MODEL STORMWATER MANAGEMENT ORDINANCE
(DRAFT FOR REVIEW – 5/04)

PLEASE HAVE YOUR SOLICITOR REVIEW THE ENCLOSED ORDINANCE AND CHECK THE APPLICABILITY OF ALL SECTIONS TO YOUR MUNICIPALITY

If you have any questions, please call
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NOTE: THE ORDINANCE PROVISIONS CAPITALIZED IN THIS MODEL ORDINANCE ARE DIRECT LANGUAGE FROM PADEP'S NPDES MODEL ORDINANCE.

STORMWATER MANAGEMENT ORDINANCE

ORDINANCE NO.

[*Municipal Name*], __[*County Name*]_ COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on _____, 20__

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ARTICLE I- GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the [Municipality Name] Stormwater Management Ordinance.

Section 102. Statement of Findings

The governing body of the Municipality finds that:

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

B. INADEQUATE PLANNING AND MANAGEMENT OF STORMWATER RUNOFF RESULTING FROM LAND DEVELOPMENT AND REDEVELOPMENT THROUGHOUT A WATERSHED CAN ALSO HARM SURFACE WATER RESOURCES BY CHANGING THE NATURAL HYDROLOGIC PATTERNS, ACCELERATING STREAM FLOWS (WHICH INCREASE SCOUR AND EROSION OF STREAM-BEDS AND STREAM-BANKS THEREBY ELEVATING SEDIMENTATION), DESTROYING AQUATIC HABITAT AND ELEVATING AQUATIC POLLUTANT CONCENTRATIONS AND LOADINGS SUCH AS SEDIMENTS, NUTRIENTS, HEAVY METALS AND PATHOGENS. GROUNDWATER RESOURCES ARE ALSO IMPACTED THROUGH LOSS OF RECHARGE.

C. A comprehensive program of stormwater management, including reasonable regulation of development, redevelopment and activities causing accelerated erosion and loss of natural infiltration is fundamental to the public health, safety, welfare, and the protection of the people of the Municipality and all 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. Through sound project design, impacts from stormwater runoff can be minimized to maintain the natural hydrologic regime, and sustain high water quality, groundwater recharge, stream baseflow and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage stormwater runoff is through nonstructural project design: minimizing impervious surfaces and sprawl, avoiding sensitive areas (i.e.

stream buffers, floodplains, steep slopes), and designing with consideration of topography and soils to maintain the natural hydrologic regime, e.g., by concentrating development on less permeable soils (Hydrologic Soil Groups (HSGs) C and D) and keeping more permeable soils (HSGs A and B) undeveloped.

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 MUNICIPALITY.

Section 103. Purpose

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

A. Promote alternative project designs and layouts that minimize impacts to surface and groundwater.

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 and stormwater runoff impacts at their source by regulating activities that cause these problems during construction.

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

G. Utilize and preserve the existing natural drainage systems as much as possible.

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. Strive to maintain existing base flows and quality of streams and watercourses.

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 NONSTORMWATER DISCHARGES INTO THE MUNICIPALITY'S SEPARATE STORM SEWER SYSTEM.

O. Preserve 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 Municipality.

Section 104. Statutory Authority

The Municipality is empowered to regulate land use activities that affect runoff, surface and groundwater quality and quantity by the authority of the Act of October 4, 1978 32 P.S., P.L. 864 (Act 167) Section 680.1 et seq., as amended, the "Stormwater Management Act" (hereinafter referred to as "the Act"), and the Water Resources Management Act of 2002, as amended, Second Class Township Code, 53 PS Section 66501 et seq., 66601 et seq. and the Borough Code 53 PS Section 46201 et seq.; Pa. Municipal Planning Code, Act 247, as amended.

Section 105. Applicability/Regulated Activities

THIS ORDINANCE APPLIES TO ANY REGULATED EARTH DISTURBANCE ACTIVITIES WITHIN THE MUNICIPALITY, AND ALL STORMWATER RUNOFF ENTERING INTO THE MUNICIPALITY'S COMBINED OR SEPARATE STORM SEWER SYSTEM FROM LANDS WITHIN THE BOUNDARIES OF THE MUNICIPALITY.

EARTH DISTURBANCE ACTIVITIES AND ASSOCIATED STORMWATER MANAGEMENT CONTROLS ARE ALSO REGULATED UNDER EXISTING STATE LAW AND IMPLEMENTING REGULATIONS. THIS

ORDINANCE SHALL OPERATE IN COORDINATION WITH THOSE PARALLEL REQUIREMENTS; THE REQUIREMENTS OF THIS ORDINANCE SHALL BE NO LESS RESTRICTIVE IN MEETING THE PURPOSES OF THIS ORDINANCE THAN STATE LAW.

This Ordinance shall only apply to permanent nonstructural and structural stormwater management Best Management Practices (BMPs) constructed as part of any of the Regulated Activities listed in this Section.

This Ordinance contains only the stormwater management performance standards and design criteria that are necessary or desirable from a water quality and quantity control and from a watershed-wide perspective. Local stormwater management design criteria (e.g., from a water quality and quantity control and inlet spacing, inlet type, collection system design and details, outlet structure design, etc.) shall continue to be regulated by the applicable Municipal Ordinances and applicable State Regulations.

The following activities are defined as "Regulated Activities" and shall be regulated by this Ordinance:

A. Land development.
B. Subdivisions.
C. Alteration of the natural hydrologic regime
D. Construction or reconstruction of, or additional impervious or semi-pervious surfaces (driveways, parking lots, roads, etc.).
E. Construction of new buildings or additions to existing buildings.
F. Redevelopment of a site.
G. Diversion piping or encroachments in any natural or man-made channel.
H. Nonstructural and structural stormwater management BMPs or appurtenances thereto.
I. Any of the above Regulated Activities that were approved more than 5 years before the effective date of this ordinance and resubmitted for municipal approval.

Section 106. Repealer

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

Section 107. Severability

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

Section 108. Compatibility With Other Ordinance Requirements

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

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

NOTHING IN THIS ORDINANCE SHALL BE CONSTRUED TO AFFECT ANY OF THE MUNICIPALITY'S REQUIREMENTS REGARDING STORMWATER MATTERS WHICH DO NOT CONFLICT WITH THE PROVISIONS OF THIS ORDINANCE, SUCH AS LOCAL STORMWATER MANAGEMENT DESIGN CRITERIA (E.G. INLET SPACING, INLET TYPE, COLLECTION SYSTEM DESIGN AND DETAILS, OUTLET STRUCTURE DESIGN, ETC.). CONFLICTING PROVISIONS IN OTHER MUNICIPAL ORDINANCES OR REGULATIONS SHALL BE CONSTRUED TO RETAIN THE REQUIREMENTS OF THIS ORDINANCE ADDRESSING STATE WATER QUALITY REQUIREMENTS.

ARTICLE II-DEFINITIONS

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

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

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

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

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

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

Section 202. Definitions

Accelerated Erosion - The removal of the surface of the land through the combined action of man's activity and the natural processes at a rate greater than would occur because of the natural processes 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 Ordinance 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 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 104 of this Ordinance.

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

Base Flow – (Also known as **dry weather 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 – (Also sometimes known as **biofiltration**) 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.

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 [*County Name*] 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. (also PADEP or DEP)

Designee - The agent of the [*County Name*] County Planning [Commission or Department], [*County Name*] County Conservation District and/or agent of the governing body involved with the administration, review or enforcement of any provisions of this ordinance by contract or memorandum of understanding.

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

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

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 EARTH DISTURBANCE ACTIVITIES AT A PROJECT SITE IN THE MUNICIPALITY.

DEVELOPMENT - SEE "EARTH DISTURBANCE ACTIVITY." THE TERM INCLUDES REDEVELOPMENT.

Development Site - The specific tract of land where any Earth Disturbance activities in the Municipality are planned, conducted or maintained. The specific tract of land for which a Regulated Activity is proposed.

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

Discharge – To release water from a project, site, aquifer, drainage basin or other point of interest (verb); 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) (noun). See also Peak Discharge.

Disturbed Area – 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 manage ment purposes.

Drainage Permit - A permit issued by the Municipal governing body 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, ice 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 the Federal Emergency Management Agency (FEMA). In an area where no FEMA maps or studies have defined the boundary of the 100-year frequency floodway, it is assumed - absent evidence to the contrary - that the floodway extends from the stream to 50 feet from the top-of-bank.

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 within 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).

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 U.S. Department of Agriculture Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), into four runoff potential groups. The groups range from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff.

Impervious Surface - A surface that prevents the infiltration of water into the ground. Impervious surface includes, but is not limited to, any roof, parking or driveway areas, and any new streets and sidewalks. Any surface areas designed to initially 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 - Structures designed to direct runoff into the underground water (e.g., French drains, seepage pits, seepage trenches, infiltration galleries, dry wells).

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 - (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure or (b) the division or allocation of land or space, whether initially or cumulatively, between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) A subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

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

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

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

(iii) A rock formation, other stratum or soil condition that is so slowly permeable that it effectively limits downward passage of effluent or percolating groundwater.

Lot – A part of a subdivision or a parcel of land used as a building site or intended to be used for building purposes, whether immediate or future, which would not be further subdivided. Whenever a lot is used for a multiple family dwelling or for commercial, institutional or industrial purposes, the lot shall be deemed to have been subdivided into an equivalent number of single family residential lots as determined by estimated sewage flows.

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

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

Municipality – [*Municipal name*], [*County name*] County, Pennsylvania.

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 groundwater.

Non-point 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 Practices (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 – U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (previously Soil Conservation Service or SCS).

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

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

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

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

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

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

PERSON - AN INDIVIDUAL, PARTNERSHIP, PUBLIC OR PRIVATE ASSOCIATION OR CORPORATION, OR A GOVERNMENTAL UNIT, PUBLIC UTILITY OR ANY OTHER LEGAL ENTITY WHATSOEVER WHICH IS RECOGNIZED BY LAW AS THE SUBJECT OF RIGHTS AND DUTIES.

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

Planning Commission - The planning commission of [*Municipality name*].

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 when disturbed areas are stabilized, stormwater controls are in place and functioning and all proposed improvements in the approved land development plan are completed.

Predevelopment – Undeveloped/Natural Condition.

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

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

REGULATED EARTH DISTURBANCE ACTIVITY - EARTH DISTURBANCE ACTIVITY ONE ACRE OR MORE WITH A POINT SOURCE DISCHARGE TO SURFACE WATERS OR THE MUNICIPALITY'S STORM SEWER SYSTEM, OR FIVE ACRES OR MORE REGARDLESS OF THE PLANNED RUNOFF. THIS INCLUDES EARTH DISTURBANCE ON ANY PORTION OF, PART, OR DURING ANY STAGE OF, A LARGER COMMON PLAN OF DEVELOPMENT. (Note, however, that "redevelopment" is regulated if its land disturbance exceeds 2,000 square feet.)

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

Retention Basin - A structure in which stormwater is stored and not released during the storm event. Retention basins do not have an outlet other than recharge or emergency spillways and must infiltrate stored water in no more than 4 days, unless designed as a wet basin or pond or wetland.

Return Period - The average interval, in years, within which a storm event of a given or greater 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, i.e., it would have a four (4) percent probability of occurrence in any given year.

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 PAVED OR 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 roof surfaces by incorporating controlled-flow roof drains into building designs.

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

SALDO – 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 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 - AS DEFINED UNDER STATE REGULATIONS -- PROTECTION OF *DESIGNATED* AND *EXISTING* USES (SEE 25 PA. CODE CHAPTERS 93 AND 96)-- INCLUDING:

A. EACH STREAM SEGMENT IN PENNSYLVANIA HAS A "DESIGNATED USE," SUCH AS "COLD WATER FISHERY" OR "POTABLE WATER SUPPLY," WHICH ARE LISTED IN CHAPTER 93. THESE USES MUST BE PROTECTED AND MAINTAINED, UNDER STATE REGULATIONS.

B. "EXISTING USES" ARE THOSE ATTAINED AS OF NOVEMBER 1975, REGARDLESS WHETHER THEY HAVE BEEN DESIGNATED IN CHAPTER 93. REGULATED EARTH DISTURBANCE ACTIVITIES MUST BE DESIGNED TO PROTECT AND MAINTAIN EXISTING USES AND MAINTAIN THE LEVEL OF WATER QUALITY NECESSARY TO PROTECT THOSE USES IN ALL STREAMS, AND TO PROTECT AND MAINTAIN WATER QUALITY IN SPECIAL PROTECTION STREAMS.

