that will minimize proposed conditions runoff rates and volumes, which will minimize needs for artificial conveyance and storage facilities. To simulate pre-development hydrologic conditions, infiltration is often necessary to offset the loss of infiltration by creation of impervious surfaces. The ability of the ground to infiltrate depends upon the soil types and its conditions.

Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. A well-designed site will contain a mix of all those features. The following describes various techniques to achieve the alternative approach:

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

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

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

- **Reducing the Hydraulic Connectivity of Impervious Surfaces**. Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff, and should help reduce concentration of runoff to a single point in the development.

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

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

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

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

- **Using Permeable Paving Materials**. These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.

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

- **Constructing Cluster Developments**. Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings is in street length, which

also will reduce costs of the development. Cluster development clusters the construction activity onto less-sensitive areas without substantially affecting the gross density of development.

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

Section 1006. Appendix F – West Nile Virus Guide. (Ordinance No. 191, January 5, 2009, Section 1)

(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.

Section 1007. Appendix G – References. (Ordinance No. 191, January 5, 2009, Section 1)

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**

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 Non-point Source Pollution from Stormwater (Fifth Draft May 2000) – **http://www.state.nj.us/dep/watershedmgt/bmpmanual.htm**

New York

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

Pennsylvania

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

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

Washington
Stormwater Management Manual for Western Washington (August 2001) – **http://www.ecy.wa.gov/programs/wq/stormwater/manual.html**

Federal
Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA) – **http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm**

USEPA Infiltration Trench Fact Sheet (September 1999) – **http://cfpub.epa.gov/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.

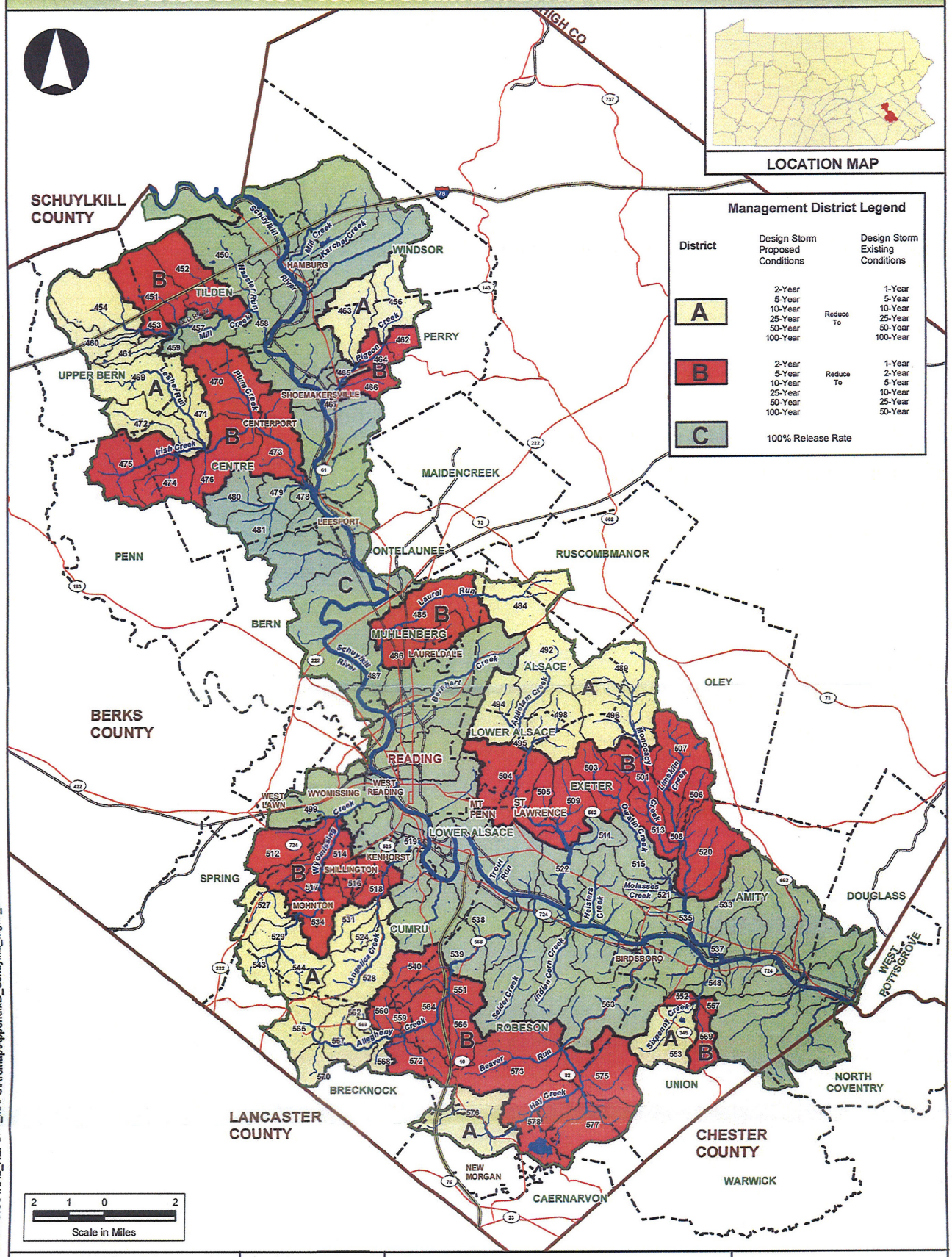
Fike, Jean, June 1999. *Terrestrial & Palustrine Plant Communities of Pennsylvania,* Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. P*ennsylvania 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.

TRIBUTARIES TO THE SCHUYLKILL RIVER IN BERKS COUNTY
PHASE II - ACT 167 STORMWATER MANAGEMENT PLAN



ORDINANCE APPENDIX D MANAGEMENT DISTRICTS

Prepared For:
Berks County
Planning Commission
County Services Center
633 Court Street
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Legend
- WATERSHED BOUNDARY
- SUBAREAS
- WATER BODIES
- STREAMS
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES

Roads
- INTERSTATE
- HIGHWAYS
- OTHER ROADS
- RAILROADS

NOTE:
Portions of this map were generated from existing data sources as listed below. These data are shown on the map for spatial reference only. These data did not enter into any computations or affect the reliability of the hydrologic analysis. Borton-Lawson Engineering has found some inaccuracies in some of these data and has corrected the data in locations where discrepancies were obvious, however, it was not a part of this ACT 167 Plan to correct all of the mapping data.

DATA SOURCES:
Watershed Boundary - PADEP (Modified by BLE)
Roads - Berks County
Counties - PennDOT
Municipalities - Berks County
Streams - PADEP
Water Bodies - USFWS (Derived from NWI Wetlands)
Management Districts and Subareas - Delineated by BLE

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DATE: 5/14/2007 PROJECT #: 2004-1489-00

FILE: \\WBDataProjects\2004\1489\00\DATA\GIS\FINAL_REPORT_MAPS\ArcMap\AppendixD_Schuylkill_Mgmt_Districts.mxd