

ORDINANCE NUMBER 305

AN ORDINANCE AMENDING THE SILVERDALE BOROUGH EAST BRANCH WATERSHED STORMWATER MANAGEMENT ORDINANCE NUMBER 276.

NOW THEREFORE, Pursuant to requirements of the East Branch Watershed Act 167 Stormwater Management Plan and National Pollution Discharge Elimination System (NPDES) regulations for issuance of permits under the Clean Water Act, Silverdale Borough Council hereby enacts and ordains the following:

East Branch Watershed Stormwater Management Ordinance

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ARTICLE I GENERAL PROVISIONS

Section 101. Statement of Findings

Silverdale Borough Council finds that:

- A. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of existing streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces groundwater recharge, and threatens public health and safety.
- B. Inadequate planning and management of stormwater runoff resulting from land development and redevelopment throughout a watershed can also harm surface water resources by: changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of stream-beds and stream-banks thereby elevating sedimentation), destroying aquatic habitat, and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals and pathogens. Groundwater resources are also impacted through loss of recharge.
- C. A comprehensive program of stormwater management (SWM), including minimization of impacts of development, redevelopment, and activities causing accelerated erosion and loss of natural infiltration is fundamental to the public health, safety, welfare, and the protection of the people of the Borough and all the people of the Commonwealth, their resources, and the environment.

- D. Stormwater can be an important water resource by providing groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.
- E. Impacts from stormwater runoff can be minimized by using project designs that maintain the natural hydrologic regime and sustain high water quality, groundwater recharge, stream baseflow, and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage stormwater runoff is through nonstructural project design that minimizes impervious surfaces and sprawl, avoids sensitive areas (i.e. stream buffers, floodplains, steep slopes), and considers topography and soils to maintain the natural hydrologic regime.
- F. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.
- G. 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).
- H. Non-stormwater discharges to storm sewer systems can contribute to pollution of waters of the Commonwealth.
- I. Inadequate maintenance of Stormwater Management Best Management Practices (BMPs) causes a loss of water quality, flooding, and other problems.
- J. A program of reasonable regulation of connections and discharges to municipal stormwater management facilities will be beneficial.

Section 102. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the East Branch Perkiomen watershed by minimizing the damages described in Section 101 of this ordinance through provisions designed to:

- A. Promote alternative project designs and layouts that minimize the impacts on surface and groundwater.
- B. Promote nonstructural Best Management Practices (BMPs).
- C. Minimize increases in stormwater volume.
- D. Minimize impervious surfaces.
- E. Reduce stormwater runoff, and prevent accelerated erosion and sedimentation, scour, and degradation at their source by regulating activities that cause these problems.

- F. Provide procedures and performance standards for stormwater planning and management.
- G. Utilize and preserve existing natural drainage systems as much as possible.
- H. Manage stormwater impacts close to the runoff source, requiring a minimum of structures and relying on natural processes.
- I. Encourage recharge of groundwater, where appropriate; prevent the degradation of surface and groundwater quality; and focus on the protection of water resources.
- J. Maintain existing base flows and quality of streams and watercourses in Silverdale Borough and the Commonwealth.
- K. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code, Chapter 93.4.a requiring protection and maintenance of “existing uses” and maintenance of the level of water quality to support those uses in all streams, and the protection and maintenance of water quality in “special protection” streams.
- L. Meet NPDES MS4 permit requirements.
- M. Address the quality and quantity of stormwater discharges from the development site.
- N. Provide a mechanism to identify stormwater controls necessary to meet NPDES permit requirements.
- O. Implement an illegal discharge detection and elimination program that addresses non-stormwater discharges into the Borough’s separate storm sewer system.
- P. Preserve and restore the flood-carrying capacity of streams.
- Q. Prevent scour and erosion of streambanks and streambeds.
- R. Provide performance standards and design criteria for watershed-wide stormwater management and planning.
- S. Provide procedures and standards for the proper operation and maintenance of all permanent stormwater management facilities and BMPs that are implemented and/or constructed in Silverdale Borough.

Section 103. Statutory Authority

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

- A. The Act of October 4, 1978 32 P.S., P.L. 864 (Act 167) §§680.1 *et seq.*, as amended, the "Stormwater Management Act" (hereinafter referred to as “the Act”);

- B. The Water Resources Management Act of 2002, as amended;
- C. The Borough Code, 53 P.S. §§46201 *et seq.*;
- D. The Pennsylvania Municipalities Planning Code, Act 247, as amended.

Section 104. Applicability/Regulated Activities

This Ordinance shall apply to those areas of Silverdale Borough that are located within the East Branch Perkiomen watershed, as delineated in Appendix D, which is hereby adopted as part of this Ordinance.

This Ordinance shall apply to temporary and permanent stormwater management facilities constructed as part of any of the regulated activities listed in this section and all activities related to proper operation and maintenance of all stormwater management facilities and BMPs, and all activities that may contribute non-stormwater discharges to the municipality's regulated small MS4. Stormwater management and erosion and sedimentation control during construction activities which are specifically not regulated by this Ordinance shall continue to be regulated under existing laws and Ordinances.

This Ordinance contains stormwater management performance standards and design criteria that are necessary or desirable from a watershedwide perspective. Local stormwater management design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.) shall continue to be regulated by the applicable ordinances of Silverdale Borough or at the Borough Engineer's discretion.

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

- A. Land development.
- B. Subdivision.
- C. Construction of new, or reconstruction of additional impervious or semipervious surfaces (e.g. driveways, parking lots, patios, tennis courts, etc.).
- D. Construction of new buildings or additions to existing buildings.
- E. Diversion or piping of, or encroachments in, any natural or man-made channel.
- F. Installation of nonstructural and/or structural BMPs and/or stormwater management facilities or appurtenances thereto.
- G. Alteration of the natural hydrologic regime.
- H. Redevelopment.
- I. Earth disturbance greater than 5,000 sq. ft*.

*This Ordinance applies to any earth disturbance activity greater than or equal to 5,000 square feet that is associated with a development or redevelopment project. Earth disturbance activities less than one (1) acre that are associated with redevelopment projects are exempt from the Section 307 Streambank Erosion Requirements.

Section 105. Exemptions

A. General Exemptions: The following land use activities are exempt from stormwater management requirements of this Ordinance.

1. Use of land for gardening for home consumption.
2. Agriculture when operated in accordance with a conservation plan, nutrient management plan, or erosion and sedimentation control plan approved by the Bucks County Conservation District, including activities such as growing crops, rotating crops, tilling of soil, and grazing animals. Installation of new, or expansion of existing, farmsteads, animal housing, waste storage, and production areas having impervious surfaces shall be subject to the provisions of this Ordinance unless exempt pursuant to Section 105.B.
3. Forest Management operations following the Department of Environmental Protection's management practices contained in publication titled Soil Erosion and Sedimentation Control Guidelines for Forestry and operating under an E&S Plan approved by the Bucks County Conservation District.
4. Public road replacement, replacement paving and/or driveway maintenance (without expansion).
5. Installation of less than one hundred (100) square feet of new impervious surface.
6. Repair and reconstruction of an on-lot sewage disposal systems where work is performed in accordance with a valid permit issued by Bucks County Department of Health.
7. Any aspect of BMP maintenance to an existing SWM system made in accordance with plans and specifications approved by the Borough.

B. Stormwater Peak Rate Control Exemption:

All Regulated Activities as described in Section 104 of this Ordinance shall comply with the Stormwater Management requirements of Section 301.A of this Ordinance except those activities listed in Table 105.1, "Stormwater Management Exemption Criteria". Any Regulated Activities that meet the exemption criteria established in this Section are exempt from Stormwater Management Plan submission requirements of Article IV of this Ordinance. This requirement shall apply to the total development even if development is to take place in phases. The starting point from which to consider tracts as "parent tracts" is the effective date of this Ordinance. All impervious surface area constructed on or after the date of adoption of this Ordinance shall be considered cumulatively. Impervious surface existing on the "parent tract" prior to the date of

adoption of this Ordinance shall not be considered in cumulative impervious area calculations for exemption purposes. An exemption shall not relieve the applicant from implementing such stormwater control measures and erosion control measures as are necessary to protect health, safety, and property.

Table 105.1 Stormwater Management Exemption Criteria	
1. Regulated activities included within Sections 104.C and D are exempt where the amount of impervious surface and proposed location on a parcel conforms to the following Tables:	
Total Parcel Area (acres)	Maximum Impervious Surface Area (square feet)
≤¼ AC	1,200
>¼ to 1AC	2,500
>1AC	5,000

Section 106. Repealer

Any ordinance or ordinance provision of Silverdale Borough 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 otherwise contained in this Ordinance shall be followed. Nothing in this Ordinance shall be construed to affect any of the Borough’s requirements regarding stormwater matters that 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 Borough ordinances or regulations shall be construed to retain the requirements of this Ordinance addressing State Water Quality Requirements.

Section 109. Short Title

This Ordinance shall be known and may be cited as the “East Branch Watershed Stormwater Management Ordinance.”

Section 110. Effective Date

This Ordinance shall become effective five (5) days after enactment.

ARTICLE II DEFINITIONS

Section 201. Interpretations

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

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

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

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

Applicant A landowner, developer, or other person who has filed an application to the Borough for approval to engage in any Regulated Activity as defined in Section 104 of this Ordinance.

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 the same, are turned over to the Borough Engineer at the completion of the project.

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

Base Flow The portion of stream flow that is sustained by groundwater discharge.

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

Best Management Practice (BMP) Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one or two broad categories or measures: “structural” or “nonstructural”. In this Ordinance, nonstructural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

Borough Silverdale Borough, Bucks County, Pennsylvania.

Channel Erosion The widening, deepening, and headward cutting of small channels and waterways, due to erosion caused by moderate to large floods.

Cistern An underground reservoir or tank for storing rainwater.

Conservation District The Bucks County Conservation District.

Culvert A structure together with its appurtenant works, which carries a stream 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 other fluid or semifluid, or a refuse bank, fill, or structure for highway, railroad, or other purposes which does or may impound water or other fluid or semifluid.

DEP The Pennsylvania Department of Environmental Protection.

Department The Pennsylvania Department of Environmental Protection.

Designee The agent of the Bucks County Planning Commission, the Bucks County Conservation District, and/or Silverdale Borough involved with the administration, review,

or enforcement of any provisions of this Ordinance by contract or memorandum of understanding.

Design Professional (Qualified) A Pennsylvania Registered Professional Engineer, Registered Landscape Architect, or 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. Also see Return Period.

Detention Basin An impoundment structure designed to manage stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

Detention District Those subareas in which some type of detention is required to meet the plan requirements and the goals of Act 167.

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

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

Development Site The specific tract of land for which a regulated activity is proposed.

Downslope Property Line That portion of the property line of the lot, tract, or parcels of land being developed located such that all 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 streams, channels, swales, pipes, conduits, culverts, storm sewers, etc.

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

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 movement of soil particles by the action of water, wind, ice, or other natural forces.

Erosion and Sediment Pollution Control Plan A plan that is designed to minimize accelerated erosion and sedimentation.

ERSAM Existing Resource and Site Analysis Map.

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 antidegradation).

Existing Conditions The initial condition of a project site prior to the proposed construction. 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” values.

Flood A general but temporary condition of partial or complete inundation of normally dry 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 as a special flood hazard area on the applicable National Flood Insurance Program Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA). Also included are areas that comprise Group 13 Soils, as listed in Appendix A of the *Pennsylvania DEP of Environmental Protection (DEP) Technical Manual for Sewage Enforcement Officers* (as amended or replaced from time to time by DEP).

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

Forest Management/Timber Operations Planning and activities necessary for the management of forest land. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

Freeboard A vertical distance between the elevation of the design high-water and the top of a dam, levee, tank, basin, or diversion ridge. 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 conduct surface water.

Groundwater Recharge Replenishment of existing natural underground water supplies.

HEC-HMS The U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC) - Hydrologic Modeling System (HMS) adapted to the East Branch Perkiomen Creek watershed.

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).

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

Hydrologic Soil Group (HSG) Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classifications. The soils in the area of the development site may be identified from a soil survey report that can be obtained from the local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D.

Hyetograph A graphical representation of average rainfall, rainfall excess rates, or volumes over specified areas during successive units of time during a storm.

Impervious Surface (Area) A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs; additional indoor living spaces, patios, garages, storage sheds and similar structures; and any new streets or sidewalks. Decks, parking areas, and driveway areas are not counted as impervious areas if they do not prevent infiltration (e.g. pervious pavers).

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 The passing of stormwater through the soil from the surface.

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

Inlet A surface connection to a closed drain. A structure at the diversion end of a conduit. The upstream end of any structure through which water may flow.

Karst A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

Land Development (1) The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving: (i) a group of two or more residential or nonresidential buildings, whether initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure; or (ii) 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. (2) A subdivision of land. (3) Development in accordance with Section 503(1.1) of the Pennsylvania Municipalities Planning Code Act of 1968 (Act 247).

Land Earth Disturbance Any activity involving grading, tilling, digging, or filling of ground; stripping of vegetation; or any other activity that causes an alteration to the natural condition of the land.

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 insufficient fine soil to fill the voids between the fragments.
- (iii) A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of effluent.

Main Stem (Main Channel) Any stream segment or other runoff conveyance facility used as a reach in the East Branch Perkiomen Creek hydrologic model.

Manning Equation in (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.

Municipality Silverdale Borough, Bucks County, Pennsylvania.

Natural Hydrologic Regime (see hydrologic regime)

Nonpoint Source Pollution Pollution that enters a body of water from diffuse origins in the watershed and does not result from confined or discrete conveyances.

NPDES National Pollutant Discharge Elimination System, the federal government's system for issuance of permits under the Clean Water Act, which is delegated to DEP in Pennsylvania.

NRCS Natural Resources Conservation Service (previously SCS).

Open 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 drainageways, swales, streams, ditches, canals, and pipes flowing partly full.

Outfall Point where water flows from a conduit, stream, or drain.

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

Parent Tract The parcel of land from which a land development or subdivision originates as of the date of the initial Silverdale Borough East Branch Perkiomen Creek Stormwater Ordinance adopted on March 7, 2005.

Parking Lot Storage Involves the use of impervious 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 (calibrated) The computer based hydrologic modeling technique adapted to the Silverdale Borough East Branch Perkiomen Creek Stormwater Ordinance. The model has been "calibrated" to reflect actual recorded flow values by adjoining key model input parameters.

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

Planning Commission The planning commission of Silverdale Borough.

PMF - Probable Maximum Flood The flood that may be expected from the most severe combination of critical meteorological and hydrologic conditions that are reasonably possible in any area. The PMF is derived from the probable maximum precipitation (PMP) as determined based on data obtained from the National Oceanographic and Atmospheric Administration (NOAA).

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.

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.

Project Site The specific area of land where any Regulated Activities in the Borough are planned, conducted, or maintained.

Qualified Person or Qualified Professional Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Ordinance.

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

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

Reconstruction The process by which existing developed area is adaptively reused, rehabilitated, restored, renovated, and/or expanded. The development relies on existing infrastructure and does not require an extension of water, sewer, or other public utilities.

Record Drawings Original documents revised to suit the as-built conditional 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 or reproducible, in both cases for the client's permanent records.

Redevelopment The construction, alteration, or improvement exceeding 5,000 square feet of land disturbance performed on sites where existing land use is commercial, industrial, institutional, single family residential or multifamily residential.