C. WATER QUALITY INVOLVES THE CHEMICAL, BIOLOGICAL AND PHYSICAL CHARACTERISTICS OF SURFACE WATER BODIES. AFTER REGULATED EARTH DISTURBANCE ACTIVITIES ARE COMPLETE, THESE CHARACTERISTIC S CAN BE IMPACTED BY ADDITION OF POLLUTANTS SUCH AS SEDIMENT, AND CHANGES IN HABITAT THROUGH INCREASED FLOW VOLUMES AND/OR RATES AS A RESULT OF CHANGES IN LAND SURFACE AREA FROM THOSE ACTIVITIES. THEREFORE, PERMANENT DISCHARGES TO SURFACE WATERS MUST BE MANAGED TO PROTECT THE STREAM BANK, STREAMBED AND STRUCTURAL INTEGRITY OF THE WATERWAY, TO PREVENT THESE IMPACTS.

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

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

Stream – A natural watercourse.

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

Stream Enclosure - A bridge, culvert or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of this Commonwealth.

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 WATER, OR PARTS THEREOF, WHETHER NATURAL OR ARTIFICIAL, WITHIN OR ON THE BOUNDARIES OF THIS COMMONWEALTH.

Swale - A low-lying stretch of land that gathers or carries surface water runoff, but which does not have a clearly defined channel.

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.

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 stormwater runoff management that is designed to detain surface runoff and always contains water.

Wetlands - 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.

ARTICLE III - STORMWATER MANAGEMENT

Section 301. General Requirements

A. Applicants proposing regulated activities, which do not meet the exemption criteria shown in Section 402, shall submit a drainage plan to the municipality 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 find practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime

C. The drainage plan must be designed consistent with the sequencing provisions of Section 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 Article III of this ordinance.

D. Stormwater drainage systems shall be provided in order to permit unimpeded flow along natural watercourses, except as modified by stormwater management facilities or open channels consistent with this Ordinance.

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

F. Areas of existing diffused drainage discharge 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 ordinance. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent property, the Applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other impacts will result from the concentrated discharge.

G. Where a development site is traversed by existing streams, drainage easements shall be provided conforming to the line of such streams. The terms of the easement shall conform to the stream buffer requirements contained in Section 306.F of this Ordinance.

H. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PADEP through the Joint Permit Application or the Environmental Assessment Approval 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.

I. Any stormwater management facilities regulated by this Ordinance that would be located on State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT).

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

K. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches, in order to promote overland flow and infiltration/percolation of stormwater where it is advantageous to do so. When it is more advantageous to connect directly to streets or storm sewers, then it shall be permitted on a case by case basis by the municipality.

L. All stormwater runoff shall be pretreated for water quality prior to discharge to surface or groundwater.

M. ALL REGULATED EARTH DISTURBANCE ACTIVITIES WITHIN THE MUNICIPALITY SHALL BE DESIGNED, IMPLEMENTED, OPERATED AND MAINTAINED TO MEET THE PURPOSES OF THIS ORDINANCE, THROUGH THESE TWO ELEMENTS:

1. EROSION AND SEDIMENT CONTROL DURING THE EARTH DISTURBANCE ACTIVITIES (E.G., DURING CONSTRUCTION), AND

2. WATER QUALITY PROTECTION MEASURES AFTER COMPLETION OF EARTH DISTURBANCE ACTIVITIES (I.E. AFTER CONSTRUCTION), INCLUDING OPERATIONS AND MAINTENANCE.

N. NO REGULATED EARTH DISTURBANCE ACTIVITIES WITHIN THE MUNICIPALITY SHALL COMMENCE UNTIL THE REQUIREMENTS OF THIS ORDINANCE ARE MET.

O. Erosion and sediment control during Regulated earth Disturbance activities shall be addressed as required by Section 303.

P. POST-CONSTRUCTION WATER QUALITY PROTECTION SHALL BE ADDRESSED AS REQUIRED BY SECTION 306.

Q. OPERATIONS AND MAINTENANCE OF PERMANENT STORMWATER BMPS SHALL BE ADDRESSED AS REQUIRED BY ARTICLE VII.

R. ALL BEST MANAGEMENT PRACTICES (BMPS) USED TO MEET THE REQUIREMENTS OF THIS ORDINANCE SHALL CONFORM TO THE STATE WATER QUALITY REQUIREMENTS, AND ANY MORE STRINGENT REQUIREMENTS AS DETERMINED BY THE MUNICIPALITY.

S. TECHNIQUES DESCRIBED IN APPENDIX D (LOW IMPACT DEVELOPMENT) OF THIS ORDINANCE ARE ENCOURAGED, BECAUSE THEY REDUCE THE COSTS OF COMPLYING WITH THE REQUIREMENTS OF THIS ORDINANCE AND THE STATE WATER QUALITY REQUIREMENTS.

T. In selecting the appropriate BMPs or combinations thereof, the Applicant SHALL consider the following:

1. Total contributing area.
2. Permeability and infiltration rate of the site soils.
3. Slope and depth to bedrock.
4. Seasonal high water table.
5. Proximity to building foundations and well heads.
6. Erodibility of soils.
7. Land availability and configuration of the topography
8. Required peak discharge and volume control.
9. Stream bank erosion.
10. Efficiency of the BMPs to mitigate potential water quality problems.
11. The volume of runoff that will be effectively treated.
12. The nature of the pollutant(s) being removed.
13. Maintenance requirements.
14. Creation/protection of aquatic and wildlife habitat.
15. Recreational value.

However, in general, BMPs for water quality management are, in order of preference and effectiveness:

1. Infiltration devices
2. Dispersed, numerous small bioretention facilities
3. Wet ponds
4. Created wetlands

SECTION 302. PERMIT REQUIREMENTS BY OTHER GOVERNMENT ENTITIES

THE FOLLOWING PERMIT REQUIREMENTS MAY APPLY TO CERTAIN REGULATED EARTH DISTURBANCE ACTIVITIES, AND MUST BE MET PRIOR TO COMMENCEMENT OF REGULATED EARTH DISTURBANCE ACTIVITIES, AS APPLICABLE:

A. ALL REGULATED EARTH DISTURBANCE ACTIVITIES SUBJECT TO PERMIT REQUIREMENTS BY DEP UNDER REGULATIONS AT 25 PA. CODE CHAPTER 102.

B. WORK WITHIN NATURAL DRAINAGEWAYS SUBJECT TO PERMIT BY DEP UNDER 25 PA. CODE CHAPTER 105.

C. ANY STORMWATER MANAGEMENT FACILITY THAT WOULD BE LOCATED IN OR ADJACENT TO SURFACE WATERS OF THE COMMONWEALTH, INCLUDING WETLANDS, SUBJECT TO PERMIT BY DEP UNDER 25 PA. CODE CHAPTER 105.

D. ANY STORMWATER MANAGEMENT FACILITY THAT WOULD BE LOCATED ON A STATE HIGHWAY RIGHT-OF-WAY, OR REQUIRE ACCESS FROM A STATE HIGHWAY, SHALL BE SUBJECT TO APPROVAL BY THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION (PENNDOT).

E. CULVERTS, BRIDGES, STORM SEWERS OR ANY OTHER FACILITIES WHICH MUST PASS OR CONVEY FLOWS FROM THE TRIBUTARY AREA AND ANY FACILITY WHICH MAY CONSTITUTE A DAM SUBJECT TO PERMIT BY DEP UNDER 25 PA. CODE CHAPTER 105.

SECTION 303. EROSION AND SEDIMENT CONTROL DURING REGULATED EARTH DISTURBANCE ACTIVITIES

A. NO REGULATED EARTH DISTURBANCE ACTIVITIES WITHIN THE MUNICIPALITY SHALL COMMENCE UNTIL APPROVAL BY THE MUNICIPALITY OF AN EROSION AND SEDIMENT CONTROL PLAN FOR CONSTRUCTION ACTIVITIES.

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 MUNICIPALITY. [*] THE ISSUANCE OF AN NPDES CONSTRUCTION PERMIT (OR PERMIT COVERAGE UNDER THE STATEWIDE GENERAL PERMIT (PAG-2) SATISFIES THE REQUIREMENTS OF SUBSECTION 303.A. [*]

[**] This sentence is optional -- if the municipality has additional or more stringent requirements than those in state regulations, then this sentence should not be used.

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 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.

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

A. The design of all Regulated Activities shall include the following steps in sequence to minimize stormwater impacts.

1. The Applicant is required to find practicable alternatives to the surface discharge of stormwater, such as those listed in Appendix B, Table B-5, and to the creation of impervious surfaces and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime of the site.

2. An alternative is practicable if it is available and capable of implementation after taking into consideration cost, existing technology and logistics in light of overall project purposes, and other municipal requirements.

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

B. The Applicant shall demonstrate that they designed the regulated activities in the following sequence. The goal of the sequence is to minimize the increases in stormwater runoff and impacts to water quality resulting from the proposed regulated activity:

1. Prepare an Existing Resource and Site Analysis Map (ERSAM), showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal pools, stream buffers, hydrologic soil groups A and B, any existing recharge areas, and any other required areas outlined in the municipal subdivision and land development ordinance (SALDO).

2. Establish a stream buffer according to Section 306.F.

3. Prepare a draft project layout avoiding the sensitive areas identified in section 304.B.1

4. Identify site specific predevelopment drainage areas, discharge points, recharge areas and hydrologic soil groups A and B (areas conducive to infiltration).

5. Evaluate nonstructural stormwater management alternatives:
   a. Minimize earth disturbance.
   b. Minimize impervious surfaces.
   c. Break up large impervious surfaces.

6. Satisfy groundwater recharge (infiltration) objective (Section 305) and provide for stormwater pretreatment before infiltration.

7. Provide for water quality in accordance with Section 306 “Water Quality Requirements”.

8. Provide stream bank erosion protection in accordance with Section 307 “Stream Bank Erosion Requirements”.

9. Prepare final project design to maintain predevelopment 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 post development runoff analysis based on the final design.

11. Manage any remaining runoff prior to discharge, through detention, bioretention, direct discharge or other structural control.

Section 305. Groundwater Recharge

Maximizing the groundwater recharge capacity of the area being developed is required. Design of the recharge stormwater management facilities shall take into consideration groundwater recharge to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs 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.

A. Minimum Requirements - Infiltration BMPs shall meet the following minimum requirements:

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

a. A minimum depth of 24 inches between the bottom of the BMP and the limiting zone.

b. An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests conducted by the Applicant’s design professional.

c. The recharge facility shall be capable of completely infiltrating the recharge volume within 4 days (96 hours).

d. Pretreatment to remove sediment shall be provided prior to infiltration. Pretreatment may include, but is not limited to, sediment retention basins,

vegetative (bio) filters, sediment and grease traps in storm drainage structures, and sand filtration chambers.

e. The requirements for recharge shall be applied to all disturbed areas, even if they are ultimately to be in an undeveloped land use such as grass, since many studies have found that compaction of soils during disturbance reduces their infiltration capacities, and that large lawn areas, especially those maintained by power equipment, generally have low infiltration capacities.

2. The size of the recharge facility shall be based upon the following volume criteria:

Recharge may not be feasible on every site due to site-specific limitations such as soil type. If it cannot be physically accomplished, then the design professional shall be responsible to show that this cannot be *physically* accomplished. If it can be physically accomplished, then the volume of runoff to be recharged shall be determined by the method outlined below.

The NRCS Curve Numbers (CN) shall be utilized to calculate infiltration requirements (I) in inches.

