ORDINANCE NO. 2005-5

AN ORDINANCE OF THE TOWNSHIP OF MAXATAWNY, BERKS COUNTY, PENNSYLVANIA, UPDATING AND ADOPTING THE LITTLE LEHIGH CREEK WATERSHED ACT 167, STORMWATER MANAGEMENT ORDINANCE, WHICH REPEALS ORDINANCE NO. 2001-1 IN ITS ENTIRETY

ARTICLE I
GENERAL PROVISIONS

SECTION 1. Short Title. This Ordinance shall be known and may be cited as the "Little Lehigh Creek Watershed Act 167 Stormwater Management Ordinance".

SECTION 2. Statement of Findings.

The Board of Supervisors of Maxatawny Township finds that:

A. Inadequate management of accelerated runoff of storm water resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, changes the natural hydrologic patterns, destroys aquatic habitat, elevates aquatic pollutant concentrations and loadings, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines floodplain management and flood control efforts in downstream communities, reduces groundwater recharge and threatens public health and safety.

B. A comprehensive program of stormwater management, including reasonable regulation of development and activities causing accelerated erosion and loss of protection of the people of the municipality and all of the people of the Commonwealth, their resources and the environment.

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

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

E. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to

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obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).

F. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by a municipality.

SECTION 3. Purpose.

The purpose of this Ordinance is to promote the public heath, safety and welfare within the Little Lehigh Creek Watershed by minimizing damages and maximizing the benefits described in Article 1, Section 2 of this Ordinance by provisions designed to:

A. Manage stormwater runoff impacts at their source by regulating activities which cause such problems.

B. Utilize and preserve the desirable existing natural drainage systems.

C. Encourage infiltration of stormwater, where appropriate, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.

D. Maintain the existing flows and quality of streams and watercourse in Maxatawny Township and in the Commonwealth.

E. Preserve and restore flood carrying capacity of streams.

F. Provide for proper maintenance of all permanent stormwater management best management practices (BMPs) that are implemented in Maxatawny Township.

G. Provide review procedures and performance standards for stormwater planning, design and management.

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

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

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J. Prevent scour and erosion of streambanks and streambeds.

K. Provide standards to meet NPDES permit requirements.

SECTION 4. Statutory Authority.

Maxatawny Township is empowered to regulate these activities by the authority of the "Stormwater Management Act", Act of October 4, 1978, P.S. 864 (Act 167), 32 P.S. § 680.1 et seq., as amended, the Second Class Township Code, as amended, the Maxatawny Township Zoning Ordinance, as amended and the Maxatawny Township Subdivision and Land Development Ordinance, as amended.

SECTION 5. Applicability.

This Ordinance shall only apply to those areas of Maxatawny Township which are located within the Little Lehigh Creek Watershed as delineated on an official map available for inspection at the Maxatawny Township Municipal Office. A map of the Little Lehigh Creek Watershed at a reduced scale is attached hereto and incorporated herein on Appendix A to this Ordinance for general reference.

This Ordinance shall apply to permanent storm water management facilities constructed as part of any of the Regulated Activities listed in this Section. Erosion and sedimentation control during construction activities are specifically not regulated by this Ordinance, but shall continue to be regulated under existing laws and ordinances.

This Ordinance contains only the storm water management performance standards and design criteria that are necessary or desirable from a watershed-wide perspective, and shall be regulated, enforced, and interpreted at the discretion of Maxatawny Township and the Maxatawny Township Engineer.

Local storm water 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 Maxatawny Township Subdivision and Land Development Ordinance and at the Maxatawny Township Engineer's discretion.

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

A. Land development.

B. Subdivision.

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C. Construction of new or additional impervious surfaces (driveways, parking lots, etc.).

D. Construction of new buildings or additions existing buildings.

E. Diversion or piping of any natural or man-made stream channel.

F. Installation of stormwater systems or appurtenances thereto.

G. Regulated Earth Disturbance Activities.

SECTION 6. Exemptions.

A. **Impervious Cover** - Any proposed Regulated Activity, except those defined in Section 5 (E) and Section 5 (F), which would create 10,000 square feet or less of additional impervious cover is exempt from the Drainage Plan preparation provisions of this Ordinance. The date of Maxatawny Township's adoption of the original Little Lehigh Act 167 Stormwater Ordinance 2000-1, January 10, 2001, shall be the starting point from which to consider tracts "parent tracts" in which future subdivisions and respective impervious area computations shall be cumulatively considered. For development taking place in stages, the entire development plan must be used in determining conformance with these criteria. Additional impervious cover shall include, but not be limited to, additional indoor living spaces, decks, patios, garages, driveways, storage sheds and similar structures, any roof, parking or driveway areas and any new streets and sidewalks constructed as part of or for the proposed Regulated Activity. Any additional areas proposed to initially be gravel, crushed stone, porous pavement, etc. shall be assumed to be impervious for the purpose of comparison to the exemption criteria. Any existing gravel, crushed stone or hard packed soil areas on a site shall be considered as pervious cover added incrementally to a site above the initial 10,000 square feet shall be subject to the provisions of this Ordinance. If a site has previously received an exemption and is proposing additional development such that the total impervious cover on the site exceeds 10,000 square feet, the total impervious cover on the site proposed since January 10, 2001 must meet the provisions of this Ordinance.

B. Prior Drainage Plan Approval - Any Regulated Activity for which a Drainage Plan was previously prepared as part of a subdivision or land development proposal that received preliminary plan approval from Maxatawny Township prior to the effective date of this Ordinance is

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exempt from the Drainage Plan preparation provisions of this Ordinance, except as cited in Section 6(C), provided that the approved Drainage Plan included design of stormwater facilities to control runoff from the site currently proposed for Regulated Activities consistent with ordinance provisions in effect at the time of approval and the approval has not lapsed under the Municipalities Planning Code ("MPC"). If significant revisions are made to the Drainage Plan after both the preliminary plan approval and the effective date of this Ordinance, preparation of a new Drainage Plan, subject to the provisions of this Ordinance, shall be required. Significant revisions would include a change in control methods or techniques, relocation or redesign of control measures or changes necessary because soil or other conditions are not as stated on the original Drainage Plan.

C. Use of land for gardening for home consumption.

D. Agriculture when operated in accordance with a conservation plan or erosion and sedimentation control plan found adequate by the Conservation District. The agricultural activities such as growing crops, rotating crops, tilling of soil and grazing animals and other such activities are specifically exempt from complying with the requirements of this Ordinance.

E. Forest Management operations which are following the Department of Environmental Protection's management practices contained in its publication "Soil Erosion and Sedimentation Control Guidelines for Forestry" and are operating under an erosion and sedimentation and control plan.

F. These exemptions shall not relieve the applicant from implementing such measures as are necessary to protect health, safety, property, and State Water Quality Requirements. These measures include adequate and safe conveyance of stormwater on the site and as it leaves the site. These exemptions do not relieve the applicant from the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance.

G. No exemptions shall be provided for regulated activities as defined in Sections 5(E) and 5(F).

SECTION 7. Repealer. Any ordinance of Maxatawny Township inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

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SECTION 8. 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 9. 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.

SECTION 10. Duty of Persons Engaged in the Development of Land. Notwithstanding any provisions of this Ordinance, including exemption and waiver provisions, any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required to manage the rate, volume, direction and quality of resulting stormwater runoff in a manner which otherwise adequately protects health and property from possible injury.

ARTICLE II
DEFINITIONS

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

A. Words used in the present tens 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 words "shall" and "must" are mandatory; the words "may" and "should" are permissive.

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

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Accelerated Erosion- The removal of the surface of land through the combined action of human activities and natural processes, at a rate greater than would occur because of the natural process alone.

Agricultural Activities - The work of producing crops and raising livestock including tillage, plowing, discing, harrowing, pasturing 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 or developer who has filed an application for approval to engage in any Regulated Activities as defined in this Ordinance.

Best Management Practice ("BMP") - Activities, facilities, measures or procedures used to manage stormwater quantity and quality impacts from the Regulated Activities listed in Section 5, to meet State Water Quality Requirements, to promote groundwater recharge and to otherwise meet the purposes of this Ordinance.

Best Management Practice Operations and Maintenance Plan - Documentation, included as part of a Drainage Plan, detailing the proposed BMPs, how they will be operated and maintained and who will be responsible.

Bioretention - Densely vegetated, depressed features that store stormwater and filter it through vegetation, mulch, planting soil, etc. Ultimately stormwater is evapotranspirated, infiltrated, or discharged. Optimal bioretention areas mimic natural forest ecosystems in terms of species diversity, density, distribution, use of native plants, etc.

Buffer -

(1) Streamside Buffer - A zone of variable width located along a stream that is vegetated and is designed to filter pollutants from runoff.

(2) Special Geologic Feature Buffer - A required isolation distance from a special geologic feature to a proposed BMP needed to reduce the risk of sinkhole formation due to stormwater management activities.

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Capture/Reuse - Stormwater management techniques such as cisterns and rain barrels which direct runoff into storage devices, surface or sub-surface, for later re-use, such as for irrigation of gardens and other planted areas. Because this stormwater is utilized and no pollutant discharge results, water quality performance is superior to other non-infiltration BMPs.

Carbonate Bedrock - Rock consisting chiefly of carbonate minerals, such as limestone and dolomite; specifically a sedimentary rock composed of more than 50% by weight of carbonate minerals that underlies soil or other unconsolidated, superficial material.

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 storm water.

Closed Depression - A distinctive bowl-shaped depression in land surface. It is characterized by internal drainage, varying magnitude, and an unbroken ground surface.

Conservation District - The Berks County Conservation District.

Constructed Wetlands - Constructed wetlands are similar to wet ponds (see below) and consist of a basin which provides for necessary stormwater storage as well as a permanent pool or water level, planted with wetland vegetation. To be successful, constructed wetlands must have adequate natural hydrology (both runoff inputs as well as soils and water table which allow for maintenance of a permanent pool of water). In these cases, the permanent pool must be designed carefully, usually with shallow edge benches, so that water levels are appropriate to support carefully selected wetland vegetation.

Culvert - A pipe, conduit or similar structure including appurtenant works which carries surface water.

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

DEP - The Pennsylvania Department of Environmental Protection (formerly the Pennsylvania Department of Environmental Resources).

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Designee - The agent of the Maxatawny Township Board of Supervisors and/or agent of the governing body involved with the administration, review or enforcement of any provisions of this Ordinance by contract or memorandum of understanding.

Design Storm - The depth and time distribution of precipitation from a storm event measured in probability of occurrence (e.g., 50-year storm) and duration (e.g. 24-hour), and used in computing stormwater management control systems.

Detention Basin - A basin designed to retard stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

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

Developer - A person, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, that undertakes any Regulated Activity of this Ordinance.

Development Site (Site) - The specific tract of land for which a Regulated Activity is proposed.

Diffused Drainage - See Sheet Flow.

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 Storm Water Management Facility designed to transmit storm water runoff and includes 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 storm water management purposes.

Drainage Permit - A permit issued by the Maxatawny Township governing body after a drainage plan as been approved. Said permit shall be issued prior to any activity governed by this Ordinance.

Drainage Plan - The documentation of the proposed stormwater quantity and quality management controls to be used for a given Site, including a BMP Operation and Maintenance Plan, the contents of which are established in Article IV, Section 3.

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Earth Disturbance Activity - A construction or other human activity which disturbs the surface of the land, including, but not limited to, clearing and grubbing, grading, excavations, embankments, road maintenance, building construction and moving, depositing, stockpiling or storing of soil, rock or earth materials.