Regulated Activity Any earth disturbance activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

Regulated Earth Disturbance Activity Activity involving earth disturbance subject to regulation under 25 Pa Code 92a, 25 Pa Code 102, or the Clean Streams Law.

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

Retention Basin An impoundment in which stormwater is stored and not released during the storm event. Stored water may be released from the basin at some time after the end of the storm.

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

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

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

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

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

SALDO Subdivision and Land Development Ordinance.

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

Sediment Pollution The placement, discharge, or any other introduction of sediment into the waters of the Commonwealth occurring from the failure to design, construct, implement, or maintain control measures and control facilities in accordance with the requirements of the DEP Erosion and Sediment Pollution Control Program manual.

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

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

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

Sheet Flow Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.

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 Area (SWPA) The zone through which contaminants 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 The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

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

Storm Frequency The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years. See "Return Period."

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

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

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

Stormwater Management Plan The plan for managing stormwater runoff in the East Branch Perkiomen Creek Watershed adopted by Bucks County as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan."

Stormwater Management Site Plan (SWM Site Plan) The plan prepared by the Applicant or his representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance.

Stormwater Permit A permit issued by Silverdale Borough Council after the Stormwater Management Plan has been approved. Said permit is issued prior to or with the final Borough approval.

Stormwater Plan The documentation of the stormwater management system, to be used for a given development site, the contents of which are established in Section 403.

Stream A natural watercourse.

Stream Buffer The land area adjacent to each side of a stream, essential to maintaining water quality measured 150 feet from the top of the bank.

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

Subarea The smallest drainage unit of a watershed for which stormwater management criteria have been established in the Stormwater Management Plan.

Subdivision The division or redivision of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels, or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition of 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 waters, or parts thereof, whether natural or artificial, within or on the boundaries of the Commonwealth of Pennsylvania.

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

Timber Operations See "Forest Management".

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

Watercourse A river, brook, creek, or a channel or ditch for water, whether natural or manmade with perennial or intermittent flow.

Watershed Region or area drained by a river, watercourse, or other surface water of this Commonwealth.

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

Wellhead The point at which a groundwater well bore hole meets the surface of the ground.

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 towards and reach the water source.

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

ARTICLE III STORMWATER MANAGEMENT

Section 301. General Requirements

- A. All regulated activities in the East Branch Perkiomen Creek watershed that do not fall under the exemption criteria shown in Section 105 shall submit a Stormwater Management Plan consistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan to Silverdale Borough for review. This criterion shall apply to the total proposed development even if development is to take place in stages. Impervious cover shall include, but not be limited to, any roof, parking, or driveway areas, and any new streets and sidewalks. Any areas designed to initially be gravel or crushed stone shall be assumed to be impervious for the exemption criteria.
- B. 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.
- C. The Stormwater Management 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 Stormwater Management Plan designer must proceed sequentially in accordance with Article IV.
- D. 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.
- E. Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by this 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 harm will result from the concentrated discharge.
- F. Whenever a watercourse is located within a development site, it shall remain open in its natural state and location and should not be piped, impeded, or altered (except for road crossings). It is the responsibility of the developer to stabilize existing eroded stream/channel banks.
- G. Where a development site is traversed by watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations that may adversely affect the flow of stormwater within any portion of the easement, and shall generally conform to the requirements of this Ordinance.

- H. When it can be shown that, due to topographic conditions, natural drainageways on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainageways. Work within natural drainageways shall be subject to approval by the Borough and the DEP through the Joint Permit Application process, or, where deemed appropriate by DEP, through the General Permit process.
- I. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or delineated wetlands shall be subject to approval by DEP through the Joint Permit Application process or the Environmental Assessment Approval process, or, where deemed appropriate by DEP, 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 DEP.
- J. Any stormwater management facilities regulated by this Ordinance that would be located on or discharge into state highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT).
- K. If permitted by soil conditions, minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc., are required to reduce the size of or eliminate the need for detention facilities or other structural BMPs.
- L. Roof drains must not be discharged to streets or roadside ditches or connected to sanitary or storm sewers. Overland flow and infiltration/percolation of stormwater shall be promoted where site conditions allow. If a developer wishes to connect directly to streets or storm sewers, it shall be permitted on a case-by-case basis only after review and approval by the Borough.
- M. Special requirements for watersheds draining to high quality (HQ) and exceptional value (EV) waters: The temperature and quality of water and streams that have been declared as exceptional value and high quality are to be maintained as defined in Chapter 93, Water Quality Standards, Title 25 of Pennsylvania Department of Environmental Protection Rules and Regulations. Temperature sensitive BMPs and stormwater conveyance systems are to be used and designed with storage pool areas and supply outflow channels and should be shaded with trees. This will require modification of berms for permanent ponds and the relaxation of restrictions on planting vegetation within the facilities, provided that capacity for volumes and rate control is maintained. At a minimum, the southern half of pond shorelines shall be planted with shade or canopy trees within 10 feet of the pond shoreline. In conjunction with this requirement, the maximum slope allowed on the berm area to be planted is 10 to 1. This will lessen the destabilization of berm soils due to root growth. A long-term maintenance schedule and management plan for the thermal control BMPs is to be established and recorded for all development sites.

- N. All stormwater runoff shall be pretreated for water quality prior to discharge to surface or groundwater as required by Section 305 of this Ordinance.
- O. 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.
- P. The Stormwater Management Plan must be designed consistent with the sequencing provisions of this Ordinance to ensure maintenance of the natural hydrologic regime and to promote groundwater recharge and protect groundwater and surface water quality and quantity.
- Q. All regulated activities within the Borough 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.
- R. No regulated earth disturbance activities within the Borough shall commence until the requirements of this Ordinance are met.
- S. Post-construction water quality protection shall be addressed as required by Section 305.
- T. Operations and maintenance of permanent stormwater BMPs shall be addressed as required by Article VII.
- U. 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 set forth by the Borough.
- V. Techniques described in Appendix E (Low Impact Development) shall be considered because they reduce the costs of complying with the requirements of this Ordinance and the State Water Quality Requirements.
- W. 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. Peak discharge and required volume control.
 9. Stream bank erosion.
 10. Effectiveness of the BMPs to mitigate potential water quality problems.
 11. The volume of runoff that will be effectively treated.
 12. The nature of the pollutant being removed.
 13. Maintenance requirements.
 14. Creation/protection of aquatic and wildlife habitat.
 15. Recreational value.
- X. The Applicant may meet the stormwater management criteria through off-site stormwater management measures as long as the proposed measures are in the same subwatershed as shown in Appendix D.

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 within 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 Borough shall commence until the Borough approves 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 when there is land disturbance greater than one (1) acre.
- D. Evidence of any necessary permit(s) for Regulated Earth Disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the Borough.
- E. A copy of the Erosion and Sediment Control Plan and any required permit, as required by DEP regulations, shall be available on the project site at all times.

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, 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 development site.
 - 2. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes, and other Borough 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 it designed the Regulated Activities in the following sequence to minimize the increases in stormwater runoff and impacts to water quality:
 - 1. Prepare an Existing Resource and Site Analysis Map (ERSAM), showing environmentally sensitive areas including, but not limited to, steep slopes, ponds,

lakes, streams, wetlands, hydric soils, vernal pools, flood plains, stream buffer zones, hydrologic soil groups A, B, C, and D, any existing recharge areas, and any other requirements outlined in the Borough's Subdivision and Land Development Ordinance. Establish stream buffer according to recommended criteria or applicable ordinances.

2. Prepare a draft project layout avoiding sensitive areas identified in Section 304.B.1 and minimizing total site earth disturbance as much as possible. The ratio of disturbed area to the entire site area and measures taken to minimize earth disturbance shall be included in the ERSAM.
3. Identify site specific existing conditions drainage areas, discharge points, recharge areas, and hydrologic soil groups A and B.
4. Evaluate Nonstructural Stormwater Management Alternatives (See Appendix B, Table B-5).
 - a. Minimize earth disturbance.
 - b. Minimize impervious surfaces.
 - c. Break up large impervious surfaces.
5. Satisfy water quality objective (Section 305).
6. Satisfy groundwater recharge (infiltration) objective (Section 306) and provide for stormwater treatment prior to infiltration.
7. Satisfy streambank erosion protection objective (Section 307).
8. Determine what Management District the site falls into (Appendix D) and conduct a predevelopment runoff analysis.
9. Prepare final project design to maintain predevelopment drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, and to reduce runoff to the maximum extent possible, the use of surface or point discharges.
10. Conduct a proposed conditions runoff analysis based on the final design and to meet the release rate and in turn the overbank flow and extreme event requirements (Section 308).
11. Manage any remaining runoff through treatment prior to discharge, as part of detention, bioretention, direct discharge, or other structural control.

Section 305. Water Quality Requirements

In addition to the performance standards and design criteria requirements of this Article, the Applicant SHALL comply with the following water quality requirements of this Article.

- A. No regulated earth disturbance activities within the Borough shall commence until approval by the Borough of a plan which demonstrates compliance with State Water Quality Requirements post-construction is complete.
- B. The BMPs shall be designed, implemented, and maintained to meet State Water Quality Requirements, and any other more stringent requirements as determined by the Borough.
- C. To control post-construction stormwater impacts from regulated earth disturbance activities, State Water Quality Requirements can be met by BMPs, including site design, which provide for replication of pre-construction stormwater infiltration and runoff conditions, so that post-construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002, September 28, 2002), this may be achieved by the following:
 - 1. Infiltration: Replication of pre-construction stormwater infiltration conditions;
 - 2. Treatment: Use of water quality treatment BMPs to ensure filtering out of the chemical and physical pollutants from the stormwater runoff; and
 - 3. Streambank and Streambed Protection: Management of volume and rate of post-construction stormwater discharges to prevent physical degradation of receiving waters (e.g., from scouring and downcutting).
- D. Adequate storage and treatment facilities will be provided to capture and treat stormwater runoff from developed or disturbed areas. The Recharge Volume computed under Section 306 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 a portion of stormwater runoff from the developed areas of the site produced from ninety percent (90%) of the average annual rainfall (P).

To achieve this goal, the following criterion is established:

The following calculation formula is to be used to determine the Water Quality Volume, (WQv), in acre-feet of storage for the East Branch Perkiomen Creek watershed:

Equation 305.1: $WQv = [(P)(Rv)(A)]/12$

WQv = Water Quality Volume (acre-feet)

P = Rainfall Amount equal to 90% of events producing this rainfall
(inches)

A = Area of the project contributing to the water quality BMP
(acres)

Rv = $0.05 + 0.009(I)$ where I is the percent of the area that is
impervious surface (impervious area/A*100)

The P value for the five PennDOT rainfall regions is shown in Table B-2 in Appendix B. Since the East Branch Perkiomen Creek is in PennDOT Region 4, the P value to be utilized to meet this requirement is 2.04 inches.

E. Design of BMPs used for water quality control shall be in accordance with design specifications outlined in the *Pennsylvania Handbook of Best Management Practices for Developing Areas* or other applicable manuals. The following factors SHALL be considered when evaluating the suitability of BMPs used to control water quality at a given development site:

1. Total contributing drainage 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. Peak discharge and required 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 being removed.
13. Maintenance requirements.
14. Creation/protection of aquatic and wildlife habitat.

15. Recreational value.
 16. Enhancement of aesthetic and property value.
- F. To accomplish the above, the Applicant shall submit original and innovative designs to the Borough for review and approval. Such designs may achieve the water quality objectives through a combination of BMPs.
 - G. 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. For other waters, use of temperature sensitive BMPs and stormwater conveyance systems should be considered as temperature can negatively impact water quality and stream health.
 - H. If a perennial or intermittent stream passes through the site, the Applicant shall create a stream buffer extending a minimum of fifty (50) feet to either side of the top-of-bank of the channel. The buffer area shall be maintained with and encouraged to use appropriate native vegetation (Reference to Appendix H of *Pennsylvania Handbook of Best Management Practices for Developing Area* for plant lists). 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. ordinance, deed, covenant, easement, etc.) and it exceeds the requirements of this Ordinance, the existing buffer shall be maintained.
 - I. Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office must be provided to the Borough.

Section 306. Groundwater Recharge (Infiltration)

- A. Regulated activities will be required to recharge (infiltrate) a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be recharged shall be determined from Sections 306.A.2.a. or 306.A.2.b. depending upon demonstrated site conditions. 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 and/or percolation rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Applicant's design professional.

- c. The recharge facility shall be capable of completely infiltrating the recharge volume within 72 hours after the end of the storm event.
 - d. Pretreatment shall be provided prior to infiltration.
 - e. The requirements for recharge are applied to all disturbed areas, even if they are ultimately to be an undeveloped land use such as grass, since studies have found that compaction of the soils during disturbance reduces their infiltrative capacity.
2. The recharge volume (Re) shall be computed by first obtaining the infiltration requirement using methods in either Section 306.A.2.a. or 306.A.2.b. then multiplying by the total proposed impervious area. The overall required recharge volume for a site is computed by multiplying total impervious area by the infiltration requirement.
- a. NRCS Curve Number Equation. The NRCS runoff shall be utilized to calculate infiltration requirements (P) in inches. The following criteria shall apply:

Equation 306.1: For zero runoff: $P = I \text{ (Infiltration)} = (200/CN) - 2$

where: $P = I =$ infiltration requirement (inches)
 $CN =$ SCS(NRCS) curve number of the existing conditions contributing to the recharge facility

This equation can be displayed graphically in, and the infiltration requirement can also be determined from Figure 306-1.