For zero runoff: $P = I = (200 / CN) - 2$

Eqn: 305.1

Where: P = I = infiltration requirement (inches)
CN = SCS (NRCS) curve number of the land area that will be converted to impervious surface or that will be disturbed

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

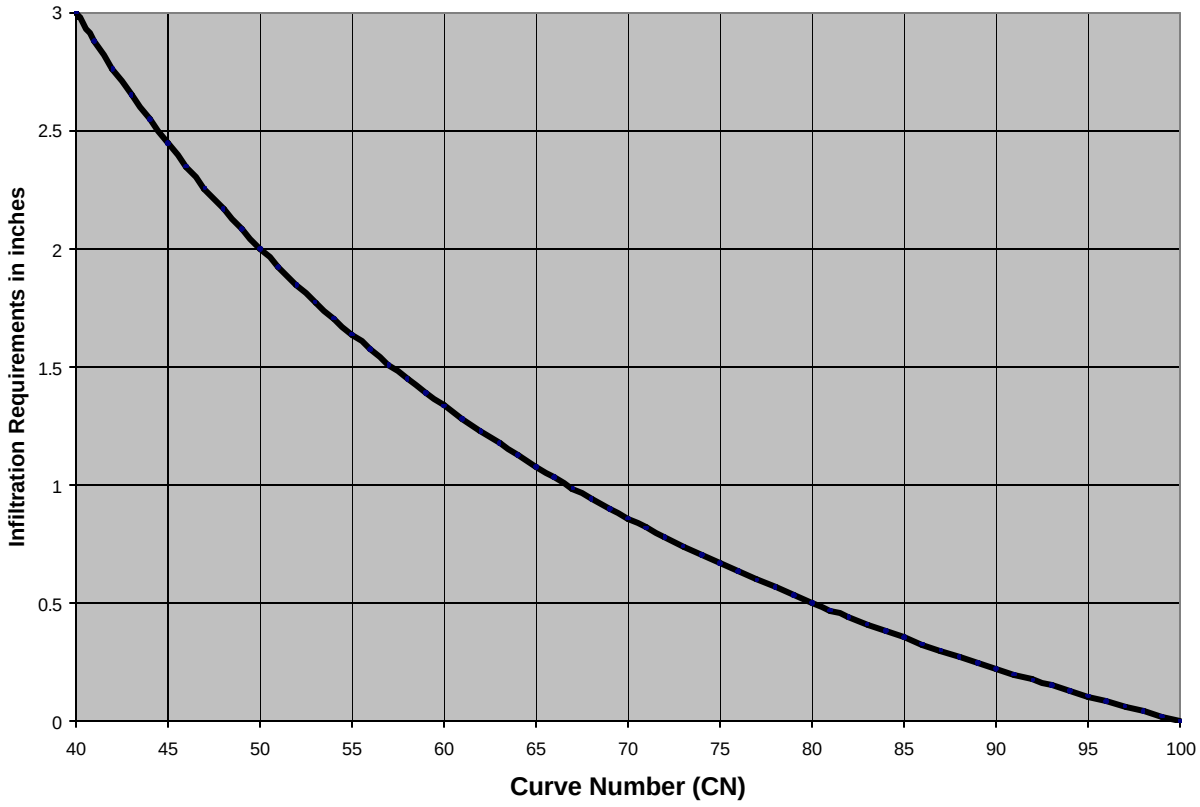
The recharge volume (Re_v) required would therefore be computed as:

Re_v = I (inches) x Impervious or Disturbed Area (in square feet)/12 (inches)
= Volume (in cubic feet (cf))

Eqn: 305.2

Where: I = infiltration requirement (in.) from Equation 305.1. However, in no case shall the infiltration requirement be less than one half (0.5) inch.

Figure 305.1. Infiltration Requirement
(based upon NRCS Curve Number)



The recharge values derived from this method are the minimum volumes the Applicant must control through a recharge BMP facility. However, if a site has areas of soils where additional volume of recharge can be achieved, the applicant is encouraged to recharge as much of the stormwater runoff from the site as possible.

B. Soils - A detailed soils evaluation of the project site shall be required to determine the suitability of recharge 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 recharge 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.

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

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

C. Stormwater Hotspots – A stormwater hotspot is defined as a land use activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical stormwater runoff, based on monitoring studies. Table 305.1 provides samples 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 cannot be allowed to recharge into groundwater where it may contaminate water supplies. Therefore, the Re_v requirement is NOT applied to development sites that fit into the hotspot category (the entire WQ_v must still be treated). Second, a greater level of stormwater treatment may be needed 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.

Table 305.1 – Classification of Stormwater Hotspots

The following land uses and activities are examples of stormwater hotspots:

- **Vehicle salvage yards and recycling facilities**
- **Fleet storage areas (bus, truck, etc.)**
- **Public works storage areas**
- **Facilities that generate, transfer, store or dispose of hazardous materials as defined by the federal Resource Conservation and Recovery Act (RCRA).**

D. Source Water Protection Areas - Extreme caution shall be exercised where infiltration is proposed in Source Water Protection Areas as defined and delineated by the local Municipality or Water Authority.

E. BMPs - Recharge/infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.

F. Extreme caution shall be exercised where salt or chloride (municipal salt storage) would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration/ recharge facility and perform a hydrogeologic justification study if necessary.

G. The infiltration requirement in High Quality/Exceptional Value waters shall be subject to the Department's Chapter 93 Antidegradation Regulations.

H. The municipality may require the installation of an impermeable liner in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the municipality.

The municipality shall require the Applicant to provide safeguards against groundwater contamination for uses that may cause groundwater contamination should there be a mishap or spill.

Section 306. Water Quality Requirements

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

NO REGULATED EARTH DISTURBANCE ACTIVITIES WITHIN THE MUNICIPALITY SHALL COMMENCE UNTIL FINAL APPROVAL BY THE MUNICIPALITY OF A PLAN THAT DEMONSTRATES POST-CONSTRUCTION COMPLIANCE WITH STATE WATER QUALITY REQUIREMENTS.

A. THE BMPS SHALL BE DESIGNED, IMPLEMENTED AND MAINTAINED TO MEET STATE WATER QUALITY REQUIREMENTS, AND ANY OTHER MORE STRINGENT REQUIREMENTS AS DETERMINED BY THE MUNICIPALITY.

B. TO CONTROL POST-CONSTRUCTION STORMWATER IMPACTS FROM REGULATED EARTH DISTURBANCE ACTIVITIES, STATE WATER QUALITY REQUIREMENTS CAN BE MET BY BMPS, INCLUDING SITE DESIGN, WHICH PROVIDE FOR REPLICATION OF PRE-CONSTRUCTION STORMWATER INFILTRATION AND RUNOFF CONDITIONS, SO THAT POST-CONSTRUCTION STORMWATER DISCHARGES DO NOT DEGRADE THE PHYSICAL, CHEMICAL OR BIOLOGICAL CHARACTERISTICS OF THE RECEIVING WATERS. AS DESCRIBED IN THE DEP COMPREHENSIVE STORMWATER MANAGEMENT POLICY (#392-0300-002, SEPTEMBER 28, 2002), THIS MAY BE ACHIEVED BY THE FOLLOWING:

1. INFILTRATION: REPLICATION OF PRE-CONSTRUCTION STORMWATER INFILTRATION CONDITIONS,

2. TREATMENT: USE OF WATER QUALITY TREATMENT BMPS TO ENSURE FILTERING OUT OF THE CHEMICAL AND PHYSICAL POLLUTANTS FROM THE STORMWATER RUNOFF, AND

3. STREAMBANK AND STREAMBED PROTECTION: MANAGEMENT OF VOLUME AND RATE OF POSTCONSTRUCTION STORMWATER DISCHARGES TO PREVENT PHYSICAL DEGRADATION OF RECEIVING WATERS (E.G., FROM SCOURING).

C. Developed areas shall provide adequate storage and treatment facilities necessary to capture and treat stormwater runoff. The recharge 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 recharge volume is less than the water quality volume, the remaining water quality volume may be captured and treated by methods other than recharge/infiltration BMPs. The required water quality volume (WQv) is the storage capacity needed to capture and treat that portion of stormwater runoff from the site, which is produced by storms that cumulatively represent 90 percent of the mean annual precipitation (P). (See table 306.1 and Figure B-2). To achieve this goal, the following criterion is established:

TABLE 306.1

24-Hour Storm Values Representing 90% of Mean Annual Precipitation
(PA Handbook of Best Management Practices for Developing Areas, 1998, Appendix F)

PennDOT Rainfall Region 5 (See Fig. B-2)	P Inches
1	1.13
2	1.48
3	1.60
4	1.95
5	2.04

The following equation is to be used to calculate the water quality storage volume, (WQv), in acre-feet:

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

Where: WQv = Water Quality Volume (acre- feet)
P = 2.04 inches (note: The entire Pennypack Creek Watershed lies within PennDOT Rainfall Region 5).
A = Area contributing to the water quality BMP (acres)
Rv = 0.05 + 0.009(Ip) where Ip is the percentage of the area that is or is proposed to be impervious surface ((impervious area/A) x 100)

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

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. Discharge orifices shall be no smaller than 3 inches in diameter.

D. For areas within defined Special Protection subwatersheds which include Exceptional Value (EV) and High Quality (HQ) waters, the temperature and quality of water and streams shall be maintained through the use of temperature sensitive BMPs and stormwater conveyance systems.

E. To accomplish the above, the Applicant shall submit original and innovative designs to the Municipal Engineer for review and approval. Such designs may achieve the water quality objectives through a combination of BMPs (Best Management Practices). (See Subsection 301.T.)

F. If a perennial or intermittent stream passes through the site, the applicant shall create a stream buffer extending a minimum of fifty (50) feet from the top-of-bank of both sides of the channel. The buffer area shall be maintained with appropriate native vegetation. 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 Ordinance, the existing buffer shall be maintained. [The Municipality may select a smaller buffer width if desired, but the selected buffer may not be less than ten (10) feet]. This does not include lakes or wetlands.

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

[*] This sentence is optional -- if the municipality has additional or more stringent requirements than those in state regulations, then this sentence should not be used.

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, and to assist in controlling overbank flows, i.e. flooding, the primary requirement is to design a BMP to store the volume of the runoff from the post-development 2-year, 24-hour design storm. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the volume of runoff from the 2-year storm takes a minimum of 24 hours and a maximum of 48 hours to drain from the facility from a point where the maximum volume of water from the 2-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 orifice is at the invert of the facility).

The minimum orifice size in the outlet structure of the BMP shall be a three (3) inch diameter orifice and a trash rack shall be installed to prevent clogging. If sites with small contributing drainage areas to this BMP do not provide enough runoff volume to allow a 24-hour attenuation

with the 3 inch orifice, the calculations shall be submitted showing this. Installation of the orifice in these cases shall meet the streambank erosion requirements.

Streambank Restoration projects shall include the following:

1. An examination of the fluvial geomorphology of the stable reaches above and below the restoration project.

2. Consideration of the long-term maintainability of adjacent stable reaches of the stream channel.

3. An Erosion and Sediment Control Plan approved by the Conservation District.

Section 308. Stormwater Quantity Control

A. In addition to the requirements specified below, the erosion and sedimentation control (Section 303), the nonstructural project design (Section 304), the groundwater recharge (Section 305), the water quality (Section 306), and the streambank erosion (Section 307) requirements shall be implemented.

As stated in Section 307, the bankfull flood volume, i.e., the 2-year 24-hour design storm runoff volume from the development site shall be captured and stored for a minimum of 24 hours and a maximum of 48 hours. (See Appendix B of this Ordinance, Table B-1, for the corresponding depth of precipitation.) This will reduce the frequency and magnitude of overbank flows, reduce downstream streambank and channel erosion and thereby mitigate downstream water quality, and will contribute significantly to the mitigation of extreme flood events. It will also help to ensure fulfillment of the minimum MS4 requirements of the NPDES Phase II regulations, specifically sec. 122.34(b)(5). (See Section 311 of this Ordinance)

In addition, development or redevelopment sites must control proposed, i.e., post-development or post-redevelopment, peak runoff rates to existing (pre-development) condition peak runoff rates for the 24-hour design storms in accordance with Table 308.1.

Table 308.1

Required Reductions in Peak Runoff Rates

Proposed (Post-Development) Condition 24-hour Design Storm	**Existing (Pre-Development) Condition 24-hour Design Storm**
2 - year	-----
5 - year	1 - year
10 - year	2 - year
25 – year	5 - year
50 – year	10 - year
100 - year	25 - year

B. Redevelopment - Any redevelopment that requires demolition or complete removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces must consider the impervious portion of the existing site conditions as twentyfive percent (25%) in meadow condition, HSG 'B' soil, when determining the existing condition curve number or "C" value and existing condition flows.

C. General - Proposed conditions rates of runoff from any regulated activity shall not exceed the peak release rates of runoff from existing conditions for the design storms specified in Table 308.1.