Erosion - The removal of soil particles by the action of water, wind, ice, or other geological agents.

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

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 a "meadow" unless the natural land cover is proven to generate lower curve numbers or Rational "C" value, such as forested lands.

Existing Uses - Those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards. (25 Pa. Code Chapter 93.1).

Fill - Man-made deposits of natural soils or rock products and waste materials.

Filter Strips - See Vegetated Buffers.

Flood - A general but temporary condition of partial or completed 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 by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary-Mapped as being special flood hazard area. Also included are areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania Department of Environmental Protection (PaDEP) Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by PaDEP).

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

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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 - The incremental depth in a stormwater management structure, provided as a safety factor of design, above that required to convey the design runoff event.

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 road bed, 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 from cropland.

Groundwater Recharge - Replenishment of existing natural underground water supplies.

Hardship Waiver Request - A written request for a waiver alleging that the provisions of this Ordinance inflict unnecessary hardship upon the applicant. Waivers from the water quality provisions of this Ordinance shall not be granted.

Hot Spot Land Uses - A Land Use or activity that generates higher concentrations of hydrocarbons, trace metals or other toxic substances than typically found in stormwater runoff. These are listed in Article III, Section 4(P).

Impervious Surface (Impervious Cover) - A surface which prevents the percolation of water into the ground.

Impoundment - A retention or detention basin designed to retain storm water runoff and release it in a controlled rate.

Infiltration Practice - A practice designed to direct runoff into the ground, e.g. French Drain, seepage pit, seepage trench or biorention area.

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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 depressions, sinkholes, limestone towers and steep-sided hills, underground drainage and caves. Karst is usually formed on carbonate rocks, such as limestones or dolomites and sometimes gypsum.

Land Development - (i) The improvement of one lot or two or more contiguous lots, tracts or parcels of land for any purpose involving (a) a group of two or more buildings, or (b) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features; (ii) subdivision of land.

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

Loading Rate - The ratio of the land area draining to the system, as modified by the weighting factors in Article III, Section 7(b), compared to the base area of the infiltration system.

Low Impact Development - A development approach that promotes practices that will minimize post-development runoff rates and volumes thereby minimizing needs for artificial conveyance and storage facilities. Site design practices include preserving natural drainage features, minimizing impervious surface area, reducing the hydraulic connectivity of impervious surfaces, and protecting natural depression storage.

"Local" Runoff Conveyance Facilities - Any natural channel or manmade conveyance system which has the purpose of transporting runoff from the Site to the mainstem.

Mainstem (main channel) - Any stream segment or other conveyance used as a reach in the Little Lehigh Creek hydrologic model.

Manning Equation (Manning Formula) - A method for calculation of velocity of flow (e.g. feet per second) and flow rate (e.g. cubic feet per second) in open channels

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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.

Maryland Stormwater Design Manual - A stormwater design manual written by the Maryland Department of the Environment and the Center for Watershed Protection. As of January 2004, the Manual can be obtained through the following web site: www.mde.state.md.us.

Minimum Disturbance/ Minimum Maintenance Practices (MC/MM) - A site design practice in which careful limits are placed on site clearance prior to development allowing for maximum retention of existing vegetation (woodlands and other), minimum disturbance and compaction of existing soil mantle and minimum site application of chemicals post-development. Typically, MD/MM includes disturbance setback criteria from buildings as well as related site improvements such as walkways, driveways, roadways, and other improvements. These criteria may vary by community context as well as by type of development being proposed. Additionally, MD/MM also shall include provisions (e.g., deed restrictions, conservation easements) to protect these areas from future disturbance and from application of fertilizers, pesticides, and herbicides.

Municipality/Township - Maxatawny Township, Berks County, Pennsylvania.

Non-point Source Pollution - Pollution that enters a watery body from diffuse origins in the watershed and does not result from discernible, confined or discrete conveyance.

No Harm Option - The option of using a less restrictive runoff quantity control if it can be shown that adequate and safe runoff conveyance exists and that the less restrictive control would not adversely affect health, safety and property.

NPDES - National Pollutant Discharge Elimination System.

NRCS - Natural Resource Conservation Service - U.S. Department of Agriculture (formerly the Soil Conservation Service).

Oil/Water Separator - A structural mechanism designed to remove free oil and grease (and possibly solids) from stormwater runoff.

Open Channel - A drainage element in which storm water 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.

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

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

PaDEP - Pennsylvania Department of Environmental Protection.

PaDOT - Pennsylvania Department of Transportation.

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 flow of stormwater runoff at a given location and time resulting from a specified storm event.

Penn State Runoff Model (PSRM) - The computer-based hydrologic modeling technique used in previous Act 167 Plans. PSRM was also updated to include water quality modeling capabilities and renamed PSRM-QUAL. The PSRM and PSRM-QUAL calculation methodologies were used as the basis for writing the WATERSHED Model.

Person - An individual, partnership, public or private association or corporation, or a governmental unit, public utility or other for or not-for-profit statutory entity or other legal entity whatsoever which is recognized by law as the subject of rights and duties.

Pipe - A culvert, closed conduit, or structure (including appurtenances) that convey storm water.

Plan - The storm water management and erosion and sediment pollution control plans and narratives.

Planning Commission - The Maxatawny Township Planning Commission.

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

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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.

Preliminary Site Investigation - The determination of the depth to bedrock, the depth to the seasonal high water table and the soil permeability for a possible infiltration location on a site through the use of published data and on-site surveys. In carbonate bedrock areas, the location of special geologic features must also be determined along with the associated buffer distance to the possible infiltration area. See, Appendix G.

Public Water Supplier - A person who owns or operates a public water system.

Public Water System - A system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. (See, 25 Pa. Code Chapter 109).

Qualified Geotechnical Professional - A licensed professional geologist or a licensed professional engineer who has a background or expertise in geology or hydrogeology.

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

Rational Method - A method of peak runoff calculation using a standardized runoff coefficient (rational 'c'), acreage of tract and rainfall intensity determined by return period and by the time necessary for the entire tract to contribute runoff. The rational method formula is stated as follows: Q=ciA, where "Q" is the calculated peak flow rate in cubic feet per second, 'c' is the dimensionless runoff coefficient (See, Appendix C), "i" is the rainfall intensity in inches per hour, and "A" is the area of the tract in acres.

Reach - Any of the natural or man-made runoff conveyance channels used for watershed runoff modeling purposes to connect the subareas and transport flows downstream.

Regulated Activities - Actions or proposed actions which impact upon proper management of stormwater runoff and which are governed by this Ordinance as specified in Article I, Section 5.

Regulated Earth Disturbance Activities - Earth disturbance activity other than agricultural plowing or tilling of one acre or more with a point source discharge to

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surface waters or to the Maxatawny Township's storm sewer system or earth disturbance activity of five acres of more regardless of the planned runoff. This includes earth disturbance on any portion of, part or during any stage of a larger common plan of development.

Release Rate - The percentage of pre-development peak rate of runoff for a development site to which the post-development peak rate of runoff must be controlled to avoid peak flow increases throughout the watershed.

Retention Basin - An impoundment in which storm water 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 over which an event of a given magnitude can be expected to recur. For example, the twenty-five (25) year return period rainfall or runoff event would be expected to recur on the average once every twenty-five years.

Riser - A vertical pipe extending from the bottom of 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 storm water falling directly onto flat roof surfaces by incorporating controlled-flow roof drains into building designs.

Runoff - The part of precipitation which flows over the land.

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

Sediment Traps/Catch Basin Sumps - A chamber which provides storage below the outlet in a storm inlet to collect sediment, debris and associated pollutants, typically requiring periodic clean out.

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Seepage Pit/Seepage Trench - An area of excavated earth filled with loose stone or similar material and 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 - Stormwater runoff flowing in a thin layer over the ground surface.

Soil-Cover-Complex Method - A method of runoff computation developed by NRCS which is based upon relating soil type and land use/cover to a runoff parameter called a Curve Number.

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

Spill Prevention and response Program - A program that identifies procedures for preventing and, as needed, cleaning up potential spills and makes such procedures known and the necessary equipment available to appropriate personnel.

Spillway - A depression in the embankment of a pond or basin which is used to pass a peak discharge greater than the maximum, design storm controlled by the pond.

State Water Quality Requirements - As defined under State regulations – protection of designated and existing uses (See, 25 Pa. Code Chapters 93 and 96)– including:

A. Each stream segment in Pennsylvania has a "designated use," such as "cold water fishes" or "potable water supply," which are listed in Chapters 93. These uses must be protected and maintained, under State regulations.

B. "Existing uses" are those attained as of November 1975, regardless whether they have been designated in Chapter 93. Regulated Earth Disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.

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C. Water quality involves the chemical, biological and physical characteristics of surface water bodies. After Regulated Earth Disturbance activities are complete, these characteristics can be impacted by addition of pollutants such as sediment, and changes in habitat through increased flow volumes and/or rates as a result of changes in land surface area frm those activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, streambed and structural integrity of the waterway, to prevent these impacts.

Storage Indication Method - A method of routing or moving an inflow hydrograph through a reservoir or detention structure. The method solves the mass conservation equation to determine an outflow hydrograph as it leaves the storage facility.

Storm Drainage Problem Areas- Areas which lack adequate stormwater collection and/or conveyance facilities and which prevent a hazard to persons or property. These areas are either documented in Appendix B of this Ordinance or identified by Maxatawny Township or Maxatawny Township's Engineer.

Strom 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 or other conduits which carries intercepted surface runoff, street water and other wash waters, or drainage, but excludes domestic sewage and industrial wastes.

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

Stormwater Filters - Any number of structural mechanisms such as multi-chamber catch basins, sand/peat filters, sand filters, and so forth which are installed to intercept stormwater flow and remove pollutants prior to discharge. Typically, these systems require periodic maintenance and clean out.

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

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Stormwater Management Plan - The plan for managing stormwater runoff adopted by Lehigh County for the Little Lehigh Creek Watershed as required by the Act of October 4, 1978, P.L. 864, (Act 167), as amended, and known as the "Stormwater Management Act".

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

Stream - A watercourse.

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 unit of watershed breakdown for hydrologic modeling purposes for which the runoff control 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, transfer of ownership or building or lot ownership.

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

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

Technical Best Management Practice Manual & Infiltration Feasibility Report, November 2002 - The report written by Cahill Associates that addresses the feasibility of infiltration in carbonate bedrock areas on the Little Lehigh Creek Watershed. The report is available at the LVPC offices.

Timber Operations - See Forest Management.

Time of Concentration (Tc) - The time for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the

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watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

Trash/Debris Collectors - Racks, screens or other similar devices installed in a storm drainage system to capture coarse pollutants (trash, leaves, etc.).

Vegetated Buffers - Gently sloping areas that convey stormwater as sheet flow over a broad, densely vegetated earthen area, possibly coupled with the use of level spreading devices. Vegetated buffers should be situated on minimally disturbed soils, have low-flow velocities and extended residence times.

Vegetated Roofs - Vegetated systems installed on roofs that generally consist of a waterproof layer, a root-barrier, drainage layer (optional), growth media, and suitable vegetation. Vegetated roofs store and eventually evapotranspirate the collected rooftop rainfall; overflows may be provided for larger storms.

Vegetated Swales - Broad, shallow, densely vegetated, earthen channels designed to treat stormwater while slowly infiltrating, evapotranspirating, and conveying it. Swales should be gently sloping with low flow velocities to prevent erosion. Check dams may be added to enhance performance.

Water Quality Inserts - Any number of commercially available devices that are inserted into storm inlets to capture sediment, oil, grease, metals, trash, debris, etc.

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

Watershed - The entire region or are drained by a river or other body of water, whether natural or artificial.

WATERSHED - The computer-based hydrologic modeling technique adapted to the Little Lehigh Creek Watershed for the Act 167 Plan. This model was written by Tarsi Software Laboratories and uses the same algorithms found in the Penn State Runoff Quality Model (PSRM-QUAL). The model has been "calibrated" to reflect actual flow values by adjusting key model input parameters.

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

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Wet Detention Ponds - A basin that provides for necessary stormwater storage as well as a permanent pool of water. To be successful, wet ponds must have adequate natural hydrology (both runoff inputs as well as soils and water table which allow for maintenance of a permanent pool of water) and must be able to support a healthy aquatic community so as to avoid creation of mosquito and other health and nuisance problems.

Wetland - Those areas that are inundated or saturated by surface or ground water 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 REQUIREMENTS

SECTION 1. General Requirements.

A. All Regulated Activities in Maxatawny Township shall be subject to the stormwater management requirements of this Ordinance.

B. Storm drainage systems shall be provided to permit unimpeded flow in natural watercourses except as modified by stormwater detention facilities, pipe systems or open channels consistent with this Ordinance.

C. The existing locations of concentrated or diffused drainage discharge onto adjacent property shall not be altered without written approval of the affected property owner(s).

D. Areas of existing diffused or concentrated drainage discharge onto an adjacent property shall be managed such that, at minimum, the peak diffused or concentrated flow does not increase in the general direction of discharge, except as otherwise provided in this Ordinance. If diffused flow is proposed to be concentrated or vice versa and discharged onto adjacent property, the developer must document that there are adequate downstream conveyance facilities to safely transport the concentrated discharge to the point of pre-development flow concentration, to the stream reach or otherwise provide that no harm will result form the concentrated discharge, and must obtain approval of the adjacent property owner. Areas of existing diffused drainage discharge shall be subject to any applicable release rate criteria in the general direction of existing discharge whether they are proposed to be concentrated or maintained as diffused drainage areas.

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E. Where a site is traversed by watercourse other than those for which a 100-year floodplain is defined by Maxatawny Township, there shall be provided a drainage easement conforming substantially with the line of such watercourses. The width of any easement shall be adequate to provide for unimpeded flow of storm run-off based on calculations made in conformance with Article III, Section 7 for the 100-year return period run-off and to provide a freeboard allowance of one-half (0.5) foot above the design water surface level. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations which may adversely affect the flow of stormwater within any portion of the easement. Also, periodic maintenance of the easement to ensure proper run-off conveyance shall be required. Watercourses for which the 100-year floodplain is formally defined are subject to the applicable Maxatawny Township floodplain regulations.

F. When it can be shown that, due to topographic conditions, natural drainage swales on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainage swales. Capacities of open channels shall be calculated using the Manning Equation.

G. Post-construction BMPs shall be designed, installed, operated and maintained to meet the requirements of the Clean Streams Law and implementing regulations, including the established practices in 25 Pa. Code Chapter 102 and the specifications of this ordinance as to prevent accelerated erosion in watercourse channels and at all points of discharge.

H. No Earth Disturbance activities associated with any Regulated Activities shall commence until approval by Maxatawny Township of a plan which demonstrates compliance with the requirements of this Ordinance.

I. Techniques described in Appendix F (Low Impact Development) of this Ordinance are encouraged because they reduce the costs of complying with the requirements of this Ordinance and the State Water Quality Requirements.

J. Infiltration for stormwater management is encouraged where soils and geology permit, consistent with the provisions of this Ordinance and, where appropriate, the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D. Infiltration is encouraged for capturing and treating the Water Quality Volume (as

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calculated in Article III, Section 4), any part of the Water Quality Volume or for otherwise meeting the purposes of this Ordinance.

SECTION 2. Permit Requirements by Other Government Entities.

A. The following permit requirements apply to certain Regulated Earth Disturbance activities and must be met prior to commencement of Regulated and Earth Disturbance activities, as applicable:

1. All Regulated and Earth Disturbance activities subject to permit requirements by DEP under regulations at 25 Pa. Code Chapter 102.

2. Work within natural drainageways subject to permit by DEP under 25 Pa. Code Chapter 102.

3. 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.

4. Any stormwater management facility that would be located on a State highway right-of-way or require access from a State highway shall be subject to approval by the Pennsylvania Department of Transportation (PaDOT).

5. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area and any facilities which may constitute a dam subject to permit by DEP under 25 Pa. Code Chapter 105.

SECTION 3. Erosion and Sediment Control During Regulated Earth Disturbance Activities.

A. No Regulated Earth Disturbance activities within Maxatawny Township shall commence until approval by Maxatawny Township of an Erosion and Sediment Control Plan for construction activities. Written approval by DEP or a delegated County Conservation District shall satisfy this requirement.

B. An Erosion and Sediment Control Plan is required by DEP regulations for any Earth Disturbance activity of 5,000 square feet or more under Pa. Code § 102.4(b).

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C. A DEP NPDES Stormwater Discharges Associated with Construction Activities Permit is required for Regulated Earth Disturbance Activities under Pa. Code Chapter 92.

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 Maxatawny Township before the commencement of Earth Disturbance Activity.

E. A copy of the Erosion and Sediment Control Plan and any permit, as required by DEP regulations, shall be available at the project site at all times.

SECTION 4. Post Construction Water Quality Criteria.

A. No Regulated Earth Disturbance Activities within Maxatawny Township shall commence until approval by Maxatawny Township of a plan which demonstrates compliance with this Ordinance. DEP has determined that this Ordinance meets State Water Quality Requirements. Therefore, any approvals under this Ordinance would satisfy the post construction stormwater management requirements associated with an NPDES Permit for Stormwater Discharges Associated with Construction Activities.

B. The Water Quality Volume (WQv) shall be captured and treated. The WQv shall be calculated two ways. First, WQv shall be calculated using the following formula:

$$WQv = (c)(P)(A)/ 12$$

Where WQv = water quality volume in acre-feet
c = Rational Method post-development run-off coefficient for the 2-year storm
P= 1.25 inches
A= Area in acres of proposed Regulated Activity

Second, the WQv shall be calculated as the difference in run-off volume from pre-development to post-development for the 2-year return period storm. The effect of closed depressions on the site shall be considered in this calculation. The larger of these two calculated volumes shall be used as the WQv to be captured and treated, except that in no case shall the WQv be permitted to exceed 1.25-inches of run-off over the site area.

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C. The WQv shall be calculated for each post-development drainage direction on a site for sizing BMPs. Site areas having no impervious cover and no proposed disturbance during development may be excluded from the WQv calculations and do not require treatment.

D. If an applicant is proposing to use a wet pond, constructed wetland or other BMP that ponds water on the land surface and may receive direct sunlight, the discharge from that BMP must be treated by infiltration, a vegetated buffer, filter strip, bioretention, vegetated swale or other BMP that provides a thermal benefit to protect the High Quality waters of the Little Lehigh Creek from thermal impacts.

E. Any stormwater runoff from the site as a result of the Regulated Activities must either be treated with infiltration or two acceptable BMPs such as those listed in Article III, Section 4(N).

F. Infiltration BMPs shall not be constructed on fill.

G. The applicant shall document the bedrock type(s) present on the site from published sources. Any apparent boundaries between carbonate and non-carbonate bedrock shall be verified through more detailed site evaluations by a qualified geotechnical professional.

H. For each proposed Regulated Activity in the watershed, the applicant shall conduct a Preliminary Site Investigation on the portion of the site that is judged to be the best candidate hydrogeologically for possible infiltration, including gathering data from published sources, a field inspection of the site, a minimum of one test pit and a minimum of two percolation tests, as outlined in Appendix G. This investigation will determine depth to bedrock, depth to the seasonal high water table, soil permeability and location of special geologic features, if applicable. The location(s) of special geologic features shall be verified by a qualified geotechnical professional.

I. For entirely non-carbonate sites, the WQv shall be infiltrated unless the applicant demonstrates that it is infeasible to infiltrate the WQv for reasons of seasonal high water table, permeability rate, soil depth or isolation distances; or except as provided in Article III, Section 4(T). The Preliminary Site Investigation described in Article III, Section 4(H) shall continue on different areas of the site until a suitable infiltration location is found or the entire site is determined to be infeasible for infiltration. For proposed infiltration areas, the Additional Site Investigation and Testing as outlined in Appendix G shall be completed. The municipality must

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witness all testing and may determine infiltration to be infeasible if there are known existing conditions or problems that may be worsened by the use of infiltration. The following conditions are suitable for infiltration in non-carbonate areas:

- Depth to bedrock below the invert of the BMP greater than or equal to 2 feet
- Depth to seasonal high water table below the invert of the BMP greater than or equal to 3 feet (If the depth to bedrock is between 2 and 3 feet and the evidence of the seasonal high water table is not found in the soil, no further testing to locate the depth to seasonal high water table is required.)
- Soil permeability greater than or equal to 0.5 inches/hour and less than or equal to 12 inches per hour
- Setback distances or buffers as follows:
  - 100 feet from water supply wells
  - 10 feet downgradient or 100 feet upgradient from building foundations
  - 50 feet from septic system drainfields
  - 50 feet from a geologic contact with carbonate bedrock unless a Preliminary Site Investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area.
  - 100 feet from the property line unless documentation is provided to show that all setbacks from wells, foundations and drainfields on neighboring properties will be met.

    If it is not feasible to infiltrate the full WQv, the applicant shall infiltrate that portion of the WQv that is feasible based on the site characteristics.

J. In entirely carbonate areas, in addition to the testing required in Article III, Section 4(H), the Preliminary Site Investigation shall include an assessment

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of the remainder of the site for possible infiltration based on required isolation distances from special geologic features and the likely soil depth and permeability based on published data or other site data available. Where infiltration BMPs are proposed, the applicant shall conduct the Additional Site Investigation and Testing as outlined in Appendix G. However, the Township must witness all testing. The soil depth, percolation rate and proposed loading rate, each weighted as described in Article III, Section 7, along with the buffer from special geologic features shall be compared to the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D to determine if the site is recommended for infiltration. If at any point in the Preliminary Site Investigation the data (e.g. location of Karst features on the site or the published soils data for the site) indicates that the entire site will not be recommended for infiltration based on this Ordinance's standards, then no further investigation is required. In addition to the recommendation from Appendix D, the following conditions are required for infiltration in carbonate areas:

- Depth to bedrock below the invert of the BMP greater than or equal to 2 feet

- Depth to seasonal high water table below the invert of the BMP greater than or equal to 3 feet (If the depth to bedrock is between 2 and 3 feet and the evidence of the seasonal high water table is not found in the soil, no further testing to locate the depth to seasonal high water table is required)

- Soil permeability greater than or equal to 0.5 inches/hour and less than or equal to 12 inches per hour

- Setback distances or buffers as follows:
  - 100 feet from water supply wells
  - 10 feet downgradient or 100 feet upgradient from building foundations
  - 50 feet from septic system drainfields
  - 100 feet from the property line unless documentation is provided to show that all setbacks from wells, foundations and drainfields on neighboring properties will be met.

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Best Management Practice	Design Reference
Bioretention	Low Impact Development Design Strategies, Prince George's County, MD., June 1999[2]
Capture/Reuse[1]	Texas Guide to Rainwater Harvesting, 2nd Edition. Texas Water Development Board, Center for Maximum Potential Building Systems, 1977[3]
Constructed Wetlands	200 Maryland Stormwater Design Manual, Maryland Department of the Environment[4]
Minimum Disturbance/ Minimum Maintenance Practices	Conservation Design for Stormwater Management. Delaware Dept. Of Natural Resources and Brandywine Conservancy, September 1997[5]
Oil/Water Separators	Georgia Stormwater Management Manual Volume 2 Technical Handbook, August 2001[6]
Sediment Traps/Catch Basin Sumps	US Environmental Protection Agency's Post-Construction Stormwater Management in New Development and Redevelopment BMP Fact Sheet for "Catch Basins/Catch Basin Insert"[7]
Significant Reduction of Existing Impervious Cover	N/A
Stormwater Filters (Sand, Peat, Compost, etc.)	Design of Stormwater Filtering Systems. Claytor, R. and Schueler, T., Center for Watershed Protection, December 1996[8]
Trash/Debris Collectors in Catch Basins	Pennsylvania Handbook of BMPs for Developing Areas[9] of Latest PA Dept. of Environmental Protection Manual
Vegetated Buffers/Filter Strips	Pennsylvania Handbook of BMPs for Developing Areas[9] of Latest PA Dept. of Environmental Protection Manual
Vegetated Roofs	Roof Gardens: History, Design, and Construction. Osmundson, T., W.W. Norton & Co., 1998[10]
Vegetated Swales/Filter Strips	2000 Maryland Stormwater Design Manual, Maryland Department of the Environment[4]
Water Quality Inserts for Inlets	Pennsylvania Handbook of BMPs for Developing Areas[9] or Latest PA Depart. of Environmental Protection Manual

Best Management Practice	Design Reference
Wet Detention Ponds	Pennsylvania Handbook of BMPs for Developing Areas[9] or Latest PA Depart. of Environmental Protection Manual

[1] If this BMP is used to treat the entire WQv then only one BMP is required because of this BMPs superior water performance.
[2] Available at www.co.pg.md.us/Goverment/AgencyIndex/DER/PPD/LID/LiDNatl.pdf as of January 2004
[3] Available at www.twdb.state.tx.us/publications/reports/RainHarv.pdf as of January 2004
[4] Available at www.mde.state.md.us as of January 2004
[5] Available at www.dnrec.state.de.us/dnrec2000/Divisions/SoilStormwater/Apps/DesignManualRequest.htm as of January 2004
[6] Available at www.georgiastormwater.com as of January 2004
[7] Available at http://cfpub.epa.cov/npdes/stormwater/menuofbmps/post_7.cfm as of January 2004
[8] Available from the Center for Watershed Protection (www.cwp.org) as of January 2004
[9] Available at www.dep.state.pa.us (Keyword Stormwater) as of January 2004
[10] Available at www.wwnorton.com as of January 2004

Applicants are not required to use infiltration BMPs on a carbonate site even if the site falls in the "Recommended" range on the chart in Appendix D. If infiltration is not proposed, the WQv shall be treated by two acceptable BMPs, as specified in Article III, Section "O".

K. If a site has both carbonate and non-carbonate areas, the applicant shall investigate the ability of the non-carbonate portion of the site to fully meet this Ordinance to control runoff for the whole site through infiltration. If that proves infeasible, the applicant shall perform the Preliminary Site Investigation for the carbonate area to determine the appropriate design strategy. No infiltration structure in the non-carbonate area shall be located within 50 feet of a boundary with carbonate bedrock, except when a Preliminary Site Investigation has been done showing the absence of special geologic features within 50 feet of the proposed infiltration area.

L. If infiltration BMPs are proposed in carbonate areas, the post-development 2-year runoff volume leaving the site shall be 80% or more of the pre-development runoff volume for the carbonate portion of the site to prevent infiltration of volumes far in excess of the pre-development infiltration volume.

M. Site areas proposed for infiltration shall be protected from disturbance and compaction except as necessary for construction of infiltration BMPs.

N. If infiltration of the entire WQv is not proposed, the remainder of the WQv shall be treated by two acceptable BMPs in series for each discharge location. Sheet flow draining across a pervious area can be considered as one BMP. Sheet flow across impervious areas and concentrated flow shall flow through two BMPs. If sheet flow from an impervious area is to be drained across a pervious area as one BMP, the length of the pervious area must be equal to or greater than the length of impervious area. In no case, may the same BMP be employed consecutively to meet this requirement. Acceptable BMPs are listed as follows along with the recommended reference for design.

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O. Storm water runoff from Hot Spot land uses shall be pre-treated. In no case, may the same BMP be employed consecutively to meet this requirement and the requirement in Article III, Section 4(N). Acceptable methods of pre-treatment are listed as follows:

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Hot Spot Land Use	Pre-treatment Method(s)
Vehicle Maintenance and Repair Facilities including Auto Parts Stores	- Oil/Water Separators - Use of Drip Pans and/or Dry Sweep Material Under Vehicles/Equipment - Use of Absorbent Devices to Reduce Liquid Releases - Spill Prevention and Response Program
Vehicle Fueling Stations	- Oil/Water Separators - Water Quality Inserts for Inlets - Spill Prevention and Response Program
Storage Areas for Public Works	- Oil/Water Separators - Sediment Traps/Catch Basin Sumps - Water Quality Inserts for Inlets - Use of Drip Pans and/or Dry Sweep Material Under Vehicles/Equipment - Use of Absorbent Devices to Reduce Liquid Releases - Spill Prevention and Response Program - Diversion of Stormwater away from Potential Contamination Areas
Outdoor Storage of Liquids	- Spill Prevention and Response Program
Commercial Nursery Operations	- Vegetated Swales/Filter Strips - Constructed Wetlands - Stormwater Collection and Reuse
Salvage Yards and Recycling Facilities*	- BMPs that are a part of a Stormwater Pollution Prevention Plan Under an NPDES Permit
Fleet Storage Yards and Vehicle Cleaning Facilities*	- BMPs that are a part of a Stormwater Pollution Prevention Plan Under an NPDES Permit
Facilities that Store or Generate Regulated Substances*	- BMPs that are a part of a Stormwater Pollution Prevention Plan Under an NPDES Permit
Marinas*	- BMPs that are a part of a Stormwater Pollution Prevention Plan Under an NPDES Permit
Certain Industrial Uses (listed under NPDES)*	- BMPs that are a part of a Stormwater Pollution Prevention Plan Under an NPDES Permit

* Regulated under the NPDES Stormwater Program

Design References for the pre-treatment methods, as necessary, are listed below. The applicant may demonstrate that due to the site characteristics the land use is not a Hot Sport land use.

Pre-treatment Method	**Design Reference**
Constructed Wetlands	2000 Maryland Stormwater Design Manual, Maryland Department of the Environment[1]
Diversion of Stormwater away from Potential Contamination Areas	Pennsylvania Handbook of BMPs for developing Areas[2] or Latest Pa Dept. of Environmental Protection Manual
Oil/Water Separators	Georgia Stormwater Management Manual Volume 2 Technical Handbook, August 2001[3]
Sediment Traps/Catch Basin Sumps	US Environmental Protection Agency's Post-Construction Stormwater Management in New Development and Redevelopment BMP Fact Sheet for "Catch Basins/Catch Basin Insert"[4]
Stormwater Collection and Reuse (especially for irrigation)	Texas Guide to Rainwater Harvesting, 2nd Edition, Texas Water Development Board, Center for Maximum Potential Building Systems, 1997[5]
Stormwater Filters (Sand, Peat, Compost, etc.)	Design of Stormwater Filtering Systems. Claytor, R. and Schueler, T., Center for Watershed Protection, December 1996[6]
Trash/Debris Collectors in Catch Basin	Pennsylvania Handbook of BMPs for Developing Areas[2] or Latest PA Dept. of Environmental Protection Manual
Vegetated Swales/Filter Strips	2000 Maryland Stormwater Design Manual, Maryland Department of the Environment[1]
Water Quality Inserts for Inlets	Pennsylvania Handbook of BMPs for Developing Areas[2] or Latest PA Dept. of Environmental Protection Manual

[1] Available at www.mde.state.md.us as of January 2004
[2] Available at www.dep.state.pa.us (Keyword Stormwater) as of January 2004
[3] Available at www.georgiastormwater.com as of January 2004
[4] Available at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post_7.cfm as of January 2004
[5] Available at www.twdb.state.tx.us/publications/preports/RainHarv.pdf as of January 2004
[6] Available from the Center for Watershed Protection (www.cwp.org) as of January 2004

P. The use of infiltration BMPs is prohibited on Hot Spot land use areas.

Q. Stormwater infiltration BMPs shall not be placed in or on a special geologic feature(s). Additionally, stormwater runoff shall not be discharged into existing on-site sinkholes.

R. Applicants shall request, in writing, Public Water Suppliers to provide the Zone I Wellhead Protection radius, as calculated by the method outlined in the Pennsylvania Department of Environmental Protection Wellhead Protection regulations, for any public water supply well within 400 feet of the site. In addition to the setback distances specified in Article III, Sections 4(I) and 4(J), infiltration is prohibited in the Zone I radius as defined and substantiated by the Public Water Supplier in writing. If the applicant does not receive a response from the Public Water Supplier, the Zone I radius is assumed to be 100 feet.

S. The volume and rate of the net increase in stormwater runoff from the Regulated Activities must be managed to prevent the physical degradation of receiving waters from such effects as scour and streambank destabilization, to satisfy State Water Quality Requirements.

T. The municipality may, after consultation with DEP, approve alternative methods for meeting the State Water Quality Requirements other than those in this Section, provided that they meet the minimum requirements of and do not conflict with State law including but not limited to the Pennsylvania Clean Streams Law.

SECTION 5. Stormwater Management Districts.

A. Mapping of Stormwater Management Districts - To implement the provisions of the Little Lehigh Creek Watershed Stormwater Management Plan, Maxatawny Township is hereby divided into Stormwater Management Districts consistent with the Little Lehigh Creek Release Rate Map presented in the Plan. The boundaries of the Stormwater Management Districts are shown on an official map which is available for inspection at the Maxatawny Township Office. A copy of the official map at a reduced scale is included in Appendix A for general reference.

B. Description of Stormwater Management Districts - Two types of Stormwater Management Districts may be applicable to Maxatawny

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Township, namely Conditional No Detention Districts and Dual Release Rate Districts as described below:

1. Conditional No Detention Districts - Within these districts, the capacity of the "local" runoff conveyance facilities (as defined in Article II) must be calculated to determine if adequate capacity exists. For this determination, the developer must calculate peak flows assuming that the site is developed as proposed and that the remainder of the local watershed is in the existing condition. The developer must also calculate peak flows assuming that the entire local watershed is developed per current zoning and that all new development would use the runoff controls specified by this Ordinance. The larger of the two peak flows calculated will be used in determining if adequate capacity exists. If adequate capacity exists to safely transport runoff from the site to the main channel (as defined in Article II), these watershed areas may discharge post-development peak runoff without detention facilities. If the capacity calculations show that the "local" runoff conveyance facilities lack adequate capacity, the developer shall either use a 100% release rate control or provide increased capacity of downstream elements to convey increased peak flows consistent with Article III, Section 6(P). Any capacity improvements must be designed to convey runoff from development of all areas tributary to the improvement consistent with the capacity criteria specified in Article III, Section 6(D). By definition, a storm drainage problem area associated with the "local" runoff conveyance facilities indicates that adequate capacity does not exist.

2. Dual Release Rate Districts - Within this district, the 2-year post-development peak runoff must be controlled to 30% of the pre-development 2-year runoff peak. Further, the 10-year, 25-year and 100-year post-development peak runoff must be controlled to the stated percentage of the pre-development peak. Release Rates associated with the 10- through 100-year events vary from 50% to 100% depending upon location in the watershed.

SECTION 6. Stormwater Management District Implementation Provisions.

A. Applicants shall provide a comparative pre- and post-construction stormwater management hydrograph analysis for each direction of discharge and for the site overall to demonstrate compliance with the provisions of this Ordinance.

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B. Any stormwater management controls required by this Ordinance and subject to a dual release rate criteria shall meet the applicable release rate criteria for each of the 2-, 10-, 25- and 100-year return period runoff events consistent with the calculation methodology specified in Article, III, Section 7.

C. 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 provided as part of the Drainage Plan. The District boundaries as originally drawn coincide with topographic divides or, in certain instances, are drawn from the intersection of the watercourse and a physical feature such as the confluence with another watercourse or a potential flow obstruction (e.g. road, culvert, bridge, etc.). The physical feature is the downstream limit of the subarea and the subarea boundary is drawn from that point up slope to each topographic divide along the path perpendicular to the contour lines.

D. Any downstream capacity analysis conducted in accordance with this Ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates:

1. Natural or man-made channels or swales must be able to convey the increased runoff associated with a 2-year return period event within their banks at velocities consistent with protection of the channels from erosion.

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

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

E. For a proposed development site located within one release rate category subarea, the total runoff from the site shall meet the applicable release rate criteria. For development sites with multiple directions of runoff discharge, individual drainage directions may be designed for up to a 100% release rate so long as the total runoff from the site is controlled to the applicable release rate.

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F. For a proposed development site located within two or more release category subareas, the peak discharge rate from any subarea shall be the pre-development peak discharge for that subarea multiplied by the applicable release rate. 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 re-combine in proximity to the site. In this case, peak discharge in any direction may be a 100% release rate provided that the overall site discharge meets the weighted average release rate.

G. For a proposed development site located partially within a release rate category subarea and partially within a conditional no detention subarea, a significant portion of the site area subject to the release rate control may not be drained to the discharge point(s) located in the no detention subarea except as part of a "No Harm" or Hardship waiver procedure.

H. No portion of a Site may be regraded between the Little Lehigh Creek Watershed and any adjacent watershed except as part of a "No Harm" or Hardship Waiver procedure.

I. Within a release rate category area, for a proposed development site which has areas which drain to a closed depression(s), the design release from the site will be the lesser of (a) the applicable release rate flow assuming no closed depression(s) or (b) the existing peak flow actually leaving the site. In cases where (b) would result in an unreasonably small design release, the design discharge of less than or equal to the release rate will be determined by the available downstream conveyance capacity to the main channel calculated using Article III, Section 6(D) and the minimum orifice criteria.

J. Off-site areas which drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site using the capacity criteria in Article III, Section 6(D) and the detention criteria in Article III, Section 7.

K. For development sites proposed to take place in phases, all detention ponds shall be designed to meet the applicable release rate(s) applied to all site areas tributary to the proposed pond discharge direction. All site tributary areas will be assumed as developed, regardless of whether all site tributary acres are proposed for development at that time. An exception shall be sites with multiple detention ponds in series where only the downstream pond must be designed to the stated release rate.

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L. Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area shall be subject to the release rate criteria. The impact area includes any proposed cover or grading changes.

M. Development proposals which, through groundwater recharge or other means, do not increase either the rate or volume of runoff discharged from the site compared to pre-development are not subject to the release rate provisions of this Ordinance.

N. "No Harm" Water Quantity Option - For any proposed development site not located in a conditional no detention district, the developer has the option of using a less restrictive runoff control (including no detention) if the developer can prove that special circumstances exist for the proposed development site and that "no harm" would be caused by discharging at a higher runoff rate than that specified by the Plan. Special circumstances are defined as any hydrologic or hydraulic aspects of the development itself not specifically considered in the development of the Plan runoff control strategy. Proof of "no harm" would have to be shown from the development site through the remainder of the downstream drainage network to the confluence of the creek with the Lehigh River. Proof of "no harm" must be shown using the capacity criteria specified in Article III, Section 6(D), if downstream capacity analysis is a part of the "no harm" justification.

Attempts to prove "no harm" based upon downstream peak flow versus capacity analysis shall be governed by the following provisions:

1. The peak flow values to be used for downstream areas for the design return period storms (2-, 10-, 25- and 100-year) shall be the values from the calibrated WATERSHED Model for the Little Lehigh Creek or as calculated by an applicant using an alternate method acceptable to the Maxatawny Township Engineer. The flow values from the WATERSHED Model would be supplied to the developer by the Maxatawny Engineer upon request.

2. Any available capacity in the downstream conveyance system as documented by a developer may be used by the developer only in proportion to his development site acreage relative to the total upstream undeveloped acreage from the identified capacity (i.e. if his site is 10% of the upstream undeveloped acreage, he may use up to 10% of the documented downstream available capacity).

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3. Developer-proposed runoff controls which would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no harm", except in conjunction with proposed capacity improvements for the problem areas consistent with Article III, Section 6 (P).

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

O. Regional Detention 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 developers. The design of any regional control basins must incorporate reasonable development of the entire upstream watershed. The peak outflow of a regional basin would be determined based on the required release rate at the point of discharge.

P. Capacity Improvements - In certain instances, primarily within the conditional no detention areas, local drainage conditions may dictate more stringent levels of runoff control than those based upon protection of the entire watershed. In these instances, if the developer could prove that it would be feasible to provide capacity improvements to relieve the capacity deficiency in the local drainage network, then the capacity improvements could be provided by the developer in lieu of runoff controls on the development site. Peak flow calculations shall be done assuming that the local watershed is in the existing condition and then assuming that the local watershed is developed per current zoning and using the specified runoff controls. Any capacity improvements would be designed using the larger of the above peak flows and the capacity criteria specified in Article III, Section 6(D). All new development in the entire subarea(s) within which the proposed development site is located shall be assumed to implement the developer's proposed discharge control, if any.

   Capacity improvements may also be provided as necessary to implement any regional detention alternatives or to implement a modified "no harm" option which proposes specific capacity improvements to provide that a less stringent discharge control would not create any harm downstream.

SECTION 7. Calculation Methodology.

A. Stormwater runoff from all development sites shall be calculated using either the rational method or the soil-cover-complex methodology.

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B. Infiltration BMP loading rate percentages in the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D shall be calculated as follows:

$$\frac{\text{(Area Tributary to Infiltration BMP)}}{\text{(Base Area of Infiltration BMP)}} * 100\%$$

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

All disturbed areas to be made impervious:	weight at 100%
All disturbed areas to be made pervious:	weight at 50%
All undisturbed pervious areas:	weight at 0%
All existing impervious areas:	weight at 100%

C. Soil thickness is to be measured from the bottom of any proposed infiltration system. The effective soil thickness in the Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock in Appendix D is the measured soil thickness multiplied by the thickness factor based on soil permeability, as follows:

PERMEABILITY RANGE*	THICKNESS FACTOR
6.0 to 12.0 inches/hour	0.8
2.0 to 6.0 inches/hour	1.0
1.0 to 2.0 inches/hour	1.4
0.75 to 1.0 inches/hour	1.2
0.5 to 0.75 inches/hour	1.0

*If the permeability rate falls on a break between two thickness factors, the smaller thickness factor shall be used.

Sites with soil permeability greater than 12.0 in./hr. or less than 0.5 in./hr. are not recommended for infiltration.

D. The design of any detention basin intended to meet the requirements of this Ordinance shall be verified by routing the design storm hydrograph through the proposed basin using the storage indication method or other methodology demonstrated to be more appropriate. For basins designed using the rational method technique, the design hydrograph for routing shall be either the Universal Rational Hydrograph or the modified rational method trapezoidal

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hydrograph which maximizes detention volume. Use of the modified rational hydrograph shall be consistent with the procedure described in Section "PIPE.RAT" of the Users' Manual for the Penn State Urban Hydrograph Method (1987).

E. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall be routed using the storage indication method.

F. BMPs designed to store or infiltrate runoff and discharge to surface runoff or pipe flow shall provide storage volume for the full WQv below the lowest outlet invert.

G. Wet Detention Ponds designed to have a permanent pool for the WQv shall assume that the permanent pool volume below the primary outlet is full at the beginning of design event routing for the purposes of evaluating peak outflows.

H. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), and any work involving wetlands as directed in PaDEP Chapter 105 regulations (as amended), shall be designed in accordance with Chapter 105 and does not fall under Chapter 105 regulations must be ab le 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 PaDEP chapter 105 regulations may require a permit under dam safety regulations. Any facility located within a PaDOT right of way must meet PaDOT minimum design standards and permit submission requirements.

I. Any drainage conveyance facility and/or channel that does not fall under PaDEP Chapter 105 Regulations, must be ab le to convey, without damage to the drainage structure or roadway, runoff, from the 100-year design storm. Conveyance facilities to or exiting from storm water management facilities (e.g. 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 PaDOT right-of-way must meet PaDOT minimum design standards and permit submission requirements.

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J. Storm sewers must be able to convey post-development runoff from a 25-year design storm without surcharging inlets, where appropriate.

K. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. Maxatawny Township shall reserve the right to disapprove any design that would result in the occurrence or continuation of an adverse hydrologic or hydraulic condition within the watershed.

L. Any storm water runoff calculations involving drainage areas greater than 200 acres, including on- and off-site areas, shall use generally accepted calculation technique that is based upon the NRCS soil cover complex methods.

M. Maxatawny Township may approve the use of the Rational Method to estimate peak discharges from drainage areas that contain less than 200 acres.

All calculations using Rational Method shall use rainfall intensities consistent with appropriate times of concentration and return periods and the Intensity-Duration-Frequency Curves as presented in Appendix C.

N. All stormwater detention facilities shall provide a minimum 1.0 foot freeboard above the maximum pool elevation associated with the 2- through 25-year runoff events. A 0.5 foot freeboard shall be provided above the maximum pool elevation of the 100-year runoff event. The freeboard shall be measured from the maximum pool elevation to the invert of the emergency spillway. The 2- through 100-year storm events shall be controlled by the primary outlet structure. An emergency spillway for each basin shall be designed to pass the 100-year return frequency storm peak basin inflow rate with a minimum 0.5 foot freeboard measured to the top of basin. The freeboard criteria shall be met considering any offsite areas tributary to the basin as developed, as applicable. If this detention facility is considered to be a dam as per DEP Chapter 105, the design of the facility must be consistent with the Chapter 105 regulations, and may be required to pass a storm greater than the 100-year event.

O. The minimum circular orifice diameter for controlling discharge rates from detention facilities shall be three (3) inches. Designs where a lesser size orifice would be required to fully meet release rates shall be acceptable provided that as much of the site runoff as practical is directed to the detention facilities.

P. Runoff calculations using the soil-cover-complex method shall use the Natural Resources Conservation Service Type II 24-hour rainfall distribution. The 24-hour rainfall depths for the various return periods to be used consistent with this

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Ordinance may be taken from NOAA Atlas 14, Volume 2 or the PaDOT Intensity - Duration - Frequency Field Manual ("PDT-IDF") (May 1986) for Region 4. The following values are taken from the PDT-IDF Field Manual:

Return Period	24-Hour Rainfall Depth
1-year	2.40 inches
2-year	3.00 inches
5-year	3.60 inches
10-year	4.56 inches
25-year	5.52 inches
50-year	6.48 inches
100-year	7.44 inches

A graphical and tabular presentation of the Type II-24 hour distribution is included in Appendix C.

Q. Runoff calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration and return periods and the Intensity-Duration-Frequency Curves as presented in Appendix C.

R. Runoff Curve Numbers (CN's) to be used in the soil-cover-complex method shall be based upon the matrix presented in Appendix C.

S. Runoff coefficients for use in the Rational Method shall be based upon the table presented in Appendix C.

T. All time of concentration calculations shall use a segmental approach which may include one or all of the flow types below:

1. Sheet Flow (overland flow) calculations shall use either the NRCS average velocity chart (Figure 3-1, Technical Release-55, 1975) or the modified kinematic wave travel time equation (equation 3-3, NRCS TR-55, June 1986). If using the modified kinematic wave travel time equation, the sheet flow length shall be limited to 50 feet for designs using the Rational Method and limited to 150 feet for designs using the Soil-Cover-Complex method.

2. Shallow Concentrated Flow travel times shall be determined from the watercourse slope, type of surface and the velocity from Figure 3-1 of TR-55, June 1986.

3. Open Channel Flow travel times shall be determined from velocities calculated by the Manning Equation. Bankfull flows shall be used for

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determining velocities. Manning 'n' values shall be based on the table presented in Appendix C.

4. Pipe Flow travel times shall be determined from velocities calculated using the Manning Equation assuming full flow and the Manning 'n' values from Appendix C.

U. All pre-development calculations for a given discharge shall be based on a common time of concentration considering both on-site drainage areas. All post-development calculations for a given discharge direction shall be based on a common time of concentration considering both on-site and any off-site drainage areas.

V. The Manning Equation shall be used to calculate the capacity of watercourses. Manning 'n' values used in the calculations shall be consistent with the table presented in Appendix C or other appropriate standard engineering 'n' value resources. Pipe capacities shall be determined by methods acceptable to the municipality.

W. The Pennsylvania DEP, Chapter 105, Rules and Regulations, apply to the construction, modification, operation or maintenance of both existing and proposed dams, water obstructions and encroachments throughout the watershed. Criteria for design and construction of stormwater management facilities according to this Ordinance may not be the same criteria that are used in the permitting of dams under the Dam Safety Program.

ARTICLE IV
DRAINAGE PLAN REQUIREMENTS

SECTION 1. General Requirements.

For any of the Regulated Activities of this Ordinance, prior to the final approval of subdivision and/or land development plans, or the issuance of any permit, or the commencement of any Regulated Earth Disturbance activity, the owner, subdivider, developer or his agent shall submit a Drainage Plan and receive municipal approval of the Plan.

SECTION 2. Exemptions.

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Exemptions from the Drainage Plan Requirements are as specified in Article I, Section 6.

SECTION 3. Drainage Plan Contents.

The Drainage Plan shall consist of all applicable calculations, maps, and plans. A note on the maps shall refer to the associated computations and erosion and sedimentation control plan by title and date. The cover sheet of the computations and erosion and sedimentation control plan shall refer to the associated maps by title and date. All Drainage Plan materials shall be submitted to Maxatawny Township in a format that is clear, concise, legible, neat, and well organized; otherwise, the Drainage Plan shall be disapproved and returned to the Applicant.

The following items shall be included in the Drainage Plan:

A. General

1. General description of project.

2. General description of proposed permanent stormwater controls.

3. The name and address of the project site, the name and address of the owner of the property and the name of the individual or firm preparing the Drainage Plan.

B. Map(s) of the Project Area Showing:

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

2. Existing contours at intervals of two (2) feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used. Off-site drainage areas impacting the project including topographic detail.

3. Streams, lakes, ponds or other bodies of water within the project area.

4. Other physical features including existing drainage swales, wetlands, closed depressions, sinkholes and areas of natural vegetation to be preserved.

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

6. An overlay showing soil types and boundaries based on the Lehigh or Berks County Soil Survey, as applicable, latest edition.

7. An overlay showing geologic types and boundaries.

8. Proposed changes to land surface and vegetative cover.

9. Proposed structures, roads, paved areas and buildings.

10. Final contours at intervals of two (2) feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used.

11. Stormwater Management District boundaries applicable to the site.

12. Clear identification of the location and nature of permanent stormwater BMPs.

13. An adequate access easement around all stormwater BMPs that would provide municipal ingress to and egress from a public right-of-way.

14. A schematic showing all tributaries contributing flow to the site and all existing man-made features beyond the property boundary that would be affected by the project.

15. The location of all public water supply wells within 400 feet of the project and all private water supply wells within 100 feet of the project.

16. 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.

17. The date of submission.

18. 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.

19. A north arrow.

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20. A total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.

21. Existing and proposed land use(s).
22. A key map showing all existing man-made features beyond the property boundary that would be affected by the project.

23. Overland drainage paths.

24. A fifteen foot wide access easement around all storm water management facilities that would provide ingress from and egress to a public right-of-way.

25. A note on the plan indicating the location and responsibility for maintenance of storm water management facilities that would be located off-site shall meet the performance standards and design criteria specified in this Ordinance.

26. A construction detail of any improvements made to sinkholes and the location of all notes to be posted, as specified in this Ordinance.

27. A statement, signed by the landowner, acknowledging the storm water management system to be a permanent fixture that can be altered or removed only after approval of a revised plan by Maxatawny Township.

28. The location of all erosions and sedimentation control facilities.

29. All other data required by the Maxatawny Township Subdivision and Land Development Ordinance.

C. Supplemental Information

1. A written description of the following information shall be submitted.

a. The overall storm water management concept for the project.

b. Stormwater runoff computations as specified in this Ordinance.

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c. Stormwater management techniques to be applied both during and after development.

d. Expected project time schedule.

2. A soil erosion and sedimentation control plan, where applicable, including all reviews and approvals, as required by PaDEP.

3. A geologic assessment of the effects of runoff on sinkholes as specified in this Ordinance.

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

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

D. Stormwater Management Controls and BMPs

1. All stormwater management controls and BMPs shall be shown on a map and described, including:

a. Groundwater recharge methods such as seepage pits, beds or trenches. When these structures are used, the locations of septic tank infiltration areas and wells shall be shown.

b. Other control devices or methods such as roof-top storage, semi-pervious paving materials, grass swales, parking lot ponding, vegetated strips, detention or retention ponds, storm sewers, etc.

2. All calculations, assumptions and criteria used in the design of the BMPs shall be shown.

3. All site testing data used to determine the feasibility of infiltration on a site.

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4. A statement, signed by the landowner, acknowledging that the stormwater BMPs are fixtures that cannot be altered or removed without approval by the municipality.

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

SECTION 4. Plan Submission.

For all activities regulated by this Ordinance, the steps below shall be followed for submission. For any activities that require a PaDEP Joint Permit Application and regulated under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Floodplain Management) of PaDEP's Rules and Regulations, require a PaDOT Highway Occupancy Permit, or require any other permit under applicable state or federal regulations, the permit(s) shall be part of the plan.

A. For Regulated Activities specified in Article I, Sections 5 (A) and (B):

1. The Drainage Plan shall be submitted by the developer to the Maxatawny Township Secretary (or other appropriate person) as part of the Preliminary Plan submission for the subdivision or land development.

2. Four (4) copies of the Drainage Plan shall be submitted.

3. Distribution of the Drainage Plan will be as follows:

a. One (1) copy to Maxatawny Township.

b. Two (2) copies to the Maxatawny Township Engineer.

c. One (1) copy to the Maxatawny Township Solicitor.

4. The submission of the proper fee.

B. For Regulated Activities specified in Article I, Sections 5(B) and (C), the Drainage Plan and appropriate fee shall be submitted by the developer to the Maxatawny Township Code Enforcement Officer as part of the building permit application.

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C. Earthmoving for all regulated activities under Article I, Section 5 shall be conducted in accordance with the current federal and State regulations relative to the NPDES and DEP Chapter 102 regulations after appropriate fees are submitted.

SECTION 5. Drainage Plan Review.

A. Maxatawny Township shall review the Drainage Plan, including the BMP Operations and Maintenance Plan, for consistency with the adopted Little Lehigh Creek Watershed Stormwater Management Plan as embodied by this Ordinance and with any permits issued by DEP. Maxatawny Township shall also review the Drainage Plan against any additional storm drainage provisions contained in the municipal subdivision and land development or zoning ordinance, as applicable.

B. For activities regulated by the Ordinance, the Maxatawny Township Engineer shall notify Maxatawny Township in writing, within forty-five (45) calender days, whether the Drainage Plan is consistent with the Stormwater Management Plan. Should the Drainage Plan be determined to be consistent with the Storm Water Management Plan, the Maxatawny Township Engineer will forward an approval letter to the Maxatawny Township Secretary with a copy to the Developer.

Should the Drainage Plan be determined to be inconsistent with the Storm Water Management Plan, the Maxatawny Township Engineer will forward a disapproval letter to the Maxatawny Township Secretary and Developer citing the reason(s) for the disapproval. Any disapproved Drainage Plans may be revised by the Developer and resubmitted consistent with this Ordinance.

C. For Regulated Activities specified in Article I, Sections 5 (C) and (D) of this Ordinance, the Maxatawny Township Engineer shall notify the Maxatawny Township Building Permit Officer in writing, within a time frame consistent with the Maxatawny Township Building Code and/or Maxatawny Township Subdivision Ordinance, whether the Drainage Plan is consistent with the Storm Water Management Plan and forward a copy of approval/disapproval letter to the Developer. Any disapproved drainage plan may be revised by the Developer and resubmitted consistent with this Ordinance.

D. For Regulated Activities requiring a PaDEP Joint Permit Application, the Maxatawny Township Engineer shall notify PaDEP whether the Drainage Plan is consistent with the Storm Water Management Plan and forward a copy of

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the approval/disapproval letter to the Developer. Any disapproved drainage plan may be revised by the Developer and resubmitted consistent with this Ordinance.

E. Maxatawny Township shall not approve any subdivision or land development for Regulated Activities specified in Article I, Sections 5(A) and (B) of this Ordinance if the Drainage Plan has been found to be inconsistent with the Storm Water Management Plan, as determined by the Maxatawny Township Engineer. All required permits from PaDEP must be obtained prior to approval.

F. The Maxatawny Township Building Permit Office shall not issue a building permit for any Regulated Activity specified in Article I, Section 5 of this Ordinance if the Drainage Plan has been found to be inconsistent with the Storm Water Management Plan, as determined by the Maxatawny Township Engineer, or without considering the comments of the Maxatawny Township Engineer. All required permits from PaDEP must be obtained prior to issuance of a building permit.

G. Maxatawny Township's approval of a Drainage Plan shall be valid for a period not to exceed one (1) year. This one-year time period shall commence on the date that Maxatawny Township signs the approved Drainage Plan. If storm water management facilities included in the approved Drainage Plan have not been constructed, or if an As-Built Survey of these facilities has not been approved within this one-year time period, then Maxatawny Township may consider the Drainage Plan disapproved and may revoke any and all permits. Drainage Plans that are considered disapproved by Maxatawny Township shall be resubmitted in accordance with Article IV, Section of this Ordinance.

H. Maxatawny Township shall notify the applicant in writing whether the BMP Operations and Maintenance Plan is approved.

I. Maxatawny Township shall not approve any subdivision or land development (Regulated Activities, Article I, Sections 5(A) and 5(B)) or building permit application (Regulated Activities, Article I, Sections 5 (C) and 5(D)) if the Drainage Plan has been found to be inconsistent with the Stormwater Management Plan.

J. Maxatawny Township may require an "As-Built Survey" of all stormwater BMPs and an explanation of any discrepancies with the Drainage Plan.

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SECTION 6. Modification of Plans.

A modification to a submitted Drainage Plan for a proposed development site which involves a change in control methods or techniques, or which involves the relocation or redesign of control measures, or which is necessary because soil or other conditions are not as stated on the Drainage Plan (as determined by the municipality) shall require a resubmission of the modified Drainage Plan consistent with Article IV, Section 4 subject to review per Article IV, Section 5 of this Ordinance.

A modification to an already approved or disapproved Drainage Plan shall be submitted to Maxatawny Township, accompanied by the applicable review fee. A modification to a Drainage Plan for which a formal action has not been taken by Maxatawny Township shall be submitted to Maxatawny Township, accompanied by the applicable Maxatawny Township Review Fee.

SECTION 7. Resubmission of Disapproved Drainage Plans.

A disapproved Drainage Plan may be resubmitted, with the revisions addressing the Maxatawny Township Engineer's concerns documented in writing, to the Maxatawny Township Engineer in accordance with Article IV, Section 4 of this ordinance and subject to the applicable review as specified in Article IV, Section 5 of this Ordinance. The applicable Maxatawny Township Review Fee must accompany a resubmission of a disapproved Drainage Plan.

SECTION 8. Hardship Waiver Procedure.

Maxatawny Township may hear requests for waivers where it is alleged that the provisions of this Ordinance inflict unnecessary hardship upon the applicant. The waiver request shall be in writing and accompanied by the requisite fee based upon a fee schedule adopted by Maxatawny Township. A copy of the waiver request shall be provided to each of the following: municipality, municipal engineer, municipal solicitor and Berks County Planning Commission. The request shall fully document the nature of the alleged hardship.

Maxatawny Township may grant a waiver provided that all of the following findings are made in a given case:

1. That there are unique physical circumstances or conditions, including irregularity of lot size or shape, or exceptional topographical or other physical conditions peculiar to the particular property, and that the unnecessary hardship is due to such conditions, and not the circumstances or conditions generally created by the provisions of this

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Ordinance in the Stormwater Management District in which the property is located;

2. That because of such physical circumstances or conditions, there is no possibility that the property can be developed in strict conformity with the provisions of this Ordinance, including the "no harm" provisions, and that the authorization of a waiver is therefore necessary to enable the reasonable use of the property;

3. That such unnecessary hardship has not been created by the applicant;

4. That the waiver, if authorized, will represent the minimum waiver that will afford relief and will represent the least modification possible of the regulation in issue; and

5. That financial hardship is not the criteria for granting of a hardship waiver.

In granting any waiver, Maxatawny Township may attach such conditions and safeguards as it may deem necessary to implement the purposes of this Ordinance. If a Hardship Waiver is granted, the applicant must still manage the quantity, velocity, direction and quality of resulting storm runoff as is necessary to prevent injury to health, safety or other property.

A. For all Regulated Activities described in Article I, Section 5, the Board of Supervisors shall hear requests for and decide on hardship waiver requests on behalf of Maxatawny Township.

B. Maxatawny Township shall not waive the water quality provisions of this Ordinance.

ARTICLE V
INSPECTIONS

SECTION 1. Schedule of Inspections.

A. DEP or its designees (e.g. County Conservation District) normally ensure compliance with any State permits issued, including those of stormwater management. In addition to DEP compliance programs, Maxatawny

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Township or its designee may inspect all phases of the construction, operations, maintenance and any other implementation of stormwater BMP's.

B. During any stage of the Regulated Earth Disturbance activities, if Maxatawny Township or its designee determines that any BMPs are not being implemented in accordance with this Ordinance, Maxatawny Township may suspend or revoke any existing permits or other approvals issued by the Township until the deficiencies are corrected.

ARTICLE VI
FEES AND EXPENSES

SECTION 1. General.

The fees required by this Ordinance are the Maxatawny Township Municipal Review Fee. The Maxatawny Township Municipal Review Fee shall be established by Resolution to defray review costs incurred by Maxatawny Township. All fees shall be paid by the Applicant.

SECTION 2. Maxatawny Township Drainage Review Fee.

Maxatawny Township shall establish a Review Fee Schedule based on the Regulated Activity and based on Maxatawny Township's costs for reviewing Drainage Plans. Maxatawny Township shall periodically update the Review Fee Schedule to ensure that review costs are adequately reimbursed.

SECTION 3. Expenses Covered by Fees

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

A. The review of the BMP Operations and Maintenance Plan by Maxatawny Township.

B. The site inspection.

C. The inspection of required controls and improvements during construction.

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D. The final inspection upon completion of the controls and improvements required in the plan.

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

F. Administrative and clerical costs.

G. Legal and engineering review expenses and document preparation.

ARTICLE VII
STORMWATER BMP OPERATIONS AND MAINTENANCE PLAN REQUIREMENTS

SECTION 1. General Requirements.

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

SECTION 2. Performance Guarantee.

The applicant at the discretion of the Township, may be required to provide financial guarantee to Maxatawny Township for the timely installation and proper construction of all stormwater management controls, including BMP's and this ordinance equal to full construction cost of the required controls, plus ten (10%) percent contingencies.

SECTION 3. Responsibilities for Operations and Maintenance of BMPs.

A. The Drainage Plan, including BMP Operations and Maintenance Plan, for the project site shall contain and operation and maintenance plan prepared by the developer and approved by Maxatawny Township. The operation and maintenance plan shall outline required routine maintenance and schedules necessary to insure proper operation of the facility(ies). The operation and maintenance plan shall be the exclusive responsibility of the developer.

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B. The Drainage Plan, including BMP Operations and Maintenance Plan, for the project site shall establish responsibilities for the continuing operation and maintenance of all proposed stormwater control facilities, consistent with the following principles:

1. If a Plan includes structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to Maxatawny Township, stormwater facilities, including BMP's, may also be dedicated to and maintained by Maxatawny Township, after a Maintenance Agreement is established per Article VII, Section 5.

2. If a Plan includes operations and maintenance by a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater facilities, including BMP's, shall be the responsibility of the owner or private management entity.

C. Maxatawny Township shall make the final determination on the continuing operations and maintenance responsibilities. Maxatawny Township reserves the right to accept or reject the operations and maintenance responsibility for any or all of the stormwater facilities, including BMP's

SECTION 4. Adherence to Approved BMP Operations and Maintenance Plan.

It shall be unlawful to alter or remove any permanent stormwater BMP required by an approved BMP Operations and Maintenance Plan or to allow the property to remain in a condition which does not conform to an approved BMP Operations and Maintenance Plan unless an exception is granted in writing by Maxatawny Township.

SECTION 5. Operations and Maintenance Agreement for Privately Owned Stormwater BMPs

A. The property owner shall sign an operations and maintenance agreement with the municipality covering all stormwater BMPs that are to be privately owned. The agreement shall include the terms of the format agreement referenced in Appendix E of this Ordinance.

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B. Other items may be included in the agreement where determined by Maxatawny Township to be reasonable or necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater BMPs. The agreement shall be subject to the review and approval of Maxatawny Township.

SECTION 6. Stormwater Easements.

Stormwater management easements shall be provided by the property owner if necessary for access for inspections and maintenance or for preservation of stormwater conveyance, infiltration, detention areas and other BMPs by persons other than the property owner. The purpose of the easement shall be specified in any agreement under Article VII, Section 5.

SECTION 7. Filing of Approved BMP Operations and Maintenance of Plan and Related Agreements.

A. The owner of any land upon which permanent BMPs will be placed, constructed or implemented, as described in the BMP Operations and Maintenance Plan, shall file the following documents with Maxatawny Township within 90 days of approval of the BMP Operations Plan by Maxatawny Township:

1. The Operations and Maintenance Plan or a summary thereof.

2. Operations and Maintenance Agreements under Article VII, Section 5.

3. Easements under Article VII, Section 6.

B. Maxatawny Township may suspend or revoke any approvals granted for the project site upon discovery of the failure of the owner to comply with this Section.

SECTION 8. Maxatawny Township Stormwater Maintenance Fund.

A. Persons installing stormwater facilities, including BMP's, shall be required to pay a specified amount to the Maxatawny Township Stormwater Maintenance Fund to help defray costs of periodic inspections and maintenance inspections. The amount of the deposit shall be determined as follows:

1. If the stormwater facility, including BMP's is to be privately owned and maintained, the deposit shall cover the cost of periodic

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inspections performed by Maxatawny Township for a period of ten (10) years, as estimated by the Township.

2. If the stormwater facility, including BMP's is to be owned and maintained by Maxatawny Township, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years, as determined by the Township.

3. The amount of the deposit to the fund shall be converted to persent worth of the annual series value.

B. If a stormwater facility, including BMP's is proposed that also serves as a recreation facility (e.g. ball field, lake), Maxatawny Township may reduce or waive the amount of the maintenance fund deposit based upon the value of land for public recreation purpose.

C. If at some point a Stormwater facility, including BMP's, (whether publicly or privately owned) is eliminated due to the installation of other stormwater facilities, including BMP's, the unused portion of the maintenance fund deposit will be applied to the cost of abandoning the facility and connecting to the storm sewer system or other facility. Any amount of deposit remaining after the costs of abandonment are paid will be returned to the depositor.

ARTICLE VIII
PROHIBITIONS

SECTION 1. Prohibited Discharges.

A. No person in Maxatawny Township shall allow or cause to allow stormwater discharges into the Township's separate storm sewer system which are not composed entirely of stormwater except as provided in subsection B below or as allowed under a State or Federal Permit.

B. Discharges that may be allowed based on Maxatawny Township finding that the discharge(s) do not significantly contribute pollution to surface waters of the Commonwealth are listed below.

1. Discharges from fire fighting activities

2. Potable water sources including dechlorinated water line and fire hydrant flushings

3. Irrigation drainage

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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. Springs

8. Water from crawl space pumps

9. Uncontaminated water from foundation or from footing drains

10. Flows from riparian habitats and wetlands

11. Lawn watering

12. Pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless spill material has been removed) and where detergents are not used.

13. Dechlorinated swimming pool discharges

14. Uncontaminated groundwater

C. In the event that Maxatawny Township determines that any of the discharges identified in Article VIII, Section 1(B) significantly contribute to pollution of waters of the Commonwealth or is so notified by DEP, Maxatawny Township will notify the responsible person to cease the discharge.

D. Upon notice provided by Maxatawny Township under Article VIII, Section 1(C), the discharger will have a reasonable time, as determined by the Township, to cease the discharge consistent with the degree of pollution caused by the discharge.

E. Nothing in this Section shall affect a discharger's responsibilities under State law.

SECTION 2. Prohibited Connections.

A. The following connections are prohibited, except as provided in Article VIII, Section 1(B) above:

1. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage,

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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.

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 Maxatawny Township.

SECTION 3. Roof Drains.

A. Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches, except as provided in Article VIII, Section 3(B).

B. When it is more advantageous to connect directly to streets or storm sewers, the connections of roof drains to streets or roadside ditches may be permitted by Maxatawny Township.

C. Roof drains shall discharge to infiltration areas or vegetative BMPs to the maximum extent practicable.

SECTION 4. Alterations of BMPs.

A. No person shall modify, remove, fill, landscape or alter any existing stormwater BMP without the written approval of Maxatawny Township unless it is part of an approved maintenance program.

B. No person shall place any structure, fill, landscaping or vegetation into a stormwater BMP or within a drainage easement, which would limit or alter the functioning of the BMP, without the written approval of Maxatawny Township.

ARTICLE IX
RIGHT OF ENTRY, NOTIFICATION AND ENFORCEMENT

SECTION 1. Right of Entry.

A. Upon presentation of proper credentials, duly authorized representatives of Maxatawny Township may enter at reasonable times upon an property within the Township to inspect the implementation, condition or operation and maintenance of the stormwater BMPs or to investigate or ascertain the condition of the subject property in regard to any aspect regulated by this Ordinance.

B. BMP owners and operators shall allow persons working on behalf of

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Maxatawny Township ready access to all parts of the premises for the purposes of determining compliance with this Ordinance.

C. Persons working on behalf of Maxatawny Township shall have the right to temporarily locate on any BMP in Maxatawny Township such devices as are necessary to conduct monitoring and/or sampling of the discharges from such BMPs.

D. Unreasonable delays in allowing Maxatawny Township access to a BMP is a violation of this Article.

SECTION 2. Notification.

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

1. The performance of monitoring, analyses and reporting

2. The elimination of prohibited connections or discharges

3. Cessation of any violating discharges, practices or operations

4. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property

5. Payment of a fine to cover administrative and remediation costs

6. The implementation of stormwater BMPs

7. Operation and maintenance of stormwater BMPs

B. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violation(s), usually sixteen (16) days. Said notice may further advise that should the violator fail to take the required action within the established deadline, the work will be done by Maxatawny Township or designee and the expense thereof, together with all related lien and enforcement fees, charges and expenses, 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 Maxatawny Township from pursuing any and all other remedies available in law or equity.

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D. It shall be the responsibility of the owner of the real property on which the Regulated Activity is proposed to occur, is occurring, or has occurred, to comply with the terms and conditions of this Ordinance.

SECTION 3. Public Nuisance.

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

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

SECTION 4. Liability Disclaimer.

A. Neither the granting of any approval nor the compliance with the provisions of this Ordinance or with any condition imposed by Maxatawny Township, or its officials, employees or designated representatives hereunder,shall relieve any person from any responsibility for any damage to persons or perty resulting therefrom, or as otherwise imposed by law, nor impose any liability upon Maxatawny Township, its officials, employees or designated representatives to the maximum extent permitted by law.

B. The granting of any permit which includes any stormwater management and/or BMP requirements shall not constitute a representation, guarantee or warranty f any kind by the Maxatawny Township offiicals, employees or designated representatives thereof, or the practicability or safety of any stormwater structures or facility or BMP, use or other plan proposed, and shall create no liability or cause of action upon Maxatawny Township, its officials, employees, or designated representatives for any damage that may result pursuant thereto to the maximum extent permitted by law.

SECTION 5. Suspension and Revocation of Permits and Approvals.

A. Any building, land development or other permit or approval issued by Maxatawny Township may be suspended or revoked by the Township for:

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

2. A violation of any provision of this Ordinance

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

B. A suspended permit or approval shall be reinstated by Maxatawny

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Township when:

1. The Township or its designee has inspected and approved the corrections to the stormwater BMPs or the elimination of the hazard or nuisance.

2. Maxatawny Township is satisfied that the violation of this Ordinance, law or rule and regulation has been corrected.

3. Payment of all Township fees, costs and expenses related to or arising from the violation has been made.

C. A permit or approval which has been revoked by Maxatawny Township cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Ordinance.

SECTION 6. Enforcement.

A. Notices. Whenever Maxatawny Township or designee determines that there are reasonable grounds to believe that there has been a violation of any provisions of this Ordinance, or of any regulation adopted pursuant thereto, the Township or Township designee shall give notice of such alleged violation as hereinafter provided. Such notice shall (a) be in writing; (b) include a statement of the reasons for its issuance; (c) allow a reasonable time, not to exceed thirty (30) days, for the performance of any act it requires; (d) be served upon the property owner or his agent as the case may require; provided, however, that such notice or order shall be deemed to have been properly served upon such owner or agent when a copy thereof has been served with such notice by any method authorized or required by the laws of the Commonwealth; and (e) contain an outline of remedial action which, if taken, will effect compliance with the provisions of this Ordinance.

B. Penalties.

1. Any person or entity who fails to comply with any or all of the requirements or provisions of this Ordinance or who fails or refuses to comply with any notice, order or direction of the Building Permit Officer/Code Enforcement Officer or other authorized employee of Maxatawny Township shall be subject to the civil enforcement procedures, fines and schedule of fines as set forth in the "Civil/Criminal Enforcement Ordinance of Maxatawny Township". The imposition of a fine or penalty for any violation of, or non-compliance with, this Ordinance shall not excuse the violation or non-compliance within a reasonable time. Any development initiated for any structure or building constructed, reconstructed,

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enlarged, altered, or relocated, in non-compliance with this Ordinance may be declared by the Township to be a public nuisance and abatable as such.

2. In addition, Maxatawny Township, through its solicitor, may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunction, mandamus or other appropriate forms of remedy or relief. A violation of this Ordinance shall constitute irreparable harm for purposes of injunctive relief.

SECTION 7. Appeals.

Any person aggrieved by any action of Maxatawny Township or its designee relevant to the provisions of this ordinance may appeal using the appeal procedures in the Pennsylvania Municipalities Planning Code.

SECTION 8. Miscellaneous.

A. All ordinances or parts of ordinances inconsistent with the provisions of this Ordinance are hereby repealed insofar, but only insofar, as the same are inconsistent herewith.

B. The provisions of this Ordinance are severable and if any provision or part thereof shall be held invalid, unconstitutional or inapplicable to any person or circumstances, such invalidity, unconstitutionality or inapplicability shall not effect or impair the remaining provisions or parts thereof of this Ordinance.

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SECTION 9. Effective Date.

This Ordinance shall take place within five (5) days from the date set forth below.

BOARD OF SUPERVISORS
MAXATAWNY TOWNSHIP, BERKS
COUNTY, PENNSYLVANIA

Carl E. Zettlemoyer, Chairman

Allen Leiby, Supervisor

Gayle Sanders, Supervisor

Date: 12/14/05

Township Secretary
Attest

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ARTICLE X
APPENDIXES

A. Map of Little Lehigh Creek Watershed.

B. Map of Storm Drainage Problem Areas.

C. Rainfall Distributions and Runoff Coefficients.

D. Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock

E. Stormwater Facilities and Best Management Practices Operations and Maintenance Agreement.

F. Low Impact Development Practices.

G. Preliminary Site Investigation and Testing Requirements.

H. Calibrated Watershed Peak Flow Values

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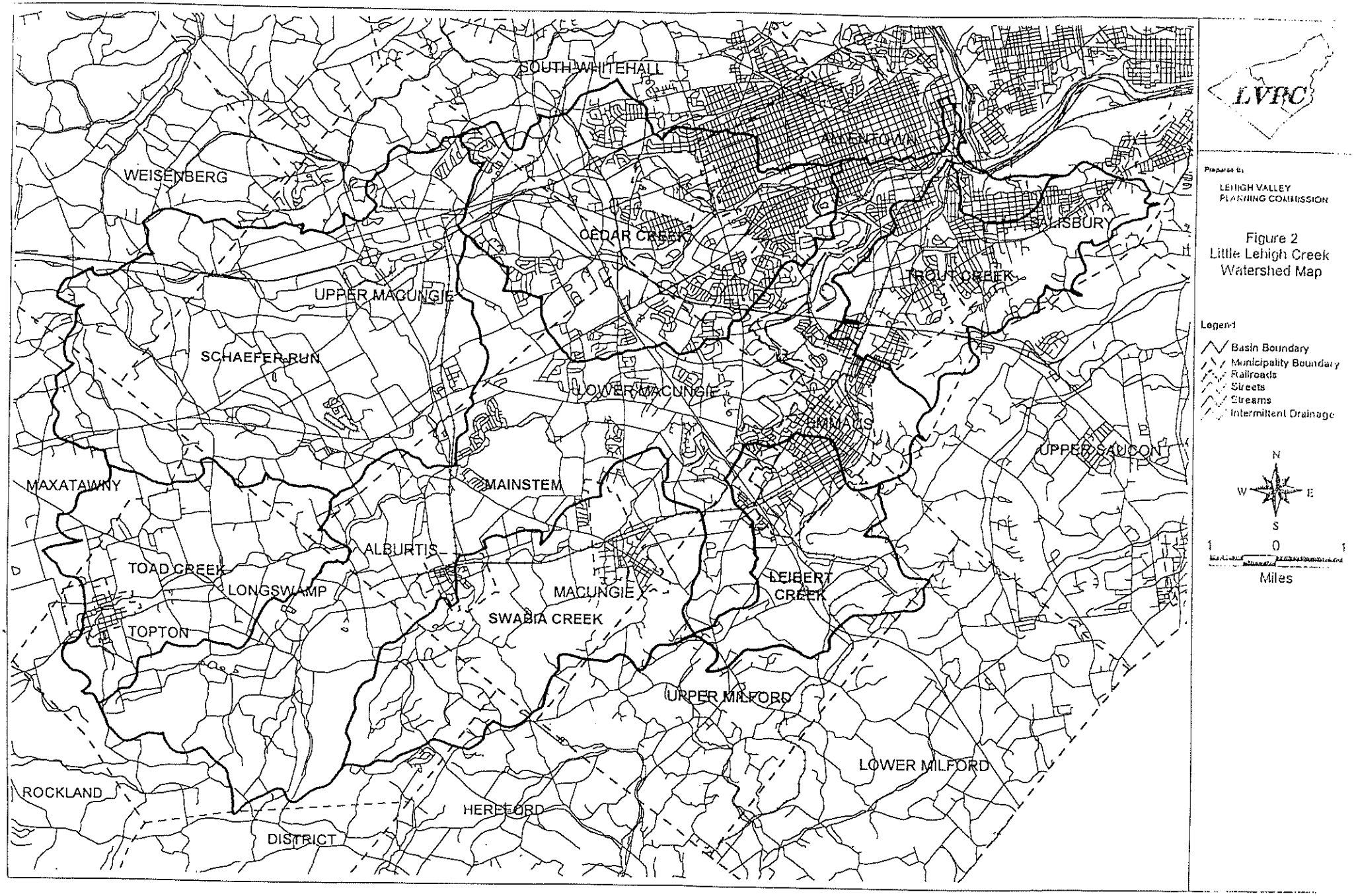
APPENDIX A

A-1 MAP OF LITTLE LEHIGH CREEK WATERSHED

A-2 MUNICIPAL MAP OF STORMWATER MANAGEMENT DISTRICTS


SOUTH WHITEHALL
ALLENTOWN
WEISENBERG
CEDAR CREEK
SALISBURY
TROUT CREEK
UPPER MACUNGIE
SCHAEFER RUN
LOWER MACUNGIE
EMMAUS
UPPER SAUCON
MAXATAWNY
MAINSTEM
ALBURTIS
TOAD CREEK
LONGSWAMP
MACUNGIE
LEIBERT CREEK
SWABIA CREEK
TOPTON
UPPER MILFORD
LOWER MILFORD
ROCKLAND
HEREFORD
DISTRICT
LVPC
Prepared by:
LEHIGH VALLEY PLANNING COMMISSION
Figure 2
Little Lehigh Creek Watershed Map
Legend
Basin Boundary
Municipality Boundary
Railroads
Streets
Streams
Intermittent Drainage
N
W
E
S
1
0
1
Miles