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

Equation 306.2: $Re_v = I * \text{impervious area (SF)} / 12 = \text{Cubic Feet (CF)}$

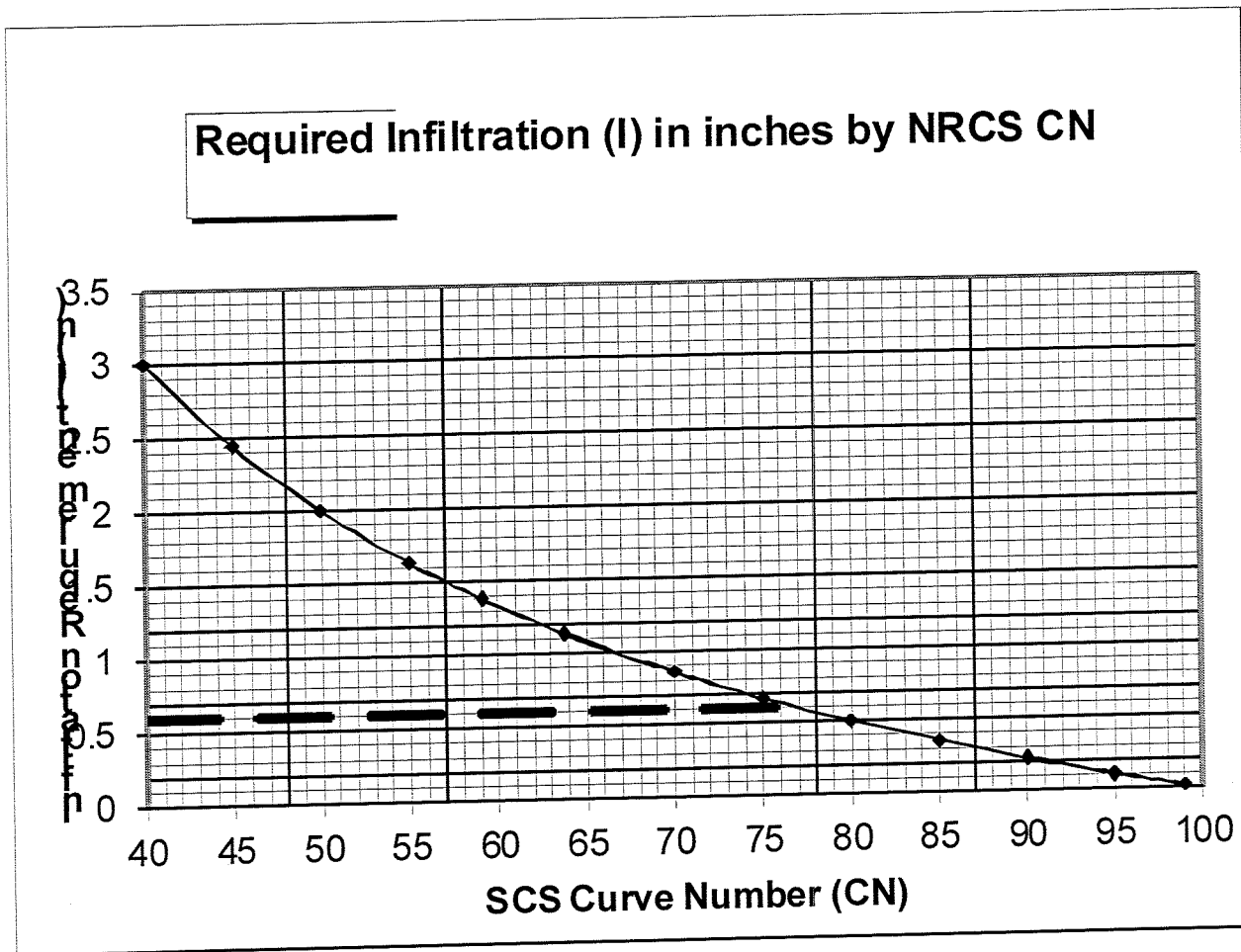
- b. Annual Recharge Water Budget Approach. It has been determined that infiltrating 0.6 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. If the goals of Section 306.A.2.a cannot be achieved, then 0.6 inches of rainfall shall be infiltrated from all impervious areas, up to an existing site conditions curve number of 77. Above a curve number of 77, Equation 306.1 or the curve in Figure 306.1 should be used to determine the Infiltration requirement.

where: $I = 0.6$ inches, the recharge volume (Re_v) required would therefore be computed as:

$Re_v = I * \text{percent impervious area (SF)} / 12 = \text{(CF)}$

The recharge values derived from these methods are the minimum volumes the Applicant must control through an infiltration/recharge BMP facility. If a site has areas of soils where additional volume of infiltration can be achieved, however, the Applicant is encouraged to recharge as much of the stormwater runoff from the site as possible.

Figure 306-1. Infiltration Requirement Based upon NRCS Curve Number.



- A. 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 shall, 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 watershed to determine general areas of suitability for infiltration practices.
 2. Provide field tests, such as double ring infiltration tests at the level of the proposed infiltration surface to determine the appropriate hydraulic conductivity rate.

3. Design the infiltration structure for the required storm volume based on field determined capacity at the level of the proposed infiltration surface.
 4. Where the recharge volume requirement cannot be physically accomplished due to the results of the field soils testing, supporting documentation and justification shall be supplied to the Borough with the Stormwater Management Plan.
 5. If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the Borough that the soils are conducive to infiltrate on the lots identified.
- B. Extreme caution shall be exercised where infiltration is proposed in geologically susceptible areas such as strip mine or limestone areas. Extreme caution shall also be exercised where salt or chloride would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. Extreme caution shall be exercised where infiltration is proposed in source water protection areas. 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. The infiltration requirement in High Quality/Exceptional Value waters shall be subject to the DEP's Title 25: Chapter 93 Antidegradation Regulations. The Borough may require the installation of an impermeable liner in BMP and/or detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Borough.
- C. The Borough shall require the Applicant to provide safeguards against groundwater contamination for uses which may cause groundwater contamination, should there be a mishap or spill.
- D. Recharge/infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.

Section 307. Stream Bank Erosion Requirements

- A. In addition to the water quality volume, to minimize the impact of stormwater runoff on downstream streambank erosion, the requirement is to design a BMP to detain the proposed conditions 2-year, 24-hour design storm to the existing conditions 1-year flow using the SCS Type II distribution. Additionally, provisions shall be made (such as adding a small orifice at the bottom of the outlet structure) so that the proposed conditions 1-year storm takes a minimum of 24 hours to drain from the facility from a point where the maximum volume of water from the 1-year storm is captured (i.e., the maximum water surface elevation is achieved in the facility.)
- B. 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 consider and minimize the chances of clogging and sedimentation. Orifices smaller than 3 inches diameter are not recommended. If, however, the Design Engineer can provide proof that

the smaller orifices are protected from clogging by use of trash racks, etc., smaller orifices may be permitted. Trash racks are required for any primary orifice.

Section 308. Stormwater Management Districts

- A. The East Branch Perkiomen Creek watershed has been divided into stormwater management districts as shown on the Watershed Map in Appendix D. In addition to the requirements specified below, the water quality (Section 305), ground water recharge (Section 306), and streambank erosion (Section 307) requirements shall be implemented.

Silverdale Borough is located within Management District A. Development sites must control proposed conditions runoff rates to existing conditions runoff rates for the design storms as follows:

District	Design Storm Proposed conditions	Design Storm Existing conditions
A	2-year 5-year 10-year 25-year 100-year	1-year 5-year 10-year 25-year 100-year

Section 309. Stormwater Management District Implementation Provisions (Performance Standards)

- A. General - Proposed conditions peak rates of runoff from any regulated activity shall meet the peak release rates of runoff prior to development for the design storms specified on the Stormwater Management District Watershed Map (Appendix D) and Section 308.
- B. District Boundaries - The boundaries of the stormwater management districts are shown on an official stormwater district map that is available for inspections at the Borough office. A copy of the map at a reduced scale is included in Appendix D. The exact location of the Stormwater Management District boundaries, as they apply to a given development site, shall be determined by mapping the boundaries using the two-foot topographic contours (or most accurate data required) provided as part of the Stormwater Management Plan.
- C. Sites Located in More Than One District - For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall be the existing conditions peak discharge for that subarea as indicated in Section 308. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the site. In this case, peak discharge in any direction may be a 100 percent release rate provided that the overall site discharge meets the weighted average release rate.

- D. Off-Site Areas - Off-site areas that drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. On-site drainage facilities shall be designed, however, to safely convey off-site flows through the development site.
- E. Site Areas - Where the area of a site being impacted by a proposed development activity differs significantly from the total site area, only the proposed disturbed area utilizing stormwater management measures shall be subject to the management district criteria. Unimpacted or undisturbed areas that do flow into or are bypassing the stormwater management facilities would not be subject to the management district criteria.
- F. "Downstream Hydraulic Capacity Analysis" - Any downstream capacity hydraulic 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 Department of Environmental Protection's *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 the Department of Environmental Protection's Chapter 105 regulations (if applicable) and, at minimum, pass the increased 25-year return period runoff.
- G. Regional Stormwater Management Facilities Alternatives - For certain areas within the study area, it may be more cost-effective to provide one control facility for more than one development site than to provide an individual control facility for each development site. The initiative and funding for any regional runoff control alternatives are the responsibility of prospective applicants. The design of any regional control facility must incorporate reasonable development of the entire upstream watershed. The peak outflow of a regional control facility would be determined on a case-by-case basis using the hydrologic model of the watershed consistent with protection of the downstream watershed areas. "Hydrologic model" refers to the calibrated model as developed for the stormwater management plan. It is a requirement that, even if regional facilities are proposed for the water quantity control, that the water quality, streambank erosion, and recharge criteria be accomplished on-site, or as close to the source of the runoff as possible.

Section 310. Design Criteria for Stormwater Management Facilities

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

- B. Any stormwater management facility (e.g., detention basin BMP) designed to store runoff and employing 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 proposed conditions. The height of embankment must be set as to provide a minimum 1.0 foot of freeboard above the maximum pool elevation computed when the facility functions for the 100-year proposed conditions peak inflow. Should any stormwater management facility require a dam safety permit under Title 25, Environmental Protection, Chapter 105, Dam Safety and Waterway Management, 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 100-year event.
- C. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), and any work involving wetlands as directed in 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. 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. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-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.
- D. Any drainage/conveyance facility and/or channel that does not fall under Chapter 105 Regulations, must be able to convey, without damage to the drainage structure or roadway, runoff from the 10-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.
- E. Storm sewers must be able to convey proposed conditions runoff from a 25-year design storm without surcharging inlets. Where appropriate, storm sewers must be able to convey proposed conditions from a 100-year design storm (i.e. when directing runoff to a stormwater management facility).
- F. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.
- G. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Borough reserves the right to disapprove any design that

would result in the creation, exacerbation, or continuation of an adverse hydrologic or hydraulic condition within the watershed.

Section 311. Calculation Methodology

Stormwater runoff from all development sites shall be calculated using either the Rational Method or a Soil Cover Complex methodology.

- A. Any stormwater runoff calculations shall use any generally accepted calculation technique that is based on the NRCS Soil Cover Complex method. Table 311-1 summarizes acceptable computation methods. It is assumed that all methods will be selected by the Applicant based on the individual limitations and suitability of each method for a particular site. The Borough may allow the use of the Rational Method to estimate peak discharges from drainage areas that contain less than 200 acres.
- 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 National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rain data corresponding to the Doylestown rain gage, as presented in Table B-1 of Appendix A of this Ordinance. The SCS Type 11 rainfall curve data from NOAA is listed in Figure B-1 in Appendix B of this Ordinance. This data may also be directly retrieved from the NOAA Atlas 14 website: hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html. 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.
- C. 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-24 of Appendix B. 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 (e.g., forest), as listed in Table B-4 of Appendix B.
- 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 Design Storm Curves from *PA Department of Transportation Design Rainfall Curves* (1986) (as amended or replaced from time to time by PennDOT). 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. For design purposes the time of concentration may not be less than five (5) minutes. Travel time (T_t) is the time it takes runoff to travel from one location to another in a watershed (subreach) and is a component of time of concentration. T_c is computed by summing all the travel times for consecutive components of the drainage conveyance system.

Water moves through a watershed as sheet flow, shallow concentrated flow, open channel flow, or some combination of these. Sheet flow rates shall be calculated using the NRCS TR-55 (1986) variation of the kinematic wave equation. Sheet flow length may not exceed fifty (50) feet over paved surfaces and one hundred and fifty (150) feet over unpaved surfaces. Maximum permitted sheet flow length shall be one hundred and fifty (150) feet unless site specific conditions exist (that can be demonstrated) that warrant an increase of the sheet flow length. Under no circumstances shall sheet flow length exceed three hundred (300) feet. Shallow concentrated flow time and open channel flow time shall be calculated using standard engineering methodologies.

- F. 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 if topsoiled and seeded. The designer may increase their proposed condition CN or C value to reflect proposed soil conditions.
- G. Runoff coefficients (c) for both existing and proposed conditions for use in the Rational Method shall be obtained from Table B-7 of Appendix B.
- 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-8 of Appendix B.
- 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. For drainage areas greater than 200 acres, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The Borough may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

Table 311-1: Acceptable Computation Methodologies For Stormwater Management Plans

METHOD	METHOD DEVELOPED BY	APPLICABILITY
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary.
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.

METHOD	METHOD DEVELOPED BY	APPLICABILITY
HEC-1, HEC-HMS	U.S. 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 Borough
Other Methods	Varies	Other computation methodologies approved by the Borough.

Section 312. Standards During Land Disturbance

- A. Whenever the vegetation and topography are to be disturbed, such activity must be in conformance with Chapter 102, Title 25, Rules and Regulations, Part I, Commonwealth of Pennsylvania, Department of Environmental Protection, Subpart C, Protection of Natural Resources, Article II, Water Resources; Chapter 102, "Erosion Control;" and in accordance with the Bucks County Conservation District.
- B. Pursuant to 25 PA Code Chapter 92, a PADEP "NPDES Construction Activities" permit is required for Regulated Earth Disturbance activities.
- C. Copies of any necessary permit(s) for Regulated Earth Disturbance activities from the appropriate PADEP regional office or Bucks County Conservation District must be submitted to the Borough.
- D. A copy of the Erosion and Sediment Control Plan and any required permit, as required by PADEP regulations shall be available at the project site at all times.
- E. Whenever infiltration BMPs are proposed, the following additional erosion and sedimentation control design standards and criteria must be applied:
 - 1. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase, so as to maintain their maximum infiltration capacity. Thirty-three (33) inch super filter fabric fence (or other approved protection mechanism) must be installed around proposed infiltration areas to prevent encroachment and compaction by construction equipment.
 - 2. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has received final stabilization. If necessary, thirty-three (33) inch super filter fabric fence (or other approved protection mechanism) must be installed in the vicinity of infiltration area to prevent contamination by runoff containing suspended sediment.

F. Peak discharges and discharge volumes from the site shall comply with the appropriate sections above, with the following additions:

1. For purposes of calculating required detention storage during land disturbance, peak discharges and discharge volumes shall be calculated based upon the runoff coefficients for bare soils during the maximum period and extent of disturbance from clearing, and impervious surface installation, indicated on the development plan. Controls shall insure that the difference in volume and rate of peak discharges before disturbance and during shall not exceed those peak discharges required in Section 308 of this Ordinance. Detention storage during the period of land disturbance and prior to establishment of permanent cover may require additional facilities on a temporary basis. Such measures shall be located so as to preserve the natural soil infiltration capacities of the planned infiltration areas. Calculations based on the above parameters must be submitted to verify "during construction" runoff does not exceed predevelopment runoff for the one (1) year frequency through one hundred (100) year frequency design storm events.
2. Wherever soils, topography, cut and fill or grading requirements, or other conditions suggest substantial erosion potential during land disturbance, the Borough may require that the entire volume of all storms up to a two (2) year storm from the disturbed areas be retained on site and that special sediment trapping facilities (such as check dams, etc.) be installed.

G. Areas of the site to remain undisturbed shall be protected from encroachment by construction equipment/vehicles to maintain the existing infiltration characteristics of the soil. Four (4) feet high orange safety fence or other similar protection fence approved by the Borough must be installed around the entire limit of disturbance/clearing prior to commencement of earthmoving activities, and maintained until completion of all construction activity.

ARTICLE IV STORMWATER MANAGEMENT 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 land disturbance activity may not proceed until the Applicant or his/her agent has received written approval of a Stormwater Management Plan from the Borough.

Section 402. Stormwater Management Plan Contents

The Stormwater Management Plan shall consist of all applicable calculations, maps, and plans. A note on the maps shall refer to the associated computations and the Erosion and Sedimentation Control Plan by title and date. The cover sheet of the computations and the Erosion and Sedimentation Control Plan shall refer to the associated maps by title and date. All Stormwater Management Plan materials shall be submitted to the Borough in a format that is clear, concise,

legible, neat, and well organized; otherwise, the Stormwater Management Plan shall be disapproved and returned to the Applicant.

The following items shall be included in the Stormwater Management Plan:

A. General

1. General description of project.
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. General description of nonpoint source pollution controls.

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

1. The location of the project relative to highways, municipalities, or other identifiable landmarks.
2. Existing contours at intervals of 2 feet. In areas of steep slopes (greater than 15%), 5-foot contour intervals may be used.
3. Existing streams, lakes, ponds, or other bodies of water within the project area.
4. Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.
5. The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines.
6. An overlay showing soil names and boundaries.
7. Proposed changes to the land surface and vegetative cover, including limits of earth disturbance and 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 2 feet. In areas of steep slopes (greater than 15%), 5-foot contour intervals may be used.
10. The name of the development, the name and address of the owner of the property, and the name of the individual or firm preparing the plan.
11. The date of submission.
12. A graphic and written scale of one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.
13. A north arrow.
14. The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
15. Existing and proposed land use(s).
16. A key map showing all existing man-made features beyond the property boundary that would be affected by the project.
17. Location of all open channels.
18. Overland drainage paths.
19. A minimum 15-foot wide access easement encircling each stormwater management facility and providing ingress and egress from a public right-of-way to that facility.
20. The location of all erosion and sedimentation 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 landowner, acknowledging the stormwater management system to be a permanent fixture that can be altered or removed only after approval of a revised plan by the Borough, which shall be recorded with the record plan and which shall be applicable to all future landowners.
23. The following signature block for the design engineer:

(Design Engineer), on this date (date of signature), has reviewed and hereby certify that the Stormwater Management Plan meets all design standards and criteria of the Silverdale Borough's East Branch Watershed 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 302.
 - 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.
2. An Erosion and Sedimentation Control Plan, where applicable, including all reviews and approvals, as required by DEP.
3. A geologic assessment of the effects of runoff on sinkholes as specified in this Ordinance.
4. 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.
5. A Declaration of Adequacy and Highway Occupancy Permit from the PennDOT District Office when the use of a PennDOT storm drainage system is proposed.

D. Stormwater Management Facilities

1. All stormwater management facilities must be located on the Stormwater Management Plan and described in detail.
2. When groundwater recharge methods such as seepage pits, beds, or trenches are used, the locations of existing and proposed septic tank infiltration areas and wells must be shown.
3. All calculations, assumptions, and criteria used in the design of the stormwater management facilities must be shown.

Section 403. Stormwater Management Plan Submission

For all activities regulated by this Ordinance, the steps below shall be followed for submission. For any activities that require a DEP Joint Permit Application and regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of DEP's Rules and Regulations, require a PennDOT Highway Occupancy Permit, or require any other permit under applicable state or federal regulations, the proof of application for that permit(s) and the permit(s) shall be part of the Stormwater Management Plan. The Plan shall be coordinated with the state and federal permit process.

- A. The Stormwater Management Plan shall be submitted by the Applicant as part of the preliminary plan submission for the regulated activity.
- B. A minimum of four (4) copies of the Stormwater Management Plan shall be submitted.
- C. Distribution of the Stormwater Management Plan will be as follows:
 - 1. Two (2) or more copies to the Borough accompanied by the requisite borough review fee, as specified in this Ordinance.
 - 2. One (1) copy to the Borough Engineer.
 - 3. One (1) copy to the Bucks County Planning Commission.

Section 404. Stormwater Management Plan Review

- A. The Borough Engineer shall review the Stormwater Management Plan for consistency with the adopted East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan. The Borough shall require receipt of a complete plan, as specified in this Ordinance.
- B. The Borough Engineer shall review the Stormwater Management Plan for any subdivision or land development against the Borough's SALDO provisions not superseded by this Ordinance.
- C. For activities regulated by this Ordinance, the Borough Engineer shall notify the Borough in writing, whether the Stormwater Management Plan is consistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan. Should the Stormwater Management Plan be determined to be consistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan, the Borough Engineer will forward a review letter to the Applicant with a copy to the Borough.
- D. Should the Stormwater Management Plan be determined to be inconsistent or noncompliant with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan, the Borough Engineer will forward a letter to the Borough with a copy to the Applicant citing the reason(s) for the inconsistency or noncompliance. Any

Stormwater Management Plans receiving this decision may be revised by the Applicant and resubmitted for reevaluation. The Borough will not grant approval to the proposal until its Stormwater Management Plan is deemed consistent with this Ordinance. Stormwater Management Plans that are considered inconsistent or noncompliant by the Borough shall be resubmitted in accordance with Section 407.

- E. For regulated activities specified in Sections 104.C and D, the Borough Engineer shall notify the person in the Borough responsible for administering building permits in writing, within a time frame consistent with the Borough building code and/or Borough's SALDO, of whether the Stormwater Management Plan is consistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan and forward a copy of the approval/disapproval letter to the Applicant. Any disapproved Stormwater Management Plan may be revised by the Applicant and resubmitted consistent with this Ordinance.
- F. For regulated activities requiring a DEP Joint Permit Application, the Borough Engineer shall notify DEP whether the Stormwater Management Plan is consistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan and forward a copy of the review letter to the Borough and the Applicant. DEP may consider the Borough Engineer's review comments in determining whether to issue a permit.
- G. The Borough shall not approve any subdivision or land development for regulated activities specified in Section 104, if the Stormwater Management Plan has been found to be inconsistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan, as determined by the Borough Engineer. All required permits from DEP must be obtained prior to approval of any subdivision or land development.
- H. The person in the Borough responsible for administering building permits shall not issue a building permit for any regulated activity specified in Section 104, if the Stormwater Management Plan has been found to be inconsistent with the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan, as determined by the Borough Engineer, or without considering the comments of the Borough 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 Stormwater Management Plan. The record drawings and an explanation of any discrepancies with the design plans shall be submitted to the Borough Engineer for final approval. In no case shall the Borough approve the record drawings until the Borough receives a copy of an approved Declaration of Adequacy, Highway Occupancy Permit from the PennDOT District Office, and any applicable permits from DEP.
- J. The Borough's approval of a Stormwater Management Plan shall be valid for a period not to exceed two years. If stormwater management facilities included in the approved Stormwater Management Plan have not been constructed, or if constructed, and record drawings of these facilities have not been approved within this two-year time period, then the Borough may consider the Stormwater Management Plan withdrawn and may revoke

any and all permits. Stormwater Management Plans that are considered disapproved by the Borough shall be resubmitted in accordance with Section 407.

Section 405. Retention of Plans at Project Site

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

Section 406. Adherence to Approved Plan

It shall be unlawful for any person to undertake any development activity on any property except as provided for in the approved stormwater management plan and pursuant to the requirements of this Ordinance. It shall be unlawful to alter or remove any BMP required by the stormwater management plan pursuant to this Ordinance or to allow the property to remain in a condition which does not conform to the approved stormwater management plan.

Section 407. Erroneous Permit

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

Section 408. Certification of Completion

At the completion of the project, and as a prerequisite for the release of the performance guarantee under Section 701, the owner or his representatives shall:

- A. Contact the Borough Engineer to request inspection of the site for completion of stormwater management facilities and compliance with the approved plans and specifications.
- B. Provide a set of as-built drawings as required pursuant to the Borough Building Code and/or Subdivision and Land Development Ordinance.

Section 409. Modification of Plans

- A. A modification to a submitted Stormwater Management Plan for a development site that involves a change in stormwater management facilities or techniques, or that involves the relocation or redesign of stormwater management facilities, or that is necessary because soil or other conditions are not as stated on the Stormwater Management Plan as determined by the Borough Engineer, shall require a resubmission of the modified Stormwater Management Plan consistent with Section 404 and be subject to review as specified in Section 405.

- B. A modification to an already approved or disapproved Stormwater Management Plan shall be submitted to the Borough, accompanied by the applicable fee. A modification to a Stormwater Management Plan for which a formal action has not been taken by the Borough shall be submitted to the Borough, accompanied by the applicable review fee.

Section 410. Occupancy Permit

An occupancy permit shall not be issued unless the approved stormwater management facilities have been installed on the lot and found satisfactory to the Borough Engineer.

Section 411. Resubmission Inconsistent or Noncompliant Stormwater Management Plans

A disapproved Stormwater Management Plan may be resubmitted, with the revisions addressing the Borough Engineer's concerns. The resubmitted Plan shall be addressed to the Borough in accordance with Section 403 and distributed accordingly, and shall be subject to review as specified in Section 404. The applicable review fee must accompany a resubmission of a disapproved Stormwater Management Plan.

ARTICLE V INSPECTIONS

Section 501. Schedule of Inspections

- A. The Borough Engineer or his/her assignee shall observe all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Borough Engineer.
- B. During any stage of the work, if the Borough Engineer determines that the stormwater management facilities are not being installed in accordance with the approved Stormwater Management and/or Erosion and Sedimentation Control Plans, the Borough shall revoke any existing permits until the mistakes, defects, errors, or deficiencies of the stormwater management facilities are corrected, and these facilities are repaired, restored, and/or reconstructed in accordance with the approved Stormwater Management or Erosion and Sedimentation Control Plans.
- C. A final inspection of all BMPs and/or stormwater management facilities shall be conducted by the Borough Engineer or his designee and to confirm compliance with the approved Stormwater Management Plan prior to the issuance of any Occupancy Permit.

ARTICLE VIFEEES AND EXPENSES

Section 601. General

The fee required by this Ordinance is the Borough Review Fee. The Borough Review Fee shall be established by the Borough to defray review costs incurred by the Borough and the Borough Engineer. All fees shall be paid by the Applicant.

Section 602. Borough Stormwater Management Plan Review Fee

The Borough shall establish a review fee schedule by resolution of the Silverdale Borough Council based on the size of the regulated activity and based on the Borough's costs for reviewing any plans related to stormwater management. The Borough shall periodically update the review fee schedule to ensure that review costs are adequately reimbursed.

Section 603. Expenses Covered by Fees

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

- A. Administrative costs.
- B. Review of Stormwater Management Plans and Erosion and Sedimentation Control Plans by the Borough, the Borough Engineer, and other Borough consultants/professionals.
- C. Site inspections.
- D. Inspection of stormwater management facilities and drainage improvements during construction.
- E. Final inspection upon completion of the stormwater management facilities and drainage improvements presented in the Stormwater Management Plan and the Erosion and Sedimentation Control Plan.
- F. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and ensure proper completion of stipulated remedial actions.

Section 604. Itemization of Costs

Expenses incurred by the Borough and charged to the applicant pursuant to Section 602 of this Ordinance shall be itemized. A copy of the itemized costs will be provided by the Borough to the applicant.

ARTICLE VII OPERATION AND MAINTENANCE RESPONSIBILITIES

Section 701. Performance Guarantee

- A. The Applicant shall provide a financial guarantee to the Borough for the timely installation and proper construction of all stormwater management facilities as required by the East Branch Perkiomen Creek Watershed Act 167 Stormwater Management Plan, this Ordinance, and the approved Stormwater Management and Erosion and Sedimentation Control Plans equal to or greater than the full construction cost of the required facilities.
- B. The amount and method of payment of this financial guarantee shall be provided as required under the Borough's Subdivision and Land Development Ordinance regarding financial guarantees.
- C. The Borough may also require a financial guarantee from the Applicant for other activities regulated under this Ordinance.

Section 702. Operation and Maintenance Responsibilities

- A. No Regulated Earth Disturbance activities within the Borough shall commence until approval by the Borough of an Operations and Maintenance Plan. The Operations and Maintenance Plan shall be a part of the Stormwater Management Plan for the development site and shall be prepared by the Applicant and approved by the Borough Engineer. The Operation and Maintenance Plan shall describe how the permanent (e.g., post-construction) stormwater management facilities will be properly inspected, operated, and maintained and shall outline required routine maintenance actions, schedules, and detailed instructions on what tasks must be performed and on what frequency to insure proper operation of the facilities.
- B. The following items shall be included in the 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 Bucks County, and shall be submitted on 24-inch x 36-inch sheets. The contents of the maps(s) shall include, but not be limited to:
 - a. Clear identification of the location and nature of permanent stormwater management facilities;
 - 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 others as appropriate;

- d. Existing streams, lakes, ponds, or other bodies of water within the project site area;
 - e. Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, and areas of natural vegetation to be preserved;
 - f. The locations of all existing and proposed utilities, sanitary sewers, and water lines within 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 minimum 15-foot wide access easement encircling each stormwater management facility and providing ingress and egress from a public right-of-way to that facility.
- 2. A description of how each permanent stormwater management facility will be inspected, operated, and maintained, and the identity and contact information associated with the person(s) responsible for inspections, 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.
 - 4. A statement, signed by the landowner, acknowledging that the stormwater management facilities and fixtures can only be altered or removed after approval by the Silverdale Borough Council.
- C. The Operations and Maintenance Plan for the development site shall establish responsibilities for the continuing operating and maintenance of all proposed stormwater management facilities, consistent with the following principals:
- 1. If a development consists of structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the Borough, stormwater management facilities may also be dedicated to and maintained by the Borough, however, the designated owner(s) of the facility(ies) must be recorded on the final development plan.
 - 2. In the instance of developments which include public improvements that are to be dedicated to the Borough, stormwater management facilities may be owned and maintained by an appropriately established Homeowners Association in lieu of Borough ownership/maintenance. The designated owner(s) of the facility(ies), however, must be recorded on the final development plan.

3. If a development site is to be maintained in a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the ownership and maintenance of stormwater management facilities may be the responsibility of the owner or private management entity. The designated owner(s) of the facility(ies), however, must be recorded on the final development plan.

- D. The Borough, upon recommendation of the Borough Engineer, shall make the final determination on the continuing maintenance responsibilities prior to final approval of the Stormwater Management Plan and the Operations and Maintenance Plan. The Borough reserves the right to accept or reject the ownership and operating responsibility for any or all of the stormwater management facilities.

Section 703. Operation and Maintenance Agreement for Privately Owned Stormwater Facilities

- A. Prior to final approval of the development site's Stormwater Management and Operations and Maintenance Plans, the Applicant shall sign an Operations and Maintenance ("O&M") Agreement with the Borough covering all stormwater management facilities that are to be privately owned. This O&M Agreement shall be transferred with transfer of ownership and shall be substantially the same as the agreement in Appendix A.

- B. Other items may be included in the O&M Agreement where determined necessary to guarantee the satisfactory maintenance of all stormwater management facilities. The O&M Agreement shall be subject to the review and approval of the Borough.

Section 704. Borough Stormwater Maintenance Fund

- A. Persons installing stormwater management facilities shall be required to pay a specified amount to the Borough Stormwater 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 management facilities are to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the Borough for a period of twenty (20) years, as estimated by the Borough Engineer. After that period of time, inspections will be performed at the expense of the Borough.

 2. If the stormwater management facilities are to be owned and maintained by the Borough, the deposit shall cover the estimated costs for maintenance and inspections for twenty (20) years. The Borough 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 Silverdale Borough Council.

- B. If a proposed stormwater management facility will also serve as a recreation facility (e.g., ballfield, lake), the Borough 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 management facility (whether publicly or privately owned) is eliminated due to the installation of storm sewers or other facilities, the unused portion of the Borough Stormwater Maintenance Fund deposit related to the maintenance or inspection of this eliminated facility 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/connection are paid will be used for the maintenance or inspection of these newly installed storm sewers or other facilities.

Section 705. Plan Requirements

- A. An Operations and Maintenance Plan shall include a plan note stating that the Borough shall have the right to enter private property to inspect and repair, if necessary, any stormwater management facility.
- B. An Operations and Maintenance Plan shall note that the stormwater management facilities are a permanent part of the development and shall not be removed, altered, or modified.

Section 706. Borough Review of the Operations and Maintenance Plan

- A. The Borough shall review the Operations and Maintenance Plan for consistency with the purposes and requirements of this Ordinance, and any permits issued by DEP.
- B. The Borough shall notify the Applicant in writing whether the Operations and Maintenance Plan is approved.
- C. The Borough shall require a "Record Drawing" of all stormwater management facilities, and an explanation of any discrepancies with the Operations and Maintenance Plan.

Section 707. Adherence to Approved Operations and Maintenance Plan

It shall be unlawful to alter or remove any stormwater management facility required by an approved Stormwater Management Plan, Erosion and Sedimentation Control Plan, or Operations and Maintenance Plan, or to allow the site to remain in a condition which does not conform to any of these Plans.

Section 708. Stormwater Management Easements

- A. Stormwater management easements are required for all areas used for off-site stormwater management, unless a waiver is granted by the Borough Engineer.

- B. Stormwater management easements shall be provided by the Applicant or property owner, if necessary for access for inspections and maintenance, or the preservation of stormwater runoff conveyance, infiltration and detention areas, and other stormwater management facilities, by persons other than the property owner. The purpose of the easement shall be specified in any agreement under Section 703.

Section 709. Recording of Approved Operations and Maintenance Plan and Related Agreements

- A. The Applicant and/or owner of any land upon which permanent stormwater management facilities will be placed, constructed, or implemented, as described in the Stormwater Management, Erosion and Sedimentation Control, and/or Operations and Maintenance Plans, shall record the following documents in the Office of the Recorder of Deeds for Bucks County, within 15 days of approval of the Operations and Maintenance Plan by the Borough:
1. The Operations and Maintenance Plan, or a summary thereof,
 2. O&M Agreements under Section 703, and
 3. Easements under Section 708.
- B. The Borough may suspend or revoke any approvals granted for the project site upon discovery of failure on the part of the owner and/or Applicant to comply with this Section.

Section 710 Post-Construction Maintenance Inspections

- A. BMPs shall be inspected by the responsible person or entity (including the Borough Engineer for dedicated BMPs) on the following basis:
1. Twelve (12) months after completion of the facility and acceptance by the Borough,
 2. at least once every three (3) years thereafter, and
 3. during or immediately after the cessation of a 100-year or greater storm event.
- B. The entity conducting the inspection shall submit a report to the Borough regarding necessary repairs, if any.

ARTICLE VIII PROHIBITIONS

Section 801. Prohibited Discharges

- A. No person in the Borough shall allow, or cause to allow, stormwater or non-stormwater discharges into the Borough's separate storm sewer system which are not composed entirely of stormwater, except (1) as provided in subsection B below, and (2) discharges allowed under a state or federal permit.
- B. Discharges that may be allowed based on a finding by the Borough that the discharge(s) do not significantly contribute to pollution to surface waters of the Commonwealth, are:
1. Discharges from fire fighting activities;
 2. Potable water sources including dechlorinated water line and fire hydrant flushings;
 3. Irrigation water;
 4. Routine external building washdown (which does not use detergents or other compounds);
 5. Air conditioning condensate;
 6. Water from individual residential car washing;
 7. Spring water from crawl space pumps;
 8. Uncontaminated water from foundation or from footing drains;
 9. Flows from riparian habitats and wetlands;
 10. Lawn watering and landscape irrigation;
 11. Pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used;
 12. Dechlorinated swimming pool discharges; and
 13. Uncontaminated groundwater;
 14. Rising groundwater
 15. Street wash water.

- C. In the event that the Borough 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 Borough will notify the responsible person to cease the discharge.
- D. Upon notice provided by the Borough under Section 801.C, the discharger will have a reasonable time, as determined by the Borough, 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 or Federal 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 Borough.

Section 803. Roof drains

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

Section 804. Alteration of Stormwater Management Facilities

- A. No person shall modify, remove, fill, landscape, or alter any existing stormwater management facility, unless it is part of an approved maintenance program, without the written approval of the Silverdale Borough Council.
- B. No person shall place any structure, fill, landscaping, or vegetation into a stormwater management facility or within a drainage easement, which would limit or alter the functioning of such facility, without the written approval of the Silverdale Borough Council.

ARTICLE IX ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry

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

Section 902. Notification

- A. Whenever the Borough finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the Borough may order compliance by written notice to the responsible person. Such notice may, without limitation, require the following remedies:
 - 1. Performance of monitoring, analyses, and reporting;
 - 2. Elimination of prohibited connections or discharges;
 - 3. Cessation of any violating discharges, practices, or operations;
 - 4. Abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
 - 5. Payment of a fine to cover administrative and remediation costs;
 - 6. Implementation of stormwater management facilities; and/or
 - 7. Operation and maintenance of stormwater management facilities.
- 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 Borough or designee and the expense thereof shall be charged to the violator.

- C. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Borough from pursuing any and all other remedies available in law or equity. 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 903. Enforcement

The Borough is hereby authorized and directed to enforce all of the provisions of this Ordinance. All inspections regarding compliance with the Stormwater Management, Erosion and Sedimentation Control, and/or Operations and Maintenance Plans shall be the responsibility of the Borough Engineer or other qualified persons designated by the Borough.

- A. A set of design plans approved by the Borough shall be on file at the development site throughout the duration of the construction activity. Periodic inspections may be made by the Borough or designee during construction.
- B. Adherence to Approved Plan. It shall be unlawful for any person, firm, or corporation to undertake any activity regulated under Section 104 on any property except as provided for in the approved Stormwater Management, Erosion and Sedimentation Control, and/or Operations and Maintenance Plans and pursuant to the requirements of this Ordinance. It shall be unlawful to alter or remove any stormwater management facility required by these Plans pursuant to this Ordinance or to allow the property to remain in a condition which does not conform to these Plans.
- C. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the Applicant shall:
 - 1. Provide a certification of completion from an engineer, surveyor or other qualified person verifying that all permanent stormwater management facilities have been constructed according to the plans and specifications and approved revisions thereto.
 - 2. Provide a set of as-built (record) drawings.
 - 3. After receipt of the certification by the Borough, a final inspection shall be conducted by the Borough Engineer or designated representative to certify compliance with this Ordinance.
- D. Suspension and Revocation of Permits

1. Any permit issued under this Ordinance may be suspended or revoked by the Borough for:
 - a. Noncompliance 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 permit shall be reinstated by Silverdale Borough Council when:
 - a. The Borough Engineer or a designee has inspected and approved the corrections to the stormwater management and erosion and sediment pollution control measure(s), or the elimination of the hazard or nuisance, and/or;
 - b. Borough Council is satisfied that the violation of the ordinance, law, or rule and regulation has been corrected.
 3. When a permit that has been revoked by Borough Council cannot be reinstated, the Applicant may apply for a new permit under the procedures outlined in this Ordinance.
 4. Prior to revocation or suspension of a permit, Borough Council will schedule a hearing to discuss the noncompliance if there is no immediate danger to life, public health, or property.
- E. Occupancy Permit. An occupancy permit shall not be issued unless the certification of compliance has been secured. The occupancy permit shall be required for each lot owner and/or applicant for all subdivisions and land development in the Borough.

Section 904. 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 905. Penalties

- A. Anyone violating the provisions of this Ordinance shall be subject to a fine of not more than one thousand dollars (\$1,000.00) for each violation, recoverable with costs, or imprisonment of not more than thirty (30) days, or both. Each day that the violation continues shall be a separate offense.

APPENDIX A

OPERATIONS AND MAINTENANCE AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between _____, (hereinafter the “Landowner”), and Silverdale Borough, Bucks County, Pennsylvania, (hereinafter “Borough”);

WITNESSETH

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

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

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

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

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

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

BMP: Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one or two broad categories or measures: “structural” or “nonstructural”. In this Ordinance, nonstructural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or

forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

Infiltration Trench: A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer.

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

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

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

1. The BMPs shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Borough and in accordance with the specific maintenance requirements noted on the Plan.
3. The Landowner hereby grants permission to the Borough, its authorized agents and employees, to enter upon the Property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Borough shall notify the Landowner prior to entering the Property.
4. In the event the Landowner fails to operate and maintain the BMP(s) as shown on the Plan in good working order acceptable to the Borough, the Borough or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Borough to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Borough is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Borough.
5. In the event the Borough, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Borough for all expenses (direct and indirect) incurred within ten (10) days of receipt of invoice from the Borough.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Borough's employees and designated representatives from all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Borough. In the event that a claim is asserted against the Borough, its designated representatives or employees, the Borough shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Borough's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.
8. The Borough shall inspect the BMP(s) at a minimum of once every three years to ensure their continued functioning.
9. This Agreement shall be recorded at the Office of the Recorder of Deeds of Bucks 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.
10. This Agreement shall be governed by and construed under the laws of the Commonwealth of Pennsylvania and Ordinances of Silverdale Borough. All the parties to this Agreement hereby consent to the exclusive jurisdiction of the Court of Common Pleas of Bucks County, Pennsylvania regarding any dispute arising out of or in connection with this Agreement.
11. Landowner shall not assign this Agreement, in whole or any part, to any person or other entity without the prior written consent of Borough. Any attempt at assignment without the prior written consent of Borough shall be null and void, not binding on Borough, and the same shall constitute a default under this Agreement.
12. The singular shall include the plural and the masculine shall include the feminine and neuter, where the context thereof shall permit or otherwise require.
13. The parties agree that this Agreement contains all of the agreements between the parties regarding the operation and maintenance of the stormwater management facilities and that there are no other agreements or representations made by either of them. This Agreement sets forth the entire understanding between the parties and any representations, oral or written, not contained therein, are without effect.
14. If any ambiguity or ambiguities in this Agreement should be claimed by either Landowner or Borough, or if any court should determine that any ambiguity exists in this Agreement, then any such ambiguity shall be resolved in favor of Borough and against Landowner.
15. If any provision of this Agreement is determined by a court of competent jurisdiction to be illegal, invalid, unenforceable, unconstitutional, or void, for any reason, only such provision shall be illegal, invalid, unenforceable, unconstitutional, or void and the remainder of this Agreement shall be in full force and effect.

**SILVERDALE BOROUGH
OPERATION AND MAINTENANCE AGREEMENT
(Signatures Page)**

IN WITNESS WHEREOF, and intending to be legally bound, the parties hereby cause this Agreement to be executed the day and year first above written.

LANDOWNER: _____

BOROUGH:

Approved by the proper action of the Silverdale Borough Council on the _____ day of _____, A.D., 20____, at an official public meeting of the Borough with a quorum present and voting, with the proper officers of the Borough being directed to execute this Agreement and the Borough Secretary or Assistant Secretary, being directed to note this action upon the minutes of said meeting.

ATTEST:

BOROUGH OF SILVERDALE

BY: _____
Secretary

BY: _____
Clair Black
President of Borough Council

Approved this _____ day of _____, 20____.

BY: _____
Lowell S. Musselman, Mayor

**SILVERDALE BOROUGH
OPERATION AND MAINTENANCE AGREEMENT
(Acknowledgments)**

COMMONWEALTH OF PENNSYLVANIA :
: SS.
COUNTY OF _____ :

On this _____ day of _____, A.D., 20___, before me a Notary Public, personally appeared _____, known to me (or satisfactorily proven) to be the persons whose name are subscribed to the within instrument, and acknowledged that she executed the same for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and Notarial Seal.

Notary Public

(SEAL)

APPENDIX B: STORMWATER MANAGEMENT DESIGN CRITERIA

TABLE B-1 DESIGN STORM RAINFALL AMOUNT

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html.

FIGURE B-1 ATLAS 14 TYPE II S-CURVES FOR ALL FREQUENCY STORMS – DOYLESTOWN GAGE (36-2221)

Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html.

TABLE B-2 NATURAL RESOURCE PROTECTION STORMWATER MANAGEMENT CONTROLS

Source: PA BMP Manual Chapter 8, pg 33

TABLE B-3 GUIDANCE TO CALCULATE THE 2-YEAR, 24-HOUR VOLUME INCREASE FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS

Source: PA BMP Manual Chapter 8, pg 37

TABLE B-4 RUNOFF CURVE NUMBERS

Source: NRCS (SCS) TR-55

TABLE B-5 VOLUME CONTROL CALCULATION GUIDANCE FOR NONSTRUCTURAL BMPS

Source: PA BMP Manual Chapter 8, pg 34

TABLE B-6 VOLUME CONTROL CALCULATION GUIDANCE FOR STRUCTURAL BMPS

Source: PA BMP Manual Chapter 8, pg 38

TABLE B-7 RATIONAL RUNOFF COEFFICIENTS

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

TABLE B-8 MANNING'S ROUGHNESS COEFFICIENTS

**TABLE B-1
DESIGN STORM RAINFALL AMOUNT (INCHES)**

The design storm rainfall amount chosen for design should be obtained from the National Oceanic and Atmospheric Administration Atlas 14 interactive website:
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html

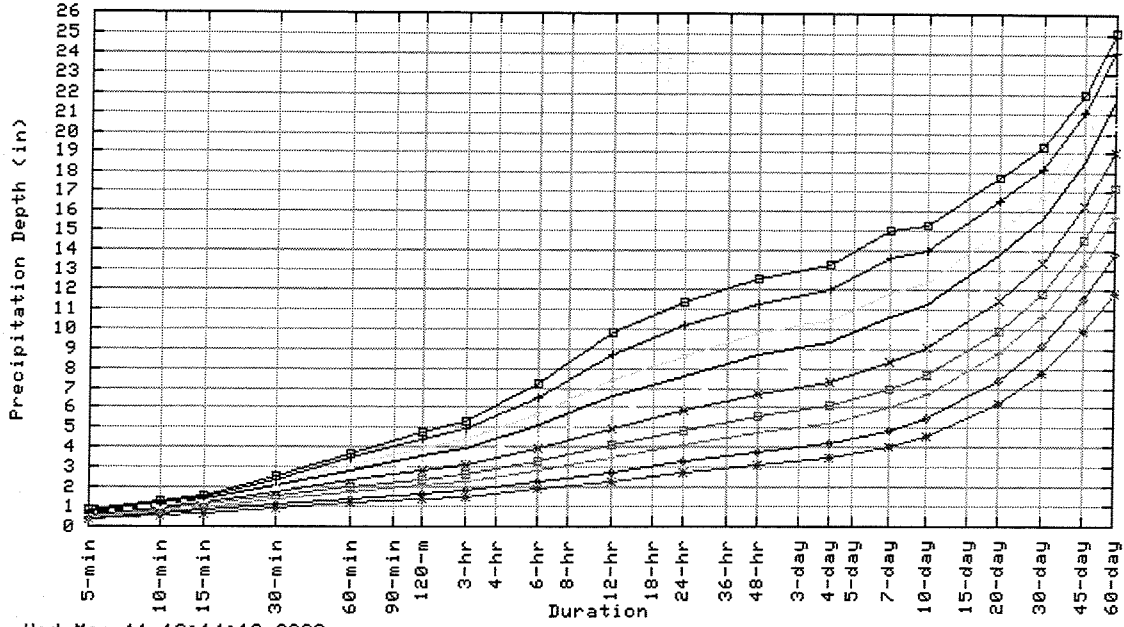
Source: NOAA Atlas 14 website, Doylestown Gage (36-2221)
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/pa_pfds.html

Precipitation Frequency Estimates (inches)																		
ARI* (years)	5 min	10 min	15 min	30 min	6 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.34	0.54	0.68	0.93	1.15	1.38	1.51	1.89	2.30	2.71	3.13	3.48	4.07	4.61	6.23	7.76	9.85	11.81
2	0.40	0.64	0.81	1.12	1.40	1.67	1.83	2.28	2.78	3.26	3.78	4.19	4.87	5.51	7.39	9.14	11.57	13.83
5	0.47	0.76	0.96	1.36	1.75	2.10	2.30	2.86	3.50	4.11	4.76	5.24	6.02	6.71	8.81	10.65	13.30	15.78
10	0.53	0.84	1.06	1.54	2.01	2.42	2.66	3.32	4.11	4.81	5.57	6.09	6.96	7.68	9.93	11.83	14.60	17.23
25	0.59	0.94	1.19	1.76	2.34	2.86	3.15	3.98	4.99	5.83	6.71	7.30	8.30	9.03	11.44	13.36	16.25	19.04
50	0.63	1.00	1.27	1.92	2.60	3.21	3.54	4.52	5.74	6.70	7.66	8.29	9.41	10.11	12.61	14.52	17.46	20.35
100	0.67	1.07	1.35	2.07	2.85	3.56	3.94	5.09	6.55	7.63	8.67	9.33	10.59	11.23	13.79	15.66	18.61	21.57
200	0.71	1.13	1.42	2.21	3.11	3.92	4.35	5.69	7.43	8.64	9.75	10.44	11.83	12.39	14.98	16.79	19.69	22.70
500	0.76	1.20	1.51	2.40	3.44	4.41	4.90	6.54	8.73	10.12	11.30	12.01	13.60	14.00	16.58	18.23	21.02	24.08
1000	0.79	1.24	1.56	2.53	3.69	4.78	5.34	7.23	9.82	11.35	12.57	13.29	15.04	15.28	17.80	19.31	21.96	25.04

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.

FIGURE B-1 Atlas 14 Type II S-Curves for All Frequency Storms – Doylestown Gage (36-2221)

Partial duration based Point Precipitation Frequency Estimates - Version: 3
40.3 N 75.1333 W 305 ft



Wed Mar 11 12:14:13 2009

Average Recurrence Interval (years)	
1	*
2	+
5	o
10	x
100	—
500	·
1000	□

**TABLE B-2: NATURAL RESOURCE PROTECTION
STORMWATER MANAGEMENT CONTROLS**

Existing Natural Sensitive Resource	Mapped in the ERSAM? Yes/No/n/a	Total Area (Ac.)	Area to be Protected (Ac.)
Waterbodies			
Floodplains			
Riparian Areas / Buffers			
Wetlands			
Vernal Pools			
Woodlands			
Natural Drainage Ways			
Steep Slopes, 15%-25%			
Steep Slopes, over 25%			
Other:			
Other:			
Total Existing:			

TABLE B-3: GUIDANCE TO CALCULATE THE 2-YEAR, 24-HOUR VOLUME INCREASE FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS

Existing Conditions: Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (ft3)
Woodland								
Meadow								
Impervious								
Total:								

Developed Conditions: Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff (in)	Runoff Volume (ft3)
Total:								

2-year Volume Increase (ft3):

TABLE B-4. 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-weed-grass mixture with brush the major element. Poor	48	67	77	83	
Brush-weed-grass mixture with brush the major element.	Fair	35	56	70	77
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-5: VOLUME CONTROL CALCULATION GUIDANCE FOR
NONSTRUCTURAL BMPS**

Type of Nonstructural BMP

$$\text{AREA (sq ft)} * \text{Runoff Volume (in)} * 1/12 = \text{Volume Reduction(ft}^3\text{)}$$

Use of Natural Drainage Feature

Utilize natural flow pathways _____sq ft * 1/4" * 1/12 = _____cu ft

Minimum Soil Compaction

Lawn _____sq ft * 1/3" * 1/12 = _____cu ft
Meadow _____sq ft * 1/3" * 1/12 = _____cu ft

Protecting existing trees (not located in protected area)

For trees within 20 feet of impervious cover:

Tree Canopy _____sq ft * 1" * 1/12 = _____cu ft

For trees within 20-100 feet of impervious cover:

Tree Canopy _____sq ft * 1/2" * 1/12 = _____cu ft

Rooftop Disconnection

For runoff directed to pervious and/or vegetative areas where infiltration occurs

Roof Area _____sq ft * 1/4" * 1/12 = _____cu ft

Impervious Disconnection

For runoff from impervious surfaces such as streets and concrete directed to pervious and/or vegetative areas where infiltration occurs

Impervious Area _____sq ft * 1/4" * 1/12 = _____cu ft

Total Volume Reduction

_____cu ft

* represents multiply

TABLE B-6: VOLUME CONTROL CALCULATION GUIDANCE FOR STRUCTURAL BMPS

$$\text{Required Volume Control (ft}^3\text{)} - \text{Nonstructural Volume Control (ft}^3\text{)} = \text{Structural Volume Requirement (ft}^3\text{)}$$

Table B-3
Table B-5

Type	Proposed Structural BMP	Section in BMP Manual	Area (sq ft)	Storage Volume (cu ft)
Infiltration and / or Evapotranspiration	Porous Pavement	6.4.1		
	Infiltration Basin	6.4.2		
	Infiltration Bed	6.4.3		
	Infiltration Trench	6.4.4		
	Rain Garden/Bioretenion	6.4.5		
	Dry Well/Seepage Pit	6.4.6		
	Constructed Filter	6.4.7		
	Vegetative Swale	6.4.8		
	Vegetative Filter Strip	6.4.9		
	Infiltration Berm	6.4.10		
Evaporation and / or Reuse	Vegetative Roof	6.5.1		
	Capture and Re-use	6.5.2		
Runoff Quality	Constructed Wetlands	6.6.1		
	Wet Pond / Retention Basin	6.6.2		
	Dry Extended Detention Basin	6.6.3		
	Water Quality Filters	6.6.4		
Restoration	Riparian Buffer Restoration	6.7.1		
	Landscape Restoration / Reforestation	6.7.2		
	Soil Amendment	6.7.3		
Other	Level Spreader	6.8.1		
	Special Storage Areas	6.8.2		
	other			

Total Volume Control from Structural BMPs: _____

TABLE B-7 RATIONAL RUNOFF COEFFICIENTS IS

By Hydrologic Soils Group and Overland Slope (%)

Land Use	A			B			C			D		
	0.2%	2.6%	6%+	0.2%	2.6%	6%+	0.2%	2.6%	6%+	0.2%	2.6%	6%+
Cultivated Land	0.08	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.25	0.31
	0.14	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential												
Lot Size 1.8 Acre	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.35	0.36	0.42
	0.35	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Lot Size 1.4 Acre	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
Lot Size 1.3 Acre	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
Lot Size 1.2 Acre	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
	0.25	0.29	0.32	0.28	0.32	0.36	0.31	0.35	0.42	0.34	0.38	0.48
Lot Size 1 Acre	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.68	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.90
Streets	0.70	0.71	0.71	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
Open Space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Parking	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

* Runoff coefficients for storm recurrence intervals less than 25 years.

* Runoff coefficients for storm recurrence intervals of 25 years or more.

Source: Rawls, W.J., S.L. Wong and R.H. McCuen, 1981, "Comparison of Urban Flood Frequency Procedures", Preliminary Draft, U.S. Department

TABLE B-8. MANNING'S ROUGHNESS COEFFICIENTS

DESCRIPTION	Manning's n-value
Smooth-wall Plastic Pipe	0.011
Concrete Pipe	0.012
Smooth-lined Corrugated Metal Pipe	0.012
Corrugated Plastic Pipe	0.024
Annular Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated) 68 mm × 13 mm (2 2/3 in × 1/2 in) Corrugations 75 mm × 25 mm (3 in × 1 in) Corrugations 125 mm × 25 mm (5 in × 1 in) Corrugations 150 mm × 50 mm (6 in × 2 in) Corrugations	0.024 0.027 0.025 0.033
Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated) 75 mm × 25 mm (3 in × 1 in), 125 mm × 25 mm (5 in × 1 in), or 150 mm × 50 mm (6 in × 2 in) Corrugations	0.024
Helically Corrugated Steel And Aluminum Alloy Pipe (Plain or polymer coated) 68 mm × 13 mm (2 2/3 in × 1/2 in) Corrugations a. Lower Coefficients* 450 mm (18 in) Diameter 600 mm (24 in) Diameter 900 mm (36 in) Diameter 1200 mm (48 in) Diameter 1500 mm (60 in) Diameter or larger b. Higher Coefficients**	0.014 0.016 0.019 0.020 0.021 0.024
Annular or Helically Corrugated Steel or Aluminum Alloy Pipe Arches or Other Non-Circular Metal Conduit (Plain or Polymer coated)	0.024
Vitrified Clay Pipe	0.012
Ductile Iron Pipe	0.013
Asphalt Pavement	0.015
Concrete Pavement	0.014
Grass Medians	0.050
Grass – Residential	0.30
Earth	0.020
Gravel	0.030
Rock	0.035
Cultivated Areas	0.030 - 0.050
Dense Brush	0.070 - 0.140
Heavy Timber (Little undergrowth)	0.100 - 0.150
Heavy Timber (w/underbrush)	0.40
Streams: a. Some Grass And Weeds (Little or no brush) b. Dense Growth of Weeds c. Some Weeds (Heavy brush on banks)	0.030 - 0.035 0.035 - 0.050 0.050 - 0.070

Notes:

* Use the lower coefficient if any one of the following conditions apply:

- a. A storm pipe longer than 20 diameters, which directly or indirectly connects to an inlet or manhole, located in swales adjacent to shoulders in cut areas or depressed medians.
- b. A storm pipe which is specially designed to perform under pressure.

**Use the higher coefficient if any one of the following conditions apply:

- a. A storm pipe which directly or indirectly connects to an inlet or manhole located in highway pavement sections or adjacent to curb or concrete median barrier.
- b. A storm pipe which is shorter than 20 diameters long.
- c. A storm pipe which is partly lined helically corrugated metal pipe.

APPENDIX C

POLLUTANT LOADING/REDUCTION WORKSHEETS

Worksheet 12 – Water Quality Analysis of Pollutant Loading from All Disturbed Areas

Total Site Area (AC)	
Total Disturbed Area (AC)	
Disturbed Area Controlled by BMPs (AC)	

Total Disturbed Areas:

	Land Cover Classification	Pollutant			Cover (Acres)	Runoff Volume (AF)	Pollutant Load		
		TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)			TSS** (LBS)	TP** (LBS)	NO ₃ (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
TOTAL LOAD									
REQUIRED REDUCTION (%)							85%	85%	50%
REQUIRED REDUCTION (LBS)									

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

**TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

Worksheet 13 – Pollutant Reduction Through BMP Applications*

*Fill this worksheet out for each BMP type with different pollutant removal efficiencies. Sum pollutant reduction achieved for all BMP types on final sheet.

BMP Type: _____

Disturbed Area Controlled by this BMPs (AC)

Disturbed Area Controlled by this BMPs:

	Land Cover Classification	Pollutant			Cover (Acres)	Runoff Volume (AF)	Pollutant Load**		
		TSS EMC (mg/l)	TP EMC (mg/l)	Nitrate-Nitrite EMC (mg/l as N)			TSS** (LBS)	TP** (LBS)	NO ₃ (LBS)
Pervious Surfaces	Forest	39	0.15	0.17					
	Meadow	47	0.19	0.3					
	Fertilized Planting Area	55	1.34	0.73					
	Native Planting Area	55	0.40	0.33					
	Lawn, Low-Input	180	0.40	0.44					
	Lawn, High-Input	180	2.22	1.46					
	Golf Course Fairway/Green	305	1.07	1.84					
	Grassed Athletic Field	200	1.07	1.01					
Impervious Surfaces	Rooftop	21	0.13	0.32					
	High Traffic Street/Highway	261	0.40	0.83					
	Medium Traffic Street	113	0.33	0.58					
	Low Traffic/Residential Street	86	0.36	0.47					
	Res. Driveway, Play Courts, etc.	60	0.46	0.47					
	High Traffic Parking Lot	120	0.39	0.60					
	Low Traffic Parking Lot	58	0.15	0.39					
TOTAL LOAD TO THIS BMP TYPE									
POLLUTANT REMOVAL EFFICIENCIES FROM APPENDIX A. STORMWATER MANUAL (%)									
POLLUTANT REDUCITON ACHIEVED BY THIS BMP TYPE (LBS)									
POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS)									
REQUIRED REDUCTION from WS12 (LBS)									

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

**TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area

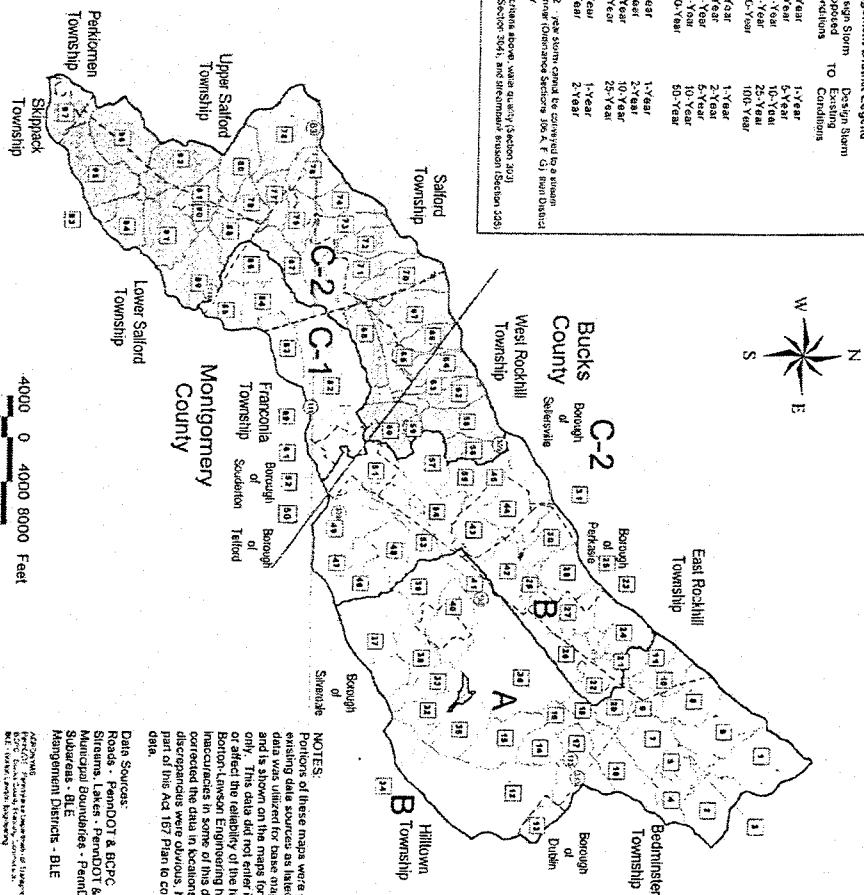
APPENDIX D

STORMWATER MANAGEMENT DISTRICT WATERSHED MAP

Management District Legend

Design Storm Proposed Conditions	Design Storm To Conditions
A 2-Year 5-Year 10-Year 25-Year 100-Year	1-Year 5-Year 10-Year 25-Year 100-Year
B 2-Year 5-Year 25-Year 100-Year	1-Year 2-Year 5-Year 50-Year
C-1 2-Year 5-Year 25-Year	1-Year 2-Year 10-Year 25-Year
C-2 2-Year 5-Year	1-Year 2-Year

If storm greater than the 2 - year storm event be conveyed to a main C-1 requirement shall apply - reference sections 302 & 7 (G) and District in addition to the ordinance cited above with the quarterly season 203. The ground water recharge Section 304, and the water return Section 305 shall also apply.



NOTES:
Portions of these maps were generated from data that was stated below. This existing data was utilized for maps for similar reference only. This data did not enter into any comparisons or effect the reliability of the hydrologic analysis. Bottom-Lewison Engineering has found some inaccuracies in some of this data and has discrepancies where there are not a part of this Act 167 Plan to correct all the base data.

Data Sources:
Roads - PennDOT & BOPC
Municipal Boundaries - PennDOT, BLE & BOPC
Management District - BLE

APPENDIX D
ACT 167
Stormwater Management Plan
Phase II

Management Districts
East Branch Perkiomen Creek Watershed
Bucks County, PA

ACT 167
Stormwater Management Plan
Phase II

Appendix - D
Map Legend

- Watershed Boundary
- County Boundary
- Municipal Boundaries
- Streams
- Water Bodies
- Interstate Roads
- PA, Traffic Routes
- State Routes
- Local Roads
- Subarea

Location Map

Prepared For:
Bucks County Planning Commission
The Almshouse
Neshaminy Manor Center
Doylestown, PA 18901

Bottom-Lewison Engineering
1000 North 22nd Street
Doylestown, PA 18901
Tel: 717.345.1234

Map Scale: 1" = 4000 Feet
Date: 1/2014

APPENDIX E

LOW IMPACT DEVELOPMENT (LID) PRACTICES ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

Preserving natural hydrologic conditions requires careful alternative site design considerations. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage. A well-designed site will contain a mix of all 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. This objective, however is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern. Streets and adjacent storm sewers are typically located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimizes the amount of grading on site.

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

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

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

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

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

Reducing Street Widths. Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. 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 impervious cover associated with driveway and entry walks, and is most readily accomplished along low-traffic streets where traffic noise is not a problem.

Constructing Cluster Developments. Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings occur with 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. Benefits include reduced potential of downstream flooding, water quality degradation of receiving streams/water bodies and enhancement of aesthetics and reduction of development costs. Other benefits include more stable baseflows in receiving streams, improved groundwater recharge, reduced flood flows, reduced pollutant loads, and reduced costs for conveyance and storage.

APPENDIX F

REFERENCES

BMP Manuals

California

California Stormwater BMP Handbook: New Development and Redevelopment (January 2003)
separate file: <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
separate file: [http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater design/index.asp](http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater%20design/index.asp)

Massachusetts

Stormwater Management, Volume Two: Stormwater Technical Handbook (Massachusetts, 1997)
separate file: <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)
separate file: <http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>

New Jersey

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

New York

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

Pennsylvania

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

Washington

Stormwater Management Manual for Western Washington (August 2001)
separate file: <http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>

Federal

Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA)
separate file: <http://www.fhwa.dot.gov/environment/ultraurb/3fs1.htm>
USEPA Infiltration Trench Fact Sheet (September 1999)
separate file: <http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm>

Riparian Buffer References

- Alliance for the Chesapeake Bay, Pennsylvania Department of Environmental Protection, September 2000. *Forest Buffer Toolkit*, Stream ReLeaf Program.
- Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips Along Streams to Improve Water Quality*. Publication # AGRS-67.
- Fike, Jean, June 1999. *Terrestrial & Palustrine Plant Communities of Pennsylvania*, Pennsylvania Natural Diversity Inventory, The Nature Conservancy, Western Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.
- Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Prepared by CH2MHill.
- Palone, R. S. and A. H. Todd (eds), 1997. *Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers*. Chesapeake Bay Program and Northeastern Area State and Private Forestry. Natural Resources Conservation Service Cooperative State Research Education and Extension Services.
- The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). *Stream Corridor Restoration Principles, Processes, and Practices*. GPO Item No. 0120-A; SuDocs No. A57.6/2:EN3/PT.653. ISBN-0-934213-59-3. Published October 1998. Revised August 2000.

APPENDIX G

West Nile Virus Guidance

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 non-point pollution in urban and urbanizing watersheds, and that degradation is ensured if stormwater BMPs are not implemented.

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

Mosquitoes

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

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

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

Stormwater Facilities

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

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

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

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

Conclusion

The Conservation District understands the pressure faced by municipalities when dealing with multifaceted issues such as stormwater management and encourages the incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, groundwater recharge and constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed appropriately, the runoff mitigation benefits to the community from these design options will far out weigh their potential to become breeding grounds for mosquitoes.

APPENDIX H

SIMPLIFIED STORMWATER MANAGEMENT PROCEDURES FOR EXISTING SINGLE FAMILY DWELLING LOTS

Projects eligible for this procedure

Individual home construction projects on single family lots which result in less than two thousand five hundred (2,500) square feet of impervious area (including the building footprint, driveway, sidewalks, and parking areas) and less than five thousand (5,000) square feet of earth disturbance but do not meet exemption criteria of Section 105.B may utilize the simplified procedure contained in this Appendix to meet requirements of this Ordinance and are not required to submit formal stormwater management plans to the Borough.

Are professional services necessary to meet these requirements?

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

What do I need to send to the Borough?

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

- Location of proposed structures, driveways or other paved areas with approximate surface area in square feet.
- Location of any existing or proposed onsite septic system and/or potable water wells showing proximity to infiltration facilities.
- Bucks County Conservation District erosion and sediment control "Adequacy" letter.

Determination of Recharge Volume

The amount of recharge volume that must be provided is determined by following the simple steps below. Impervious area calculations must include all areas on the lot proposed to be covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including sidewalks, driveways or parking areas. Sidewalks, driveways or patios that are constructed with turf pavers and are not included in this calculation.

Example Recharge Volume:

STEP 1 – Determine Total Impervious Surfaces:

House Roof (Front)	12 ft. x 48 ft.	=	576 sq. ft.
House Roof (Rear)	12 ft. x 48 ft.	=	576 sq. ft.
Driveway	12 ft. x 50 ft.	=	600 sq. ft.
Parking Pad	12 ft. x 12 ft.	=	144 sq. ft.
Walkway	4 ft. x 20 ft.	=	80 sq. ft.

			1,976 sq. ft.

STEP 2 – Determine Required Infiltration Volume (Rv) Using the Following Equation

$$Rv = \frac{2.0 \text{ inches} \times (\text{total impervious area in square feet})}{12} = \text{_____ cubic feet of recharge}$$

$$Rv = \frac{2.00 \times 1,976 \text{ sq. ft.}}{12} = 329 \text{ cu. ft.}$$

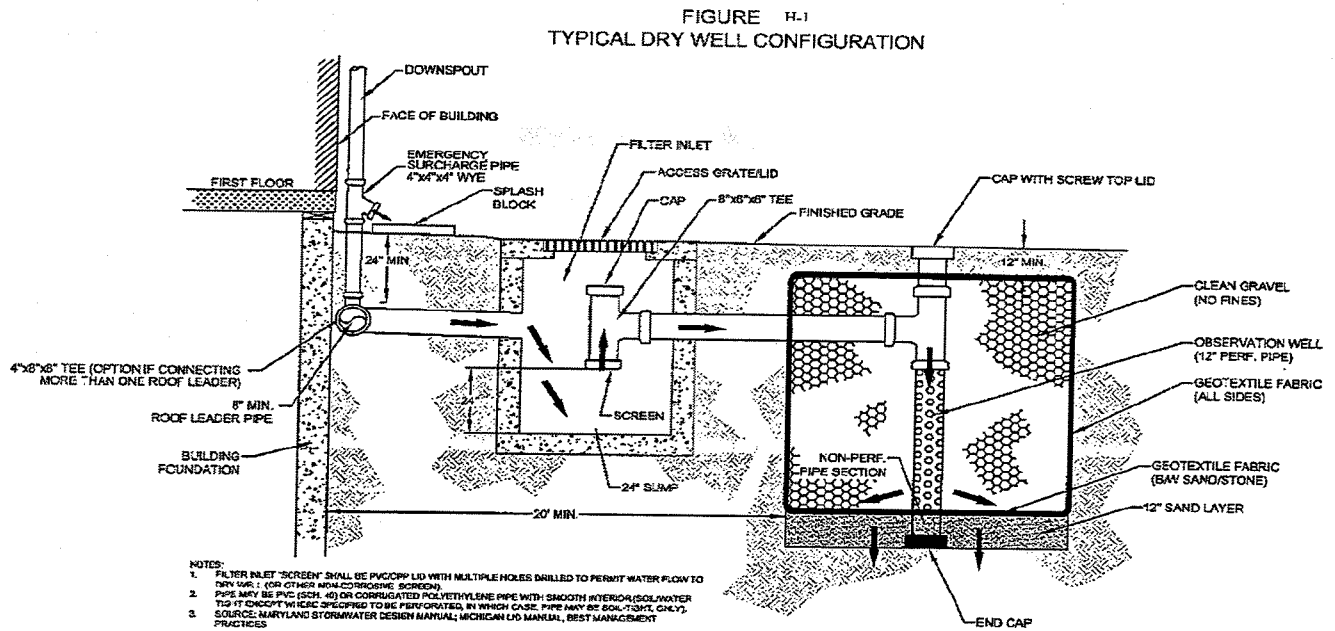
STEP 3 – Sizing of Selected Infiltration Method

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

Dry Wells

Dry wells are effective methods to infiltrate runoff from roof leaders. These facilities must be located based upon a determination by the design professional to reduce potential basement seepage problems but not less than a minimum of twenty (20) feet from the building foundation. A dry well maybe either a structural prefabricated chamber or an excavated pit filled with aggregate. Dry well shall not be constructed until all other areas of the site are stabilized, to avoid clogging. During construction, compaction of the subgrade soil shall be avoided, and construction may be performed with only light machinery. Depth of dry wells in excess of three and one-half (3 ½) feet should be avoided unless warranted by soil conditions. “Clean” gravel fill should average one and one half to three (1.5 – 3.0) inches in diameter. Dry wells should be inspected at least four (4) times annually as well as after large storm events.

FIGURE H-1 TYPICAL DRY WELL CONFIGURATION



Example Sizing For Drywells:

STEP 1 – Determine Total Impervious Surfaces

House Roof Area: 12 ft. x 48 ft. = 576 sq. ft.

STEP 2 – Determine Required Infiltration Volume using Equation

$$\frac{2.00 \text{ in.} \times 576 \text{ sq. ft.}}{12} = 96 \text{ cu. ft.}$$

$$\frac{96 \text{ cu. ft.}}{0.4^*} = 240 \text{ cu. ft. (*assumes 40% void ratio in gravel bed)}$$

STEP 3 – Sizing of Selected Infiltration Method

Volume of facility = Depth x Width x Length

Set D = 3.5 ft; Set W = L for a square chamber

$$240 \text{ cu. ft.} = 3.5 \times L \times L ; L = 8.4 \text{ ft.}$$

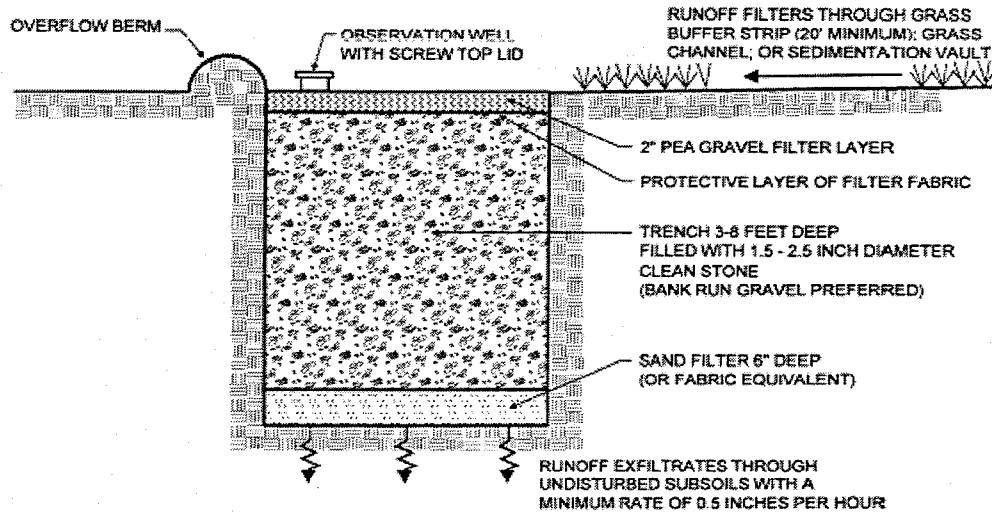
Final Facility Dimensions: 3.5 ft. (D) x 8.3 ft. (W) x 8.3 ft. (L)

Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom

and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

FIGURE H-2
TYPICAL INFILTRATION TRENCH CONFIGURATION



Source: Maryland Stormwater Design Manual

Example Sizing For Infiltration Trenches:

STEP 1 – Determine Total Impervious Surfaces

Driveway	12 ft. x 50 ft.	=	600 sq. ft.
Parking Pad	12 ft. x 12 ft.	=	144 sq. ft.
Walkway	4 ft. x 20 ft.	=	80 sq. ft.

			824 sq. ft.

STEP 2 – Determine Required Infiltration Volume using Equation

$$\frac{2.00 \text{ in.} \times 824 \text{ sq. ft.}}{12} = 137 \text{ cu. ft.}$$

$$\frac{137 \text{ cu. ft.}}{0.4^*} = 343 \text{ cu. ft.} \text{ (*assumes 40\% void ratio in gravel bed)}$$

STEP 3 – Sizing of Selected Infiltration Method

Volume of facility = Depth x Width x Length

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

$$343 \text{ cu. ft.} / 3 \text{ ft.} = 114 \text{ sq. ft.}$$

The width of the trench should be greater than 2 times its depth (2 x D); therefore, in this example a trench width of 6 feet is selected;

Determine trench length: $L = 117 \text{ sq. ft.} / 6 \text{ ft.} = 20 \text{ ft.}$

Final trench dimensions: 3 ft. (D) x 6 ft. (W) x 19 ft. (L)

Example Sizing:

STEP 1 – Determine Total Impervious Surfaces

Driveway	12 ft. x 50 ft.	=	600 sq. ft.
Parking Pad	12 ft. x 12 ft.	=	144 sq. ft.
Walkway	6 ft. x 20 ft.	=	120 sq. ft.

			864 sq. ft.

STEP 2 – Determine Required Infiltration Volume Using Equation

$$\frac{1.0 \text{ in.} \times 864 \text{ sq. ft.}}{12} = 72 \text{ cu. ft.}$$

$$\frac{72 \text{ cu. ft.}}{0.4^*} = 180 \text{ cu. ft.} \text{ (* assume 40\% void ratio in gravel bed)}$$

STEP 3 – Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Set D = 3 ft: determine required surface area of trench

$$180 \text{ cu. ft.} / 3 \text{ ft.} = 60 \text{ sq. ft.}$$

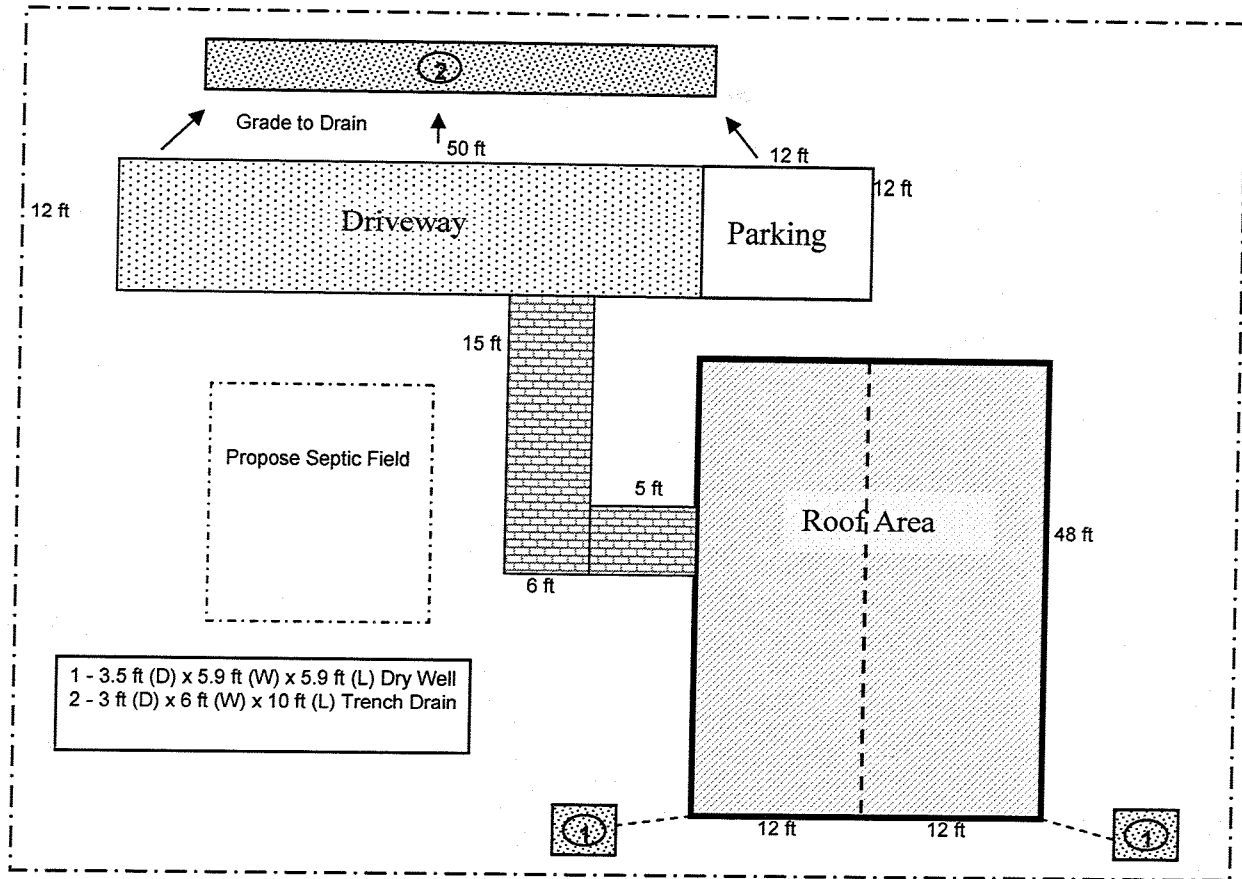
The width of the trench should be greater than 2 times its depth (2 x D); therefore, in this example a trench width of 6 feet is selected;

Determine trench length: $L = 60 \text{ sq. ft.} / 6 \text{ ft.} = 10 \text{ ft.}$

Final trench dimensions: 3 ft. (D) x 6 ft. (W) x 10 ft. (L)

FIGURE H-3

SAMPLE SITE SKETCH PLAN



Source: Maryland Stormwater Design Manual

APPENDIX I

NPDES PHASE II REQUIREMENTS

What is NPDES Phase II?

Polluted stormwater runoff has been determined to be the leading cause of impairment threatening our nation's surface waters. Mandated by Congress under the Clean Water ACT, the National Pollutant Discharge Elimination System (NPDES) Stormwater Program is a comprehensive two-phased approach to addressing sources of stormwater pollution which affect the quality of the nation's waters.

In Pennsylvania, the state Department of Environmental Protection (PADEP) has implemented Phase I of this program which affects certain industrial sites, construction sites over 5 acres, and municipalities with populations over 100,000, which includes Philadelphia, Pittsburgh, Allentown, and Erie. NPDES permits which were issued under this program were the state's first step in addressing the affects of Non-point Source Pollution on our lakes and streams.

Building upon the success of this program, Phase II of Pennsylvania's NPDES program will require permitting of over 700 Municipal Separate Storm Sewer System (MS4) in Pennsylvania. Operators of these regulated MS4s are required to apply for NPDES permit coverage by March 10, 2003. Phase II also requires permitting of all constructions sites, regardless of location, with over 1 acre of disturbance.

Am I an MS4 Borough?

The over 700 MS4s are located in 20 designated Urban Areas (UAs) and 17 Potential UAs in Pennsylvania. An Urban Area is defined by the US Census Bureau as "a place and the adjacent densely settled surrounding territory that together have a minimum population of 50,000 people and a density of 1000 persons/square mile". The list of MS4 municipalities can be obtained from DEP's website, DEP ID 385-2000-012.

Even if your Borough is not a designated MS4, it may be beneficial to adopt some or all of the requirements under Phase II of the NPDES program to address existing stormwater pollution problems within your Borough. Although not mandated by federal or state law, non-MS4 municipalities should consider the goals of the program and the overall return it may provide in improving overall water quality in the community.

What are the Minimum Stormwater Management Requirements Under Phase II?

The Phase II Stormwater regulations specify six program elements that must be addressed by designated Municipal Separate Storm Sewer System (MS4) municipalities. The regulations also imply that additional things will need to be done but the lack of specific requirements gives permit holders a great deal of flexibility if not a lot of guidance about what to do about some aspects of stormwater management, chiefly monitoring.

The six required stormwater program elements include:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Management
6. Pollution Prevention/Good Housekeeping Practices for All Municipal Operations

1. Public Education and Outreach

Awareness of stormwater related environmental issues and problems is generally low. A variety of surveys suggest that public awareness of the fact that storm drains are usually not connected to the sewers or that individual actions around our homes causes significant environmental impact to urban streams is not high! Many citizens do not know that our urban streams and watersheds are being damaged by the effects of urbanization and by the pollutants found in urban environments. Support for stormwater or urban watershed management will not be strong, particularly if new resources are needed, unless citizens are aware of the condition of urban watersheds and stream segments.

In some Phase II communities the presence of 303d list streams (streams listed by U.S. EPA as impaired streams) and the TMDL (Total Maximum Daily Load) process for reducing pollution and restoring water quality in these streams may help to increase awareness. Nonetheless, a strong, well-designed and ongoing or at least periodic education program will be needed both to build support for the stormwater program and make citizens aware of changes they can and need to make to reduce unnecessary stormwater impacts. A strong, effective community education program will include general public awareness education as well as more technical education that targets specific groups such as developers, construction contractors, landscapers, lawn care services, and a variety of small businesses. It is important to address specific sectors of the community due to special concerns about pollution or other impacts associated with that activity as well as general things that homeowners and property owners can do to address needless or avoidable pollution.

In many communities there may already be an educator or educators involved in environmental education in the classroom who would be happy to assist the community by developing a stormwater education unit for delivery at appropriate grade levels. Likewise, local scouting organizations or student conservation organizations would probably be willing to conduct educational activities in the neighborhood using activities like the stream walk or storm drain activity. *Hands-on activity and involvement is critical to learning at all ages. Stormwater programs should utilize these existing resources whenever possible.*

2. Public Involvement and Participation

It is absolutely vital to involve the public as early as possible in the design and implementation of the stormwater or urban watershed management program. A diverse cross section of the community representing all the different stakeholder groups should be represented. This should include the regulated community (developers, builders, business owners or managers etc.), the taxpayers who will be paying the tab, the property owners who have been impacted by flooding in the past, environmental groups and environmental activists, landowners, educators, volunteer citizen monitors, and others. These are the people who will pay the bills, work with you to reduce pollution from their activities (or oppose you at every turn if they are not informed and do not buy into the program),

work with you to implement school and community education programs, work on cleanups and assist with monitoring through citizen monitoring programs.

The Phase II U.S. EPA requirements include public involvement and there is probably no better way to do this than to form a citizen advisory committee. This should not be a committee appointed from political insiders. It should be composed of stakeholders who come to the table and are interested enough to stay with the process and who are in basic agreement that the community or stormwater management area organization is responsible for and must develop a stormwater management program. Truly open public involvement can avoid expensive and time-consuming controversies that often lead to legal actions. They can also reduce the potential of citizen lawsuits from groups or individuals critical of the progress toward addressing stormwater management. As parties involved from the beginning in designing, implementing, and evaluating the program, it is likely that the concerns of all groups will be addressed sufficiently to avoid serious controversy that can be resolved only through legal remedies. Citizen groups and persons fully involved in a meaningful way in the process will not choose expensive legal action to resolve disputes. Furthermore, most Phase II communities are not going to find it easy to fund stormwater management efforts.

Volunteer involvement will probably be a critical component of many successful programs. Volunteers can contribute a lot, whether it is scout troops interested in helping with neighborhood education through activities like storm drain stenciling, educators willing to help design education materials, citizens interested in working to help via involvement in volunteer water monitoring or businesses willing to contribute to the support of these citizen efforts or other forms of volunteerism.

3. Illicit Discharge Detection and Elimination

In some areas pollutants from illicit or illegal discharges may be a significant contribution to pollutant loadings. These may be intentional or unintentional. In older areas they may be discharges that were never rerouted to the sewer system as regulations for discharges were put in place. There may also be things like floor drains that were never properly connected to the sewer system. The task facing permit holders is to develop strategies and methods for detecting these illicit/illegal discharges so that they can be eliminated. A strategy for addressing this problem should first employ education of business owners and operators and homeowners and involve the public in detecting and correcting these problems voluntarily. Addressing the problem will also require a monitoring strategy. Monitoring for illicit/illegal discharges should be kept as simple as possible given resource realities and should progress from simpler, cheaper methods to more complex and more expensive methods as needed. Some techniques for detecting these discharges include:

- visual inspection along water courses for pipes and unusual discharges (at the same time a check can be made for leaking or broken sewer pipes).
- visual inspections of business and industrial sites.
- smoke or dye testing to detect or confirm suspected illicit/illegal connections.
- dry weather sampling of suspicious discharges for substances indicative of domestic or industrial wastewater (detergent, optical brighteners, caffeine, or high conductivity).
- inspection, visual or remote camera, inside stormwater conveyances.
- reconnaissance sampling upstream of where contamination hot spots are found.

4. Construction Site Runoff Control

Perhaps one of the most damaging and preventable forms of pollution in rapidly growing urban areas is the excessive sediment loads that can be contributed to streams due to erosion and transport of sediments from construction sites. Communities must have in place measures to control polluted runoff from construction sites. The Phase II rule requires permitting of construction sites down to 1 acre. Also a robust and effective program for erosion and sediment control from construction sites will require education and enforcement. Since it is the permit holder that will be the most likely target of any clean water suits filed by local citizens or by environmental groups representing citizens who feel that enforcement is inadequate, permit holders should have their own program for enforcement. This means that the community or (in cases of a watershed authority with multiple jurisdictions), the authority, will need to have an erosion and sediment control program. Some suggestions for doing this include:

- ✓ adopt and implement a strong erosion and sediment control ordinance.
- ✓ provide education and training for municipal personnel who are involved in municipal construction projects from supervisors to equipment operators.
- ✓ encourage erosion and sediment control training for construction contractors and homebuilders, or if possible, work with others to provide training locally.
- ✓ require that at least one appropriate individual (an engineer, landscaper, engineering technician etc.) become certified as a Certified Professional in Erosion and Sediment Control Specialist and assist that person with the costs associated with certification.
- ✓ create a process for review and approval of construction site erosion and sediment control plans and provide for review of significant projects by the CPESC.
- ✓ cross-train building inspectors to do initial inspections of construction sites.
- ✓ as necessary have the CPESC conduct more detailed inspections.
- ✓ determine whether you wish to develop a local enforcement program.

Having an effective erosion and sediment control ordinance and program is a critical part of an effective stormwater management program. An effective erosion and sediment control program coupled with effective public involvement in the stormwater program provides insurance against costly legal actions.

5. Post-Construction Runoff Management

The Phase II minimum requirements also include management of runoff after the active construction period. These requirements assure that a responsible party will take care of maintaining best management practices (BMPs) until the site is stabilized for erosion control practices and that maintenance of detention basins, retention basins, and other structural BMPs will be funded and taken care of in the future. If the permit holder can through incentives (fee structures etc.) induce developers to utilize non-structural BMPs, the potential and actual future obligations of the permit holder or community will be lessened. Even then, it is desirable to have some sort of bonding mechanism in place or some sort of recurring fee so that funds for maintenance will be available when needed. The permit holder or community should research the positive and negative aspects of different mechanisms for post-construction maintenance before choosing an approach that it believes best suits the needs of the community or area.

6. Pollution Prevention and Good Housekeeping for Municipal Operations

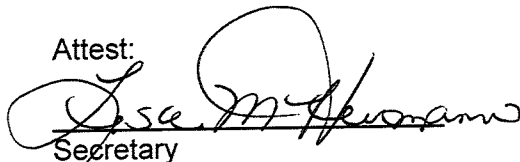
The final requirement for stormwater Phase II permit holders is for the municipalities regulated under the permit to develop and implement pollution reduction and good housekeeping procedures for prevention of pollution from stormwater runoff. This means that a program for prevention of stormwater impacts from city facilities and city operations will have to be developed or perhaps strengthened if such a program already exists. Elements of such a program might include structural components or such things as fuel and materials storage and handling safeguard improvements, erosion and sediment control on municipal projects, protection or restoration of riparian corridors on municipal property, use of design elements to prevent stormwater runoff and pollution on new projects or redevelopment projects, flow and pollution control BMPs for municipal parking areas, and other actions for prevention or reduction of polluted stormwater runoff. Since careless or thoughtless actions of individuals often contribute to stormwater pollution, a pollution prevention and housekeeping improvement program should include an education component for appropriate city employees and contractors. This public sector pollution prevention and housekeeping component of the stormwater management program can be important particularly so when a community or permit holder is going to implement voluntary or even regulatory programs for reducing stormwater pollution. The public pollution prevention and housekeeping improvements can be used to demonstrate improvements and thus serve as education activities for private sector businesses and industries in the community.

When Should a Community do More than the Minimum?

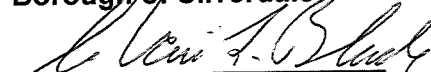
Clearly these six activities represent the minimum requirements for Phase II communities or permit holders. Every community is different and every community may have issues, concerns or problems a little different from those in other communities. For example, some communities may have concerns about streams or water bodies that are special, very high quality resources that the community places special value on or which have important economic value. A community may have a TMDL stream for which special additional actions are needed or required to restore water quality in order to avoid growth restrictions or other possible sanctions. A community might have a specific problem like bacteriological contamination from waterfowl that threatens a public beach, flooding problems, or something else that is a special concern in the community that causes it to desire to do more. Communities should pursue everything that makes sense to do for which there is a public consensus and adequate funding to complete. Permit holders *should not*, however, list anything in their plan or permit (if they are applying for an individual permit) that they do not definitely plan and know that they can and will complete. EPA will hold permit holders to those things that they say they will do as part of the permit. *It is safer for permit holders to do more than they indicated they would do than to list something tenuous and not be able to accomplish it.*

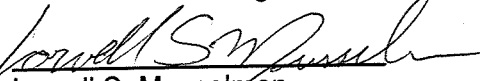
ORDAINED AND ENACTED into Ordinance at a regular meeting of the Silverdale Borough Council on this 17th day of February, 2014. This Ordinance shall take effect in five (5) days from the date of adoption.

Attest:


Secretary

Borough of Silverdale


Clair Black
President of Borough Council


Lowell S. Musselman
Mayor