D. "No Harm" Option - For any proposed development site the Applicant has the option of using a less restrictive runoff control (including no detention) if the Applicant can prove that "no harm" would be caused by discharging at a higher runoff rate than that specified by Subsection 308.A above. The "no harm" option is used when an Applicant can prove that the proposed conditions hydrographs can match the existing conditions hydrographs, or if it can be proved that the proposed conditions will not cause increases in peaks at all points downstream. Proof of "no harm" must be shown based upon the following "Downstream Impact Evaluation" which shall include a "downstream hydraulic capacity analysis" consistent with Section 308E to determine if adequate hydraulic capacity exists. The Applicant shall submit to the municipality this evaluation of the impacts due to increased downstream stormwater flows in the watershed.

1. The Hydrologic Regime of the site must be maintained.

2. The "Downstream Impact Evaluation" shall include hydrologic and hydraulic calculations necessary to determine the impact of hydrograph timing modifications due to the proposed development upon a dam, highway, structure, natural point of restricted streamflow or any stream channel section, established with the concurrence of the municipality, or downstream municipalities.

3. The evaluation shall continue downstream until the increase in flow diminishes due to additional flow from tributaries and/or stream attenuation.

4. Applicant-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no-harm", except in conjunction with proposed capacity improvements for the problem areas consistent with Section 308.D.5.

5. Capacity improvements may be provided as necessary to implement the “no harm” option provided that a less stringent discharge control would not create any harm downstream.

6. A financial distress shall not constitute grounds for the municipality to approve the use of the “no- harm” option.

7. Any "no harm" justifications shall be submitted by the Applicant as part of the Drainage Plan submission per Article IV.

E. "Downstream Hydraulic Capacity Analysis" - Any downstream hydraulic capacity analysis conducted in accordance with this Ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates:

1. Natural or man-made channels or swales must be able to convey the increased runoff associated with a 2-year return period event within their banks at velocities consistent with protection of the channels from erosion. Acceptable velocities shall be based upon criteria included in the DEP *Erosion and Sediment Pollution Control Program Manual*.

2. Natural or man-made channels or swales must be able to convey increased 25-year return period runoff without creating any hazard to persons or property.

3. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area must be designed in accordance with DEP Chapter 105 regulations (if applicable) and, at minimum, pass the increased 25-year return period runoff.

F. Hardship Option - The standards and criteria outlined in Section 308 of this Ordinance are designed to maintain existing peak flows and volumes throughout the Pennypack Creek watershed as it becomes even more developed. There may be certain instances, however, where the standards and criteria established are too restrictive for a particular landowner or Applicant. The existing drainage network in some areas may be capable of safely transporting slight increases in flows without causing a problem or increasing flows elsewhere. If an Applicant or homeowner cannot meet the stormwater standards due to lot conditions or if conformance would become a hardship to an owner, the hardship option may be applied. The Applicant would have to plead his/her case to the Governing Body with the final determination made by the Municipality. Any landowners pleading the "hardship option" will assume all liabilities that may arise due to exercising this option.

Section 309. Calculation Methodology

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

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 a full hydrology computer model package is desirable or necessary.
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.
HEC-1 / HEC-HMS	US Army Corps of Engineers	Applicable where use of full hydrologic computer model is desirable or necessary.
PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites less than 200 acres, or as approved by the Municipality and/or Municipal Engineer.
Other Methods	Varies	Other computation methodologies approved by the Municipality and/or Municipal Engineer.

B. All calculations consistent with this Ordinance using the soil cover complex method shall use the appropriate design rainfall depths for the various return period storms according to the PennDot Rainfall region in which they are located as presented in Table B-1 in Appendix B of this Ordinance. (See Fig. B-2). 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 Alternating Block Method shown in Figure B-1, or the S.C.S. Type II S Curve, Figure B-3 in the Ordinance Appendix B shall be used for the rainfall distribution.

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-2 or B-3 in Appendix B of this Ordinance.

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 Region 5 Curves from the PA Department of Transportation Storm-Duration-Frequency Chart (Figure B-4). Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of *Urban Hydrology for Small Watersheds*, NRCS, TR-55 (as amended or replaced from time to time by NRCS). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation.

E. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be obtained from Table B-2 in Appendix B of this Ordinance.

F. Runoff coefficients (C) for both existing and proposed conditions for use in the Rational method shall be obtained from Table B-3 in Appendix B of this Ordinance.

G. The designer shall consider that the runoff from proposed sites graded to the subsoil will not have the same runoff conditions as the site under existing conditions, even after topsoiling or seeding. The designer shall increase his proposed condition “CN” or “C” to better reflect proposed soil conditions.

H. 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-4 in Appendix B of the Ordinance or with standard references on the subject such as the U.S. Geological Survey Water Supply Paper No. 1849.

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

J. The design of any stormwater detention facilities intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. The design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The municipality may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

Section 310. Other Requirements

A. Any stormwater facility located on State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT).

B. All wet basin designs shall incorporate biologic controls consistent with the West Nile Guidance found in Appendix G.

C. Any stormwater management facility (i.e., detention basin) designed to store runoff and requiring a berm or earthen embankment required or regulated by this Ordinance shall be designed to provide an emergency spillway to handle flow up to and including the 100-year post-development conditions. The height of embankment must provide a minimum [*recommended 1.0 foot*] of freeboard above the maximum pool elevation computed when the facility functions for the 100-year post-development inflow. Should any stormwater management facility require a dam safety permit under DEP Chapter 105, the facility shall be designed in accordance with Chapter 105 and meet the regulations of Chapter 105 concerning dam safety which may be required to pass storms larger than the 100-year event.

D. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), and any work involving wetlands governed by DEP Chapter 105 regulations (as amended or replaced from time to time by DEP), shall be designed in accordance with Chapter 105 and will require a permit from DEP.

E. Any other drainage conveyance facility that does not fall under Chapter 105 regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the 25-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of the roadway. Any facility that constitutes a dam as defined in DEP Chapter 105 regulations may require a permit under dam safety regulations. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.

F. Any drainage conveyance facility and/or channel not governed by Chapter 105 Regulations, must be able to convey, without damage to the drainage structure or roadway, runoff from the 25-year design storm. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from that structure. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-year design storm. Any

facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.

G. Storm sewers must be able to convey post-development runoff from a [5, *10, or 25*]-year design storm without surcharging inlets, where appropriate.

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

I. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Municipality reserves the right to disapprove any design that would result in the construction or continuation of a stormwater problem area.

Section 311. NPDES Requirements

Federal regulations published December 8, 1999 as a Final Rule (40 CFR Parts 9, 122, 123, and 124) required 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 the municipalities in the Pennypack Creek watershed. Therefore, all municipalities within the Pennypack Creek watershed will be subject to the NPDES Phase II requirements mandated by the Federal Clean Water Act as administered by PADEP. For more information on NPDES II requirements, contact the DEP Regional Office.

ARTICLE IV-DRAINAGE PLAN REQUIREMENTS

Section 401. General Requirements

For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any earth disturbance activity may not proceed until the Property Owner or Applicant or his/her agent has received written approval of a Drainage Plan from the Municipality and an adequate Erosion and Sediment Control Plan review by the Conservation District.

Section 402. Exemptions

A. General Exemptions
The following land use activities are exempt from the drainage plan submission requirements of this ordinance.

1. Use of land for gardening for home consumption.

2. Agriculture when operated in accordance with a Conservation Plan or Erosion and Sediment Control Plan (E & S) found adequate by the Conservation District.

3. Forest Management operations that are following the Department of Environmental Protection's management practices contained in its publication "Soil Erosion and Sedimentation Control Guidelines for Forestry" and are operating under an approved E&S Plan. However, such operations must comply with the stream buffer requirements in Section 306.F.

B. Stormwater Quantity Control Exemption for Residential Land Development

Any residential land development or subdivision that meets the following exemption criterion shall not be required to submit a drainage plan implementing the stormwater quantity controls, specified in Section 308 of this Ordinance. However, this criterion shall apply to the total development even if the development is to take place in phases. The date of the municipal Ordinance adoption shall be the starting point from which to consider tracts as “parent tracts” in which future subdivisions and respective impervious area computations shall be cumulatively considered. Exemption shall not relieve the applicant from implementing such measures as are necessary to protect health, safety, and property. This exemption criterion does not apply to commercial, industrial and institutional land development.

Stormwater Quantity Control Exemption Criterion

A maximum of two thousand (2,000) square feet of new or additional impervious cover.

Applicants whose activities are exempted under Section 302.B above shall still be required to meet the Groundwater Recharge (Section 305) and Water Quality (Section 306) controls of this Ordinance.

C. Additional exemption criteria:

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 purpose of this Ordinance; however, drainage plans will not have to be submitted to the municipality.

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, Source Water Protection Areas (SWPA), and requirements or 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 municipality may require a drainage plan submittal.

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 municipality in a format that is clear, concise, legible, neat, and well organized; otherwise, the drainage plan shall not be accepted for review and shall be returned to the Applicant.

The following items shall be included in the drainage plan:

A. General

1. General description of the project including those areas described in Section 304.B.

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 non-point source pollution controls.

6. The Drainage Plan Application and Fee Schedule (Ordinance Appendix C).

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 [*County Name*] County. If the 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 foot and bearings to the nearest degree.

15. Existing and proposed land use(s).

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

17. Location of all open channels.

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 off-site. All off-site facilities shall meet the performance standards and design criteria specified in this Ordinance.

22. A statement, signed by the Applicant, acknowledging that any revision to the approved drainage plan must be approved by the Municipality and that a revised E&S Plan must be submitted to the Conservation District for a determination of adequacy.

23. The following signature block for the Design Engineer: "I, (Design Engineer), on this date (date of signature), hereby certify that the Drainage Plan meets all design standards and criteria of the (Municipality Name) Stormwater Management Ordinance."

C. Supplemental Information

1. A written description of the following information shall be submitted.
    a. The overall stormwater management concept for the project designed in accordance with Section 304.

b. Stormwater runoff computations as specified in this Ordinance.
c. Stormwater management techniques to be applied both during and after development.
d. Expected project time schedule.
e. Development stages (project phases) if so proposed.
f. An operation and maintenance plan in accordance with Section 702 of this Ordinance.

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 municipal stormwater collection system that may receive runoff from the project site.

4. A Declaration of Adequacy and Highway Occupancy Permit from the PennDOT District Office when utilization of a PennDOT storm drainage system is proposed.

D. Stormwater Management Facilities

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

2. When groundwater recharge methods such as seepage pits, beds or trenches, or infiltration galleries 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.

Section 404. Plan Submission

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

For any activities that require an NPDES Permit for Stormwater Discharges from Construction Activities, a DEP Joint Permit Application, a PennDOT Highway Occupancy Permit, or any other permit under applicable state or federal regulations, or which are regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of DEP'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 processes and the municipal 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 Municipality accompanied by the requisite Municipal Review Fee, as specified in this Ordinance.

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

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

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

D. Any submissions found incomplete shall not be accepted for review and shall be returned to the Applicant with a notification in writing of the specific manner in which the submission is incomplete.

Section 405. Drainage Plan Review

A. The Municipal Engineer shall review the drainage plan for consistency with this Ordinance. Any found incomplete shall not be accepted for review and shall be returned to the Applicant.

B, The Municipal Engineer shall review the drainage plan for any subdivision or land development, comparing it to the municipal subdivision and land development ordinance provisions not otherwise superseded by this Ordinance.

C. The County Conservation District shall review and approve the E & S Plan for consistency with PaDEP's Chapter 102 regulations.

D. For activities regulated by this Ordinance, the Municipal Engineer shall notify the Applicant and the Municipality in writing, within ___ calendar days, whether the drainage plan is consistent with the Ordinance.

1. Should the drainage plan be determined to be consistent with this Ordinance, the Municipal Engineer shall forward a letter of consistency to the Municipal Secretary who will then forward a copy to the Applicant.

2. Should the Drainage Plan be determined to be inconsistent or noncompliant with the Ordinance, the Municipal Engineer shall forward a letter to the Municipal Secretary with a copy to the Applicant citing the reason(s) and specific Ordinance sections for the inconsistency or noncompliance. Inconsistency or noncompliance may be due to inadequate information to make a reasonable judgment as to compliance with the Ordinance. Any Drainage Plans that are inconsistent or noncompliant may be revised by the Applicant and resubmitted consistent with this Ordinance. The Municipal Secretary shall then notify the Developer of the Municipal Engineer’s findings. Any inconsistent or

noncompliant Drainage Plans may be revised by the Developer and resubmitted consistent with this Ordinance.

E. For regulated activities specified in Section 105 of this Ordinance, which require a building permit, the Municipal Engineer shall notify the Municipal Building Permit Officer in writing, within a time frame consistent with the Municipal Building Code and/or Municipal subdivision ordinance, whether the drainage plan is consistent with the Stormwater Management Ordinance. The Municipal Building Permit Officer shall forward a copy of the consistency/inconsistency letter to the Applicant. Any drainage plan deemed inconsistent may be revised by the Applicant and resubmitted consistent with this Ordinance.

F. For regulated activities under this Ordinance that require an NPDES Permit Application, the Applicant shall forward a copy of the Municipal Engineer's letter stating that the drainage plan is consistent with the Stormwater Management Ordinance to the Conservation District. DEP and the Conservation District may consider the Municipal Engineer's review comments in determining whether to issue a permit.

G. The Municipality shall not grant approval or grant preliminary approval to any subdivision or land development for regulated activities specified in Section 105 of this Ordinance if the drainage plan has been found to be inconsistent with the Ordinance as determined by the Municipal Engineer. All required permits from PADEP must be obtained prior to approval of any subdivision or land development.

H. No building permits for any Regulated Activity specified in Section 105 of this Ordinance if the drainage plan has been found to be inconsistent with the Ordinance, as determined by the Municipal Engineer, or without considering the comments of the Municipal Engineer. All required permits from DEP must be obtained prior to issuance of a building permit.

I. The Applicant shall be responsible for completing record drawings of all stormwater management facilities included in the approved drainage plan. The record drawings and an explanation of any discrepancies with the design plans shall be submitted to the Municipal Engineer for final approval. In no case shall the Municipality approve the record drawings until the Municipality receives a copy of an approved Declaration of Adequacy and/or Highway Occupancy Permit from the PennDOT District Office, NPDES Permit, and any other applicable permits or approvals, from DEP or the Conservation District. The above permits and approvals must be based on the record drawings.

J. The Municipality's approval of a drainage plan shall be valid for a period not to exceed _____ ( ) (recommended 5) years, commencing on the date that the Municipality signs the approved drainage plan. If stormwater management facilities included in the approved drainage plan have not been constructed, or if constructed, and record drawings of these facilities have not been approved within this _____ year time period, then the Municipality may consider the drainage plan inconsistent or noncompliant and may revoke any and all permits. Drainage plans that are considered inconsistent or

noncompliant by the Municipality shall be resubmitted in accordance with Section 407 of this Ordinance.

Section 406. Modification of Plans

A. A modification to a drainage plan under review by the municipality 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 Municipal Engineer, shall require a resubmission of the modified drainage plan consistent with Section 404 of this Ordinance and be subject to review as specified in Section 405 of this Ordinance.

B. A modification to an already approved or inconsistent or noncompliant drainage plan shall be submitted to the Municipality, accompanied by the applicable Municipal Review and Inspection Fee. A modification to a drainage plan for which a formal action has not been taken by the Municipality shall be submitted to the Municipality, accompanied by the applicable Municipal Review and Inspection Fee.

Section 407. Resubmission of Inconsistent or Noncompliant Drainage Plans

An inconsistent or noncompliant drainage plan may be resubmitted, with the revisions addressing the Municipal Engineer's concerns documented in writing and addressed to the Municipal Secretary in accordance with Section 404 of this Ordinance and distributed accordingly and be subject to review as specified in Section 405 of this Ordinance. The applicable Municipal Review and Inspection Fee must accompany a resubmission of an inconsistent or noncompliant drainage plan.

ARTICLE V-INSPECTIONS

Section 501. Inspections

A. The Municipal Engineer or his municipal designee shall inspect all phases of the installation of the permanent BMPs and/or stormwater management facilities as deemed appropriate by the Municipal Engineer.

B. During any stage of the work, if the Municipal Engineer or his municipal designee determines that the permanent BMPs and/or stormwater management facilities are not being installed in accordance with the approved drainage plan, the Municipality shall revoke any existing permits or other approvals and issue a cease and desist order until a revised drainage plan is submitted and approved, as specified in this Ordinance, and the deficiencies are corrected.

C. A final inspection of all BMPs and/or stormwater management facilities shall be conducted by the Municipal Engineer or his municipal designee to confirm compliance with the approved drainage plan prior to the issuance of any Occupancy Permit.

ARTICLE VI-FEES AND EXPENSES

Section 601. Municipality Drainage Plan Review and Inspection Fee

Fees shall be established by the Municipality to defray plan review and construction inspection costs incurred by the Municipality. All fees shall be paid by the Applicant at the time of drainage plan submission. The Review and Inspection Fee Schedule shall be established by resolution of the municipal governing body based on the size of the Regulated Activity and based on the Municipality's costs for reviewing drainage plans and conducting inspections pursuant to Section 501. The Municipality shall periodically update the Review and Inspection Fee Schedule to ensure that review costs are adequately reimbursed.

Section 602. Expenses Covered by Fees

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

A. Administrative costs.

B. The review of the Drainage Plan by the Municipality and the Municipal Engineer.

C. The site inspections.

D. The inspection of stormwater management facilities and drainage improvements during construction.

E. The final inspection upon completion of the stormwater management facilities and drainage improvements presented in the Drainage Plan.

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

ARTICLE VII-MAINTENANCE RESPONSIBILITIES

Section 701. Performance Guarantee

A. For subdivisions and land developments the Applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as: 1) Required by the approved drainage plan equal to or greater than the full construction cost of the required controls, or 2) in the amount and method of payment provided for in the subdivision and land development ordinance.

B. For other regulated activities, the Municipality 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 municipality receives the certification, a final inspection shall be conducted by the municipal engineer or designee to certify compliance with this ordinance.

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

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

B. The following items shall be included in the Stormwater Control and BMP Operations and Maintenance Plan:

1. Map(s) of the project area, in a form that meets the requirements for recording at the offices of the Recorder of Deeds of _____ County, which shall be submitted on 24- inch x 36- inch or 30-inch x 42-inch sheets. The contents of the maps(s) shall include, but not be limited to:

a. Clear identification of the location and nature of permanent stormwater controls and BMPs,
b. The location of the project site relative to highways, municipal boundaries or other identifiable landmarks,
c. Existing and final contours at intervals of two feet, or other intervals as

appropriate,

d. Existing streams, lakes, ponds, or other bodies of water within the project site area,
e. Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved,
f. The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines of the project site,
g. Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added,
h. Proposed final structures, roads, paved areas, and buildings, and
i. A 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 Municipality.

C. THE STORMWATER CONTROL AND BMP OPERATIONS AND MAINTENANCE PLAN FOR THE PROJECT SITE SHALL ESTABLISH RESPONSIBILITIES FOR THE CONTINUING OPERATION AND MAINTENANCE OF ALL PERMANENT STORMWATER CONTROLS AND BMPS, AS FOLLOWS:

1. IF A PLAN INCLUDES STRUCTURES OR LOTS WHICH ARE TO BE SEPARATELY OWNED AND IN WHICH STREETS, SEWERS AND OTHER PUBLIC IMPROVEMENTS ARE TO BE DEDICATED TO THE MUNICIPALITY, STORMWATER CONTROLS AND BMPS MAY ALSO BE DEDICATED TO AND MAINTAINED BY THE MUNICIPALITY;

2. IF A PLAN INCLUDES OPERATIONS AND MAINTENANCE BY A SINGLE OWNERSHIP, OR IF SEWERS AND OTHER PUBLIC IMPROVEMENTS ARE TO BE PRIVATELY OWNED AND MAINTAINED, THEN THE OPERATION AND MAINTENANCE OF STORMWATER CONTROLS AND BMPS SHALL BE THE RESPONSIBILITY OF THE OWNER OR PRIVATE MANAGEMENT ENTITY.

D. THE MUNICIPALITY SHALL MAKE THE FINAL DETERMINATION ON THE CONTINUING OPERATIONS AND MAINTENANCE RESPONSIBILITIES. THE MUNICIPALITY RESERVES THE RIGHT TO ACCEPT OR REJECT THE OPERATIONS AND MAINTENANCE RESPONSIBILITY FOR ANY OR ALL OF THE STORMWATER CONTROLS AND BMPS.

SECTION 703. MUNICIPALITY REVIEW OF STORMWATER CONTROL AND BMP OPERATIONS AND MAINTENANCE PLAN

A. THE MUNICIPALITY SHALL REVIEW THE STORMWATER CONTROL AND BMP OPERATIONS AND MAINTENANCE PLAN FOR CONSISTENCY WITH THE PURPOSES AND REQUIREMENTS OF THIS ORDINANCE, AND ANY PERMITS ISSUED BY DEP.

B. THE MUNICIPALITY SHALL NOTIFY THE APPLICANT IN WRITING WHETHER THE STORMWATER CONTROL AND BMP OPERATIONS AND MAINTENANCE PLAN IS APPROVED.

C. THE MUNICIPALITY MAY REQUIRE A "RECORD DRAWING" OF ALL STORMWATER CONTROLS AND BMPS, AND AN EXPLANATION OF ANY DISCREPANCIES WITH THE OPERATIONS AND MAINTENANCE PLAN.

SECTION 704. ADHERENCE TO 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, UNLESS AN EXCEPTION IS GRANTED IN WRITING BY THE MUNICIPALITY.

SECTION 705. OPERATIONS AND MAINTENANCE AGREEMENT FOR PRIVATELY OWNED STORMWATER CONTROL FACILITIES AND BMPS

A. PRIOR TO FINAL APPROVAL OF THE SITE'S DRAINAGE PLAN, THE APPLICANT SHALL SIGN AND RECORD AN OPERATIONS AND MAINTENANCE AGREEMENT WITH THE MUNICIPALITY COVERING ALL STORMWATER CONTROL FACILITIES AND BMPS THAT ARE TO BE PRIVATELY OWNED. THE AGREEMENT SHALL BE SUBSTANTIALLY THE SAME AS THE AGREEMENT IN APPENDIX A OF THIS ORDINANCE.

B. OTHER ITEMS MAY BE INCLUDED IN THE AGREEMENT WHERE DETERMINED NECESSARY TO GUARANTEE THE SATISFACTORY OPERATION AND MAINTENANCE OF ALL STORMWATER CONTROL FACILITIES AND BMPS. THE AGREEMENT SHALL BE SUBJECT TO THE REVIEW AND APPROVAL OF THE MUNICIPALITY.

SECTION 706. STORMWATER MANAGEMENT EASEMENTS

A. STORMWATER MANAGEMENT EASEMENTS ARE REQUIRED FOR ALL AREAS USED FOR OFF-SITE STORMWATER CONTROL, UNLESS A WAIVER IS GRANTED BY THE MUNICIPAL ENGINEER.

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 705.

SECTION 707. 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 _____ COUNTY, WITHIN 15 DAYS OF APPROVAL OF THE STORMWATER CONTROL AND BMP OPERATIONS PLAN BY THE MUNICIPALITY:

1. THE OPERATIONS AND MAINTENANCE PLAN, OR A SUMMARY THEREOF,

2. OPERATIONS AND MAINTENANCE AGREEMENTS UNDER SECTION 705, AND

3. EASEMENTS UNDER SECTION 706.

B. THE MUNICIPALITY MAY SUSPEND OR REVOKE ANY APPROVALS GRANTED FOR THE PROJECT SITE UPON DISCOVERY OF THE FAILURE OF THE OWNER TO COMPLY WITH THIS SECTION.

Section 708. Municipal Stormwater Control and BMP Operation and Maintenance Fund

A. Persons installing stormwater controls or BMPs shall be required to pay a specified amount to the Municipal Stormwater Control and BMP Operation and Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:

1. If the stormwater control or BMP is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the municipality for a period of ten (10) years, as estimated by the municipal engineer. After that period of time, inspections will be performed at the expense of the municipality.

2. If the stormwater control or BMP is to be owned and maintained by the municipality, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The municipal engineer will establish the estimated costs utilizing information submitted by the Applicant.

3. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The municipal engineer shall determine the present worth equivalents, which shall be subject to the approval of the governing body.

B. If a stormwater control or BMP is proposed that also serves as a recreation facility (e.g., ball field, lake), the municipality 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. Long-Term Maintenance – The municipality may require applicants to pay a fee to the Municipal Stormwater Maintenance Fund to cover long term maintenance of stormwater control and best management practices.

E. Stormwater Related Problems - The municipality may require applicants to pay a fee to the Municipal Stormwater Maintenance Fund to cover stormwater related problems which may arise from the land development and earth disturbance

ARTICLE VIII- PROHIBITIONS

SECTION 801. PROHIBITED DISCHARGES

A. NO PERSON IN THE MUNICIPALITY SHALL ALLOW, OR CAUSE TO ALLOW, STORMWATER DISCHARGES INTO THE MUNICIPALITY'S SEPARATE STORM SEWER SYSTEM WHICH ARE NOT COMPOSED ENTIRELY OF STORMWATER, EXCEPT (1) AS PROVIDED IN SUBSECTION B BELOW, AND (2) DISCHARGES ALLOWED UNDER A STATE OR FEDERAL PERMIT.

B. DISCHARGES WHICH MAY BE ALLOWED BASED ON A FINDING BY THE MUNICIPALITY THAT THE DISCHARGE(S) DO NOT SIGNIFICANTLY CONTRIBUTE TO POLLUTION OF SURFACE WATERS OF THE COMMONWEALTH, ARE:

DISCHARGES FROM FIRE FIGHTING ACTIVITIES

POTABLE WATER SOURCES INCLUDING DECHLORINATED WATER LINE AND FIRE HYDRANT FLUSHINGS

IRRIGATION DRAINAGE

ROUTINE EXTERNAL BUILDING WASHDOWN (WHICH DOES NOT USE DETERGENTS OR OTHER COMPOUNDS)

AIR CONDITIONING CONDENSATE

WATER FROM INDIVIDUAL RESIDENTIAL CAR WASHING

SPRING WATER FROM CRAWL SPACE PUMPS

UNCONTAMINATED WATER FROM FOUNDATION OR FROM FOOTING DRAINS

FLOWS FROM RIPARIAN HABITATS AND WETLANDS

LAWN WATERING

PAVEMENT WASHWATERS WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED (UNLESS ALL SPILL MATERIAL HAS BEEN REMOVED) AND WHERE DETERGENTS ARE NOT USED

DECHLORINATED SWIMMING POOL DISCHARGES

UNCONTAMINATED GROUNDWATER

C. IN THE EVENT THAT THE MUNICIPALITY DETERMINES THAT ANY OF THE DISCHARGES IDENTIFIED IN SECTION 801.B SIGNIFICANTLY CONTRIBUTE TO POLLUTION OF WATERS OF THE COMMONWEALTH, OR IS SO NOTIFIED BY DEP, THE MUNICIPALITY WILL NOTIFY THE RESPONSIBLE PERSON TO CEASE THE DISCHARGE.

D. UPON NOTICE PROVIDED BY THE MUNICIPALITY UNDER SECTION 801.C, THE DISCHARGER WILL HAVE A REASONABLE TIME, AS DETERMINED BY THE MUNICIPALITY, TO CEASE THE DISCHARGE CONSISTENT WITH THE DEGREE OF POLLUTION CAUSED BY THE DISCHARGE.

E. NOTHING IN THIS SECTION SHALL AFFECT A DISCHARGER'S RESPONSIBILITIES UNDER STATE LAW.

SECTION 802. PROHIBITED CONNECTIONS

A. THE FOLLOWING CONNECTIONS ARE PROHIBITED, EXCEPT AS PROVIDED IN SECTION 801.B ABOVE:

1. ANY DRAIN OR CONVEYANCE, WHETHER ON THE SURFACE OR SUBSURFACE, WHICH ALLOWS ANY NON-STORMWATER DISCHARGE INCLUDING SEWAGE, PROCESS WASTEWATER, AND WASH WATER, TO ENTER THE SEPARATE STORM SEWER SYSTEM, AND ANY CONNECTIONS TO THE STORM DRAIN SYSTEM FROM INDOOR DRAINS AND SINKS; AND

2. ANY DRAIN OR CONVEYANCE CONNECTED FROM A COMMERCIAL OR INDUSTRIAL LAND USE TO THE SEPARATE STORM SEWER SYSTEM WHICH HAS NOT BEEN DOCUMENTED IN PLANS, MAPS, OR EQUIVALENT RECORDS, AND APPROVED BY THE MUNICIPALITY.

SECTION 803. ROOF DRAINS

A. ROOF DRAINS SHALL NOT BE CONNECTED TO STREETS, SANITARY OR STORM SEWERS OR ROADSIDE DITCHES, IN ORDER TO PROMOTE OVERLAND FLOW AND INFILTRATION/ PERCOLATION OF STORMWATER WHERE ADVANTAGEOUS TO DO SO. WHEN IT IS MORE ADVANTAGEOUS TO CONNECT DIRECTLY TO STREETS OR STORM SEWERS, THEN IT MAY BE PERMITTED ON A CASE BY CASE BASIS BY THE MUNICIPALITY.

B. ROOF DRAINS SHALL DISCHARGE TO INFILTRATION AREAS OR VEGETATIVE BMPS TO THE MAXIMUM EXTENT PRACTICABLE.

SECTION 804. ALTERATION OF BMPS

A. NO PERSON SHALL MODIFY, REMOVE, FILL, LANDSCAPE OR ALTER ANY EXISTING STORMWATER CONTROL OR BMP, UNLESS IT IS PART OF AN APPROVED MAINTENANCE PROGRAM, WITHOUT THE WRITTEN APPROVAL OF THE MUNICIPALITY.

B. NO PERSON SHALL PLACE ANY STRUCTURE, FILL, LANDSCAPING OR VEGETATION INTO A STORMWATER CONTROL OR BMP OR WITHIN A DRAINAGE EASEMENT, WHICH WOULD LIMIT OR ALTER THE FUNCTIONING OF THE STORMWATER CONTROL OR BMP, WITHOUT THE WRITTEN APPROVAL OF THE MUNICIPALITY.

ARTICLE IX-ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry

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

B. STORMWATER CONTROL AND BMP OWNERS AND OPERATORS SHALL ALLOW PERSONS WORKING ON BEHALF OF THE MUNICIPALITY READY ACCESS TO ALL PARTS OF THE PREMISES FOR THE PURPOSES OF DETERMINING COMPLIANCE WITH THIS ORDINANCE.

C. PERSONS WORKING ON BEHALF OF THE MUNICIPALITY SHALL HAVE THE RIGHT TO TEMPORARILY LOCATE ON ANY STORMWATER CONTROL OR BMP IN THE MUNICIPALITY SUCH DEVICES AS ARE NECESSARY TO CONDUCT MONITORING AND/OR SAMPLING OF THE DISCHARGES FROM SUCH STORMWATER CONTROL OR BMP.

D. UNREASONABLE DELAYS IN ALLOWING THE MUNICIPALITY ACCESS TO A STORMWATER CONTROL OR BMP IS A VIOLATION OF THIS ARTICLE.

Section 902. Public Nuisance

A. The violation of any provision of this ordinance is hereby deemed a Public Nuisance.

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

Section 903. Enforcement Generally

A. WHENEVER THE MUNICIPALITY FINDS THAT A PERSON HAS VIOLATED A PROHIBITION OR FAILED TO MEET A REQUIREMENT OF THIS ORDINANCE, THE MUNICIPALITY MAY ORDER COMPLIANCE BY WRITTEN NOTICE TO THE RESPONSIBLE PERSON. SUCH NOTICE MAY 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 Municipality or its designee and the expense thereof shall be charged to the violator.

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

Section 904. Enforcement

The municipal governing body is hereby authorized and directed to enforce all of the provisions of this ordinance. All inspections regarding compliance with the drainage plan shall be the responsibility of the municipal engineer or other qualified persons designated by the municipality.

A. A set of design plans approved by the municipality shall be on file at the site throughout the duration of the construction activity. Periodic inspections may be made by the municipality or designee during construction.

B. Adherence to Approved Plan

It shall be unlawful for any person, firm or corporation to undertake any regulated activity under Section 104 on any property except as provided for in the approved drainage plan and pursuant to the requirements of this ordinance. It shall be unlawful to alter or remove any control structure required by the drainage plan pursuant to this ordinance or to allow the property to remain in a condition which does not conform to the approved drainage plan.

C. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the owner or his representatives shall:

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

2. Provide a set of as-built (record) drawings.

D. After receipt of the certification by the municipality, a final inspection shall be conducted by the municipal engineer or designated representative to certify compliance with this ordinance.

E. Prior to revocation or suspension of a permit and at the request of the applicant, the governing body will schedule a hearing to discuss the non-compliance if there is no immediate danger to life, public health or property. The expense of a hearing shall be the owner's responsibility.

F. Suspension and Revocation of Permits

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

   a. Non-compliance with or failure to implement any provision of the permit;

   b. A violation of any provision of this ordinance or any other applicable law, ordinance, rule or regulation relating to the project;

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

2. A suspended building permit shall be reinstated by the Municipality when:

   a. The Municipal Engineer or his designee has inspected and approved the corrections to the stormwater management and erosion and sediment pollution control measure(s) and BMPs, or the elimination of the hazard or nuisance, and/or;

   b. The Municipality is satisfied that the violation of the ordinance, law, rule or regulation has been corrected.

3. A permit or approval that has been revoked by the Municipality cannot be reinstated. The Applicant may apply for a new permit under the procedures outlined in this Ordinance.

G. Occupancy Permit

An occupancy permit shall not be issued unless the certification of completion pursuant to Section 403.B.23 has been secured and the final inspection required by Section 501.C has confirmed compliance with the approved drainage plan. The occupancy permit shall be required for each lot owner and/or Applicant for all subdivisions and land development in the municipality

Section 905. Notification

In the event that a person fails to comply with the requirements of this Ordinance, or fails to conform to the requirements of any permit issued hereunder, the municipality shall provide written notification of the violation. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violation(s). Failure to comply within the time specified shall subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the municipality from pursuing any and all remedies. It shall be the responsibility of the Owner of the real property on which any Regulated

Activity is proposed to occur, is occurring, or has occurred, to comply with the terms and conditions of this Ordinance.

Section 906. Penalties

A. Any person violating the provisions of this ordinance shall be guilty of a misdemeanor, and upon conviction shall be subject to a fine of not more than $ _____ for each violation, recoverable with costs, or imprisonment of not more than _____ days, or both. Each day that the violation continues shall be a separate offense.

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

Section 907. Appeals

A. Any person aggrieved by any action of the [*Municipality*] or its designee may appeal to [*the municipality's governing body*] within thirty (30) days of that action.

B. Any person aggrieved by any decision of [*the municipality's governing body*] may appeal to the County Court of Common Pleas in the County where the activity has taken place within thirty (30) days of the municipal decision.

ENACTED and ORDAINED at a regular meeting of the _____ _____ on the _____ of _____, 20__. This Ordinance shall take effect immediately.

_____
[Name]

_____
[Title]

_____
[Name]

_____
[Title]

_____
[Name]

_____
[Title]

_____
[Name]

_____
[Title]

_____
[Name]

_____
[Title]

ATTEST:

_____
Secretary

I hereby certify that the foregoing Ordinance was advertised in the _____ on _____, 20__, a newspaper of general circulation in the municipality and was duly enacted and approved as set forth at a regular meeting of the municipality's governing body held on _____, 20__.

_____
Secretary

ORDINANCE APPENDIX A

STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES
OPERATIONS AND MAINTENANCE AGREEMENT

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

(hereinafter "Municipality");

WITNESSETH

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

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

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

WHEREAS, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site 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 Municipal Stormwater Management Ordinance, including but not limited to infiltration trenches, infiltration galleries, seepage pits, filterstrips, 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,

- Infiltration Galleries – Underground chambers, usually of modular construction, designed and built with large voids, with fully open bottoms, often with perforated sidewalls. They allow large volumes of stormwater to be stored within the voids until they can infiltrate into the subsurface soils,

- Seepage Pit – An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,

- Rain Garden – A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or underground aquifer, and

WHEREAS, the Municipality requires, through the implementation of the Plan, that stormwater management BMPs as required by said Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his successors and assigns, 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 Municipality and in accordance with the specific maintenance requirements noted on the Plan.

3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.

4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

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

6. The intent and purpose of this Agreement is to ensure the proper maintenance of the 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 Municipality's employees and designated representatives from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality. In the event that a claim is asserted against the Municipality, its designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.

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

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL) For the Municipality:

_____

(SEAL) For the Landowner:

_____

ATTEST:
_____ (City, Borough, Township)

County of _____, Pennsylvania

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

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

_____

_____

NOTARY PUBLIC **(SEAL)**

ORDINANCE APPENDIX B

STORMWATER MANAGEMENT DESIGN CRITERIA

TABLE B-1
DESIGN STORM RAINFALL AMOUNT
Source: "Field Manual of Pennsylvania Department of Transportation"
STORM INTENSITY-DURATION-FREQUENCY CHARTS
P D T - I D F May 1986.

FIGURE B-1
ALTERNATING BLOCK METHOD FOR
RAINFALL DISTRIBUTION
Source: Applied Hydrology, Chow, Maidment, Mays, 1988

FIGURE B-2
PENNDOT DELINEATED REGIONS
Source: "Field Manual of Pennsylvania Department of Transportation"
STORM INTENSITY-DURATION-FREQUENCY CHARTS
P D T - I D F May 1986.
or PA Handbook of Best Management Practices for Developing Areas,
1998, Appendix F

FIGURE B-3
NRCS (SCS) TYPE II RAINFALL DISTRIBUTION – S CURVE

FIGURE B-4
PENNDOT REGION 5 STORM INTENSITY-DURATION-FREQUENCY CURVE
Source: "Field Manual of Pennsylvania Department of Transportation"
STORM INTENSITY-DURATION-FREQUENCY CHARTS
P D T - I D F May 1986.

TABLE B-2
RUNOFF CURVE NUMBERS
Source: NRCS (SCS) TR-55

TABLE B-3
RATIONAL RUNOFF COEFFICIENTS

TABLE B-4
MANNING ROUGHNESS COEFFICIENTS

TABLE B-5
NONSTRUCTURAL STORMWATER MANAGEMENT MEASURES

TABLE B-1
DESIGN STORM RAINFALL AMOUNT (INCHES)

The design storm rainfall amount chosen for design should be obtained from the PennDOT region in which the site is located according to Figure B-2.

Source: "Field Manual of Pennsylvania Department of Transportation"
STORM INTENSITY-DURATION-FREQUENCY CHARTS
P D T - I D F May 1986.

Region 5
Precipitation Depth (in)

Duration	1 Yr	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
5 min	0.33	0.38	0.45	0.50	0.56	0.63	0.68
15 min	0.64	0.75	0.90	1.00	1.15	1.35	1.50
1 hr	1.10	1.35	1.61	1.85	2.15	2.60	2.98
2 hrs	1.34	1.66	2.00	2.34	2.70	3.26	3.76
3 hrs	1.50	1.86	2.28	2.67	3.09	3.69	4.29
6 hrs	1.86	2.28	2.82	3.36	3.90	4.62	5.40
12 hrs	2.28	2.76	3.48	4.20	4.92	5.76	6.72
24 hrs	2.64	3.36	4.32	5.28	6.24	7.20	8.40

FIGURE B-1
ALTERNATING BLOCK METHOD FOR
RAINFALL DISTRIBUTION
Source: Applied Hydrology, Chow, Maidment, Mays, 1988

The Alternating Block Method can be utilized to develop design hydrographs from the PennDOT Storm Intensity-Duration-Frequency (PDT-IDF) curves. This method redistributes the incremental rainfall values developed from the PDT-IDF curves in a quasi-symmetrical form, where the block of maximum incremental depth is positioned at the middle of the required duration and the remaining blocks of rainfall are arranged in descending order, alternately to the right and to the left of the central block. Example B-1 below shows this method for a 100-year, 2- hour duration storm with 10- minute time intervals.

Example B-1
100- Year, 2- hour Duration Storm Hydrograph Development
Region 5

(1)	(2)	(3)	(4)	(5)
Time (min.)	100- Yr Rainfall Intensity (Inches/hr)	100-Yr Accumulated Rainfall Depth (inches)	100-Yr Incremental Rainfall Depth (inches)	100-Yr Rainfall Distribution (inches)
0	0.00	0.00	0.00	0.00
10	6.91	1.15	1.15	0.07
20	5.34	1.78	0.63	0.15
30	4.41	2.21	0.43	0.21
40	3.78	2.52	0.32	0.26
50	3.33	2.78	0.26	0.43
60	2.98	2.98	0.21	1.15
70	2.75	3.20	0.22	0.63
80	2.51	3.35	0.15	0.32
90	2.28	3.42	0.07	0.22
100	2.15	3.58	0.16	0.16
110	2.01	3.69	0.11	0.11
120	1.88	3.76	0.07	0.07

Notes :
Values from Column (2) are derived from the appropriate rainfall chart based on the location of the site under analysis. (Region 5 in this example, therefore use Figure B-3)

Column (3) = Column (2) * Column (1) / 60 minutes (i.e. 6.91 inches / hr * 10 min / 60 = 1.15).

Column (4) = Difference in Column(3) for each time interval (i.e. 1.78 – 1.15 = 0.63).

Column (5) is Column (4) rearranged with the maximum increment from Column (4) placed at the middle of the event (Time = 60 minutes, in this example), then rearranging the remaining values from Column (4) in descending order, alternately right and left (below and above) the central block.

FIGURE B-2
PENNDOT DELINEATED REGIONS

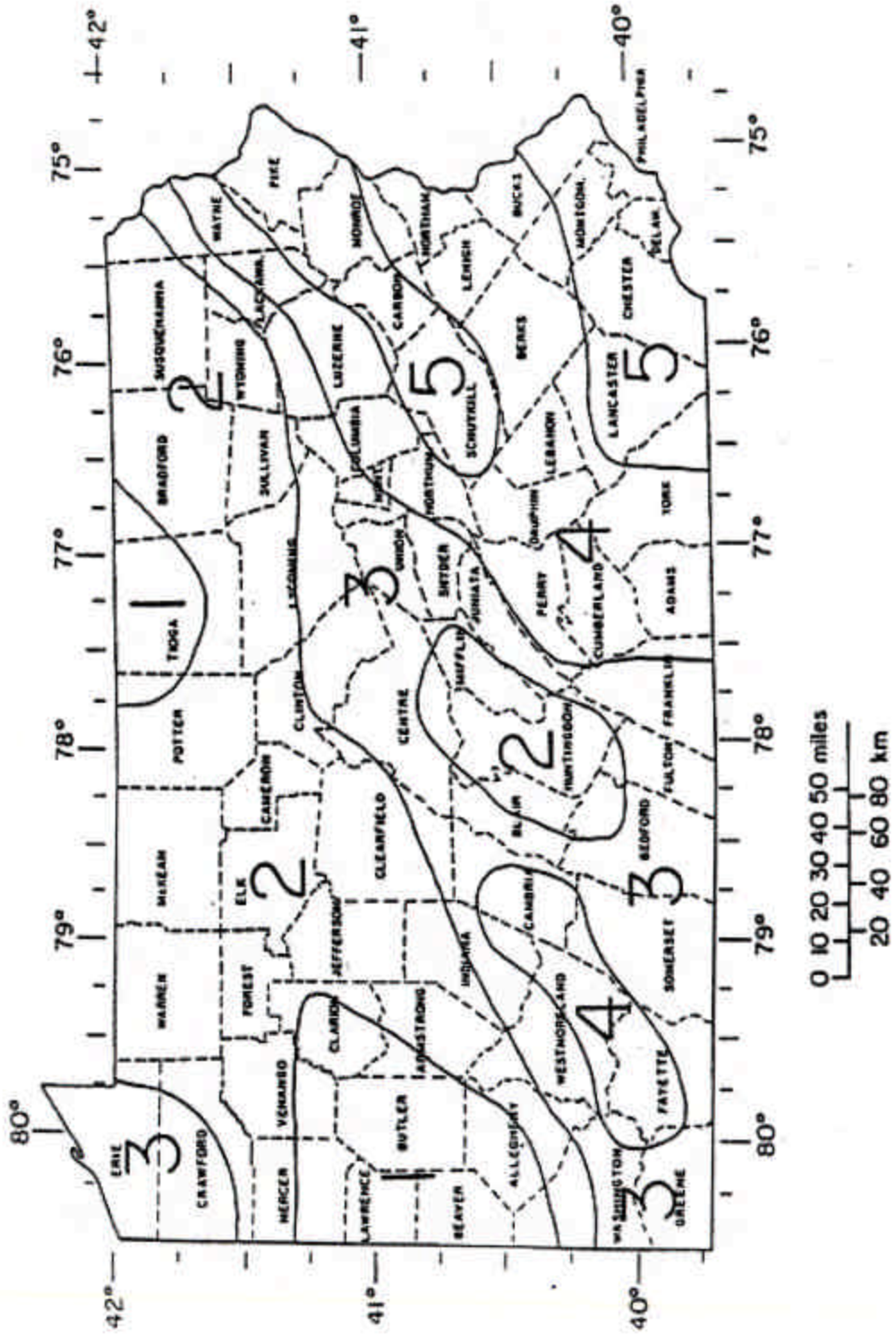


FIGURE B-3
NRCS (SCS) TYPE II RAINFALL DISTRIBUTION – S CURVE

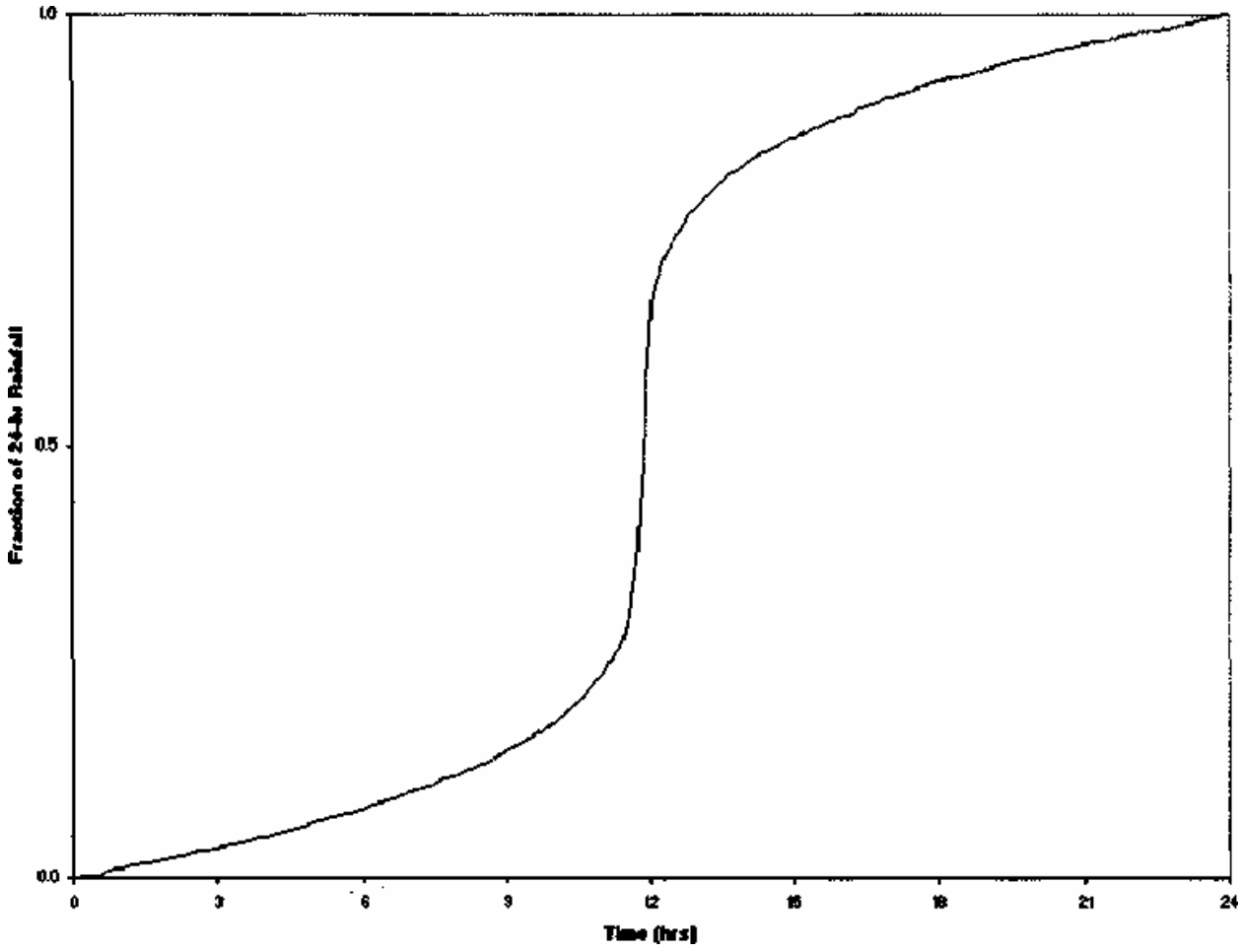


FIGURE B-4
PENNDOT REGION 5 STORM INTENSITY-DURATION-FREQUENCY CURVE

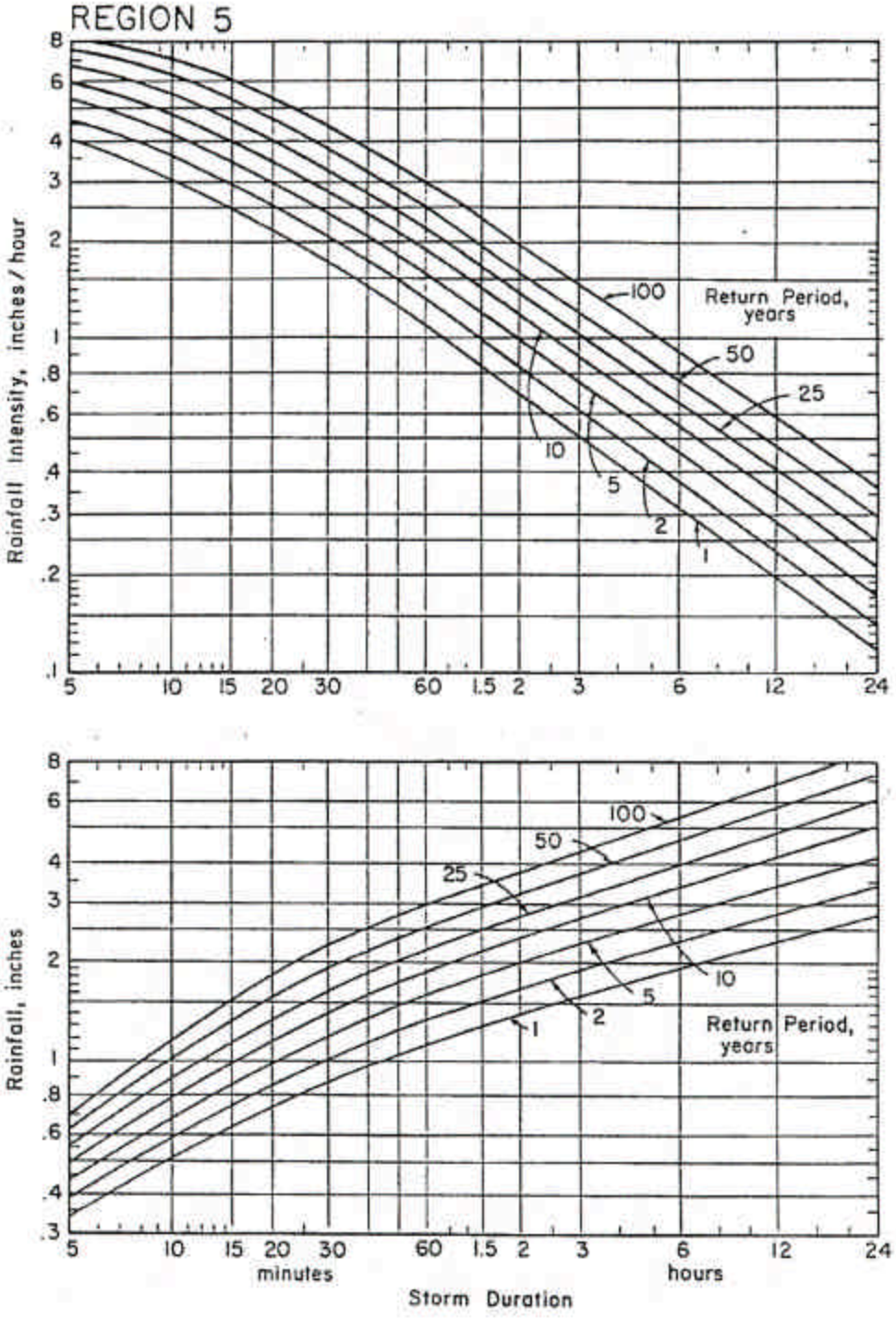


TABLE B-2
Runoff Curve Numbers
(From NRCS (SCS) TR-55)

LAND USE DESCRIPTION	Hydrologic Condition	HYDROLOGIC SOIL GROUP A	B	C	D
Open Space					
Grass cover < 50%	Poor	68	79	86	89
Grass cover 50% to 75%	Fair	49	69	79	84
Grass cover > 75%	Good	39	61	74	80
Meadow		30	58	71	78
Agricultural					
Pasture, grassland, or range – Continuous forage for grazing	Poor	68	79	86	89
Pasture, grassland, or range – Continuous forage for grazing.	Fair	49	69	79	84
Pasture, grassland, or range – Continuous forage for grazing	Good	39	61	74	80
Brush-brush-weed- grass mixture with brush the major element.	Poor	48	67	77	83
Brush-brush-weed- grass mixture with brush the major element.	Fair	35	56	70	77
Brush-brush-weed- grass mixture with brush the major element.	Good	30	48	65	73
Fallow Bare soil	-------	77	86	91	94
Crop residue cover (CR)	Poor	76	85	90	93
	Good	74	83	88	90
Woods – grass combination (orchard or tree farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Commercial	(85% Impervious)	89	92	94	95

Industrial	(72% Impervious)	81	88	91	93
Institutional	(50% Impervious)	71	82	88	90
Residential districts by average lot size:					
	% Impervious				
1/8 acre or less * (town houses)	65	77	85	90	92
1/4 acre		38	61	75	83 87
1/3 acre		30	57	72	81 86
1/2 acre		25	54	70	80 85
1 acre		20	51	68	79 84
2 acres		12	46	65	77 82
Farmstead		59	74	82	86
Smooth Surfaces (Concrete, Asphalt, Gravel or Bare Compacted Soil)		98	98	98	98
Water		98	98	98	98
Mining/Newly Graded Areas (Pervious Areas Only)		77	86	91	94

* Includes Multi-Family Housing unless justified lower density can be provided.

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

TABLE B-3
RATIONAL RUNOFF COEFFICIENTS

		HYDROLOGIC SOIL GROUP			
LAND USE DESCRIPTION		A	B	C	D
Cultivated Land: without conservation treatment		.49	.67	.81	.88
: with conservation treatment		.27	.43	.61	.67
Pasture or range land: poor condition		.38	.63	.78	.84
: good condition		---*	.25	.51	.65
Meadow : good condition		---*	---*	.44	.61
Wood or Forest Land: thin stand, poor cover, no mulch		---*	.34	.59	.70
: good cover		---*	---*	.45	.59
Open Spaces, lawns, parks, golf courses, cemeteries					
Good condition: grass cover on 75% or more of the area		---*	.25	.51	.65
Fair condition: grass cover on 50% to 75% of the area		---*	.45	.63	.74
Commercial and business areas (85% impervious)		.84	.90	.93	.96
Industrial districts (72% impervious)		.67	.81	.88	.92
Residential:					
Average lot size	Average % Impervious				
1/8 acre or less	65	.59	.76	.86	.90
1/4 acre	38	.25	.49	.67	.78
1/3 acre	30	---*	.49	.67	.78
1/2 acre	25	---*	.45	.65	.76
1 acre	20	---*	.41	.63	.74
Paved parking lots, roofs, driveways, etc.		.99	.99	.99	.99
Streets and roads:					
Paved with curbs and storm sewers		.99	.99	.99	.99
Gravel		.57	.76	.84	.88
Dirt		.49	.69	.80	.84

Notes: Values are based on S.C.S. definitions and are average values.

Values indicated by "---" should be determined by the design engineer based on site characteristics.

Source: New Jersey Department of Transportation, Technical Manual for Stream Encroachment, August, 1984

TABLE B-4
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.

TABLE B-5
Nonstructural Stormwater Management Measures

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

ORDINANCE APPENDIX C

SAMPLE DRAINAGE PLAN APPLICATION

(To be attached to the "land subdivision plan or development plan review application or "minor land subdivision 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 _____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 owner’s 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_____ Other (_____) Development

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. Do the peak rates of runoff from proposed conditions meet the requirements of Section 308 of the Ordinance for the designated design storms?

   b. Design storm utilized (on-site conveyance systems) (24 hr.)_____

   Watershed Name_____

   Explain:_____

   _____

   _____

   c. Type of proposed runoff control_____

   d. Do the proposed stormwater control criteria meet the requirement/guidelines of the Stormwater Ordinances?_____

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

   Reasons_____

e. Does the plan meet the requirements of Article III of the Stormwater Ordinance?

If not, what variances/waivers are requested? _____

Reasons _____

_____

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

_____

g. What hydrologic method was used in the stormwater computations?

_____

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

_____

i. Is a construction schedule or staging attached?_____

j. Is a recommended maintenance program attached?_____

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

Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the [*County Name*] 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

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 _____ are the owners of the property described in this application, and that the application was made with their knowledge and/or direction and do 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 Municipality)

(Name of Municipality) official submission receipt:

Date complete application received _____Plan Number_____

Fees_____ date fees paid_____ received by_____

Official submission receipt date_____

Received by_____

_____
Municipality

PROPOSED SCHEDULE OF FEES

Subdivision name_____ Submittal No._____

Owner_____ Date_____

Engineer_____

1. Filing fee $_____

2. Land use

2a. Subdivision, campgrounds, mobile home parks, and multi- family dwelling where the units are located in the same local watershed. $_____

2b. Multi- family dwelling where the designated open space is located in a different local watershed from the proposed units. $_____

2c. Commercial/industrial. $_____

3. Relative amount of earth disturbance

3a. Residential

road <500 l.f. $ _____

road 500-2,640 l.f. $ _____

road >2,640 l.f. $ _____

3b. Commercial/industrial and other

impervious area <3,500 s.f. $ _____

impervious area 3,500-43,560 s.f. $ _____

impervious area >43,560 s.f. $ _____

4. Relative size of project

4a. Total tract area <1 ac $ _____

1-5 ac $ _____

5-25 ac $_____

25-100 ac $ _____

100-200 ac $ _____

>200 ac $ _____

5. Stormwater control measures

5a. Detention basins & other controls which require a review of hydraulic routings ($ per control). $ _____

5b. Other control facilities which require storage volume calculations but no hydraulic routings. ($ per control) $ _____

6. Site inspection ($ per inspection) $ _____

Total $ _____

All subsequent reviews shall be 1/4 the amount of the initial review fee unless a new application is required as per Section 406 of the stormwater ordinance. A new fee shall be submitted with each revision in accordance with this schedule.

ORDINANCE APPENDIX D

LOW IMPACT DEVELOPMENT (LID) PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

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

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

- **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 depressions or by incorporating their 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 sewers). 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 onstreet parking or by reducing roadway widths. Municipal 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, reduced water quality degradation of receiving streams/water bodies, 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.

ORDINANCE APPENDIX E

BMP MANUAL REFERENCES

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
The New Jersey Stormwater Best Management Practices Manual, January 2003 Draft –
http://www. nj.gov/dep/watershedmgt/bmpmanual2003.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, Spring 1998 (Currently in revision)

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: National Menu of Best Management Practices for Stormwater Phase II (Provides guidance for regulated small MS4s)

USEPA Infiltration Trench Fact Sheet (September 1999) – **http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm**

ORDINANCE APPENDIX F

West Nile Virus Guidance

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

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

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

The Monroe County Conservation District recognizes the need to address the problem of 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 nonpoint 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 been 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 outweigh their potential to become breeding grounds for mosquitoes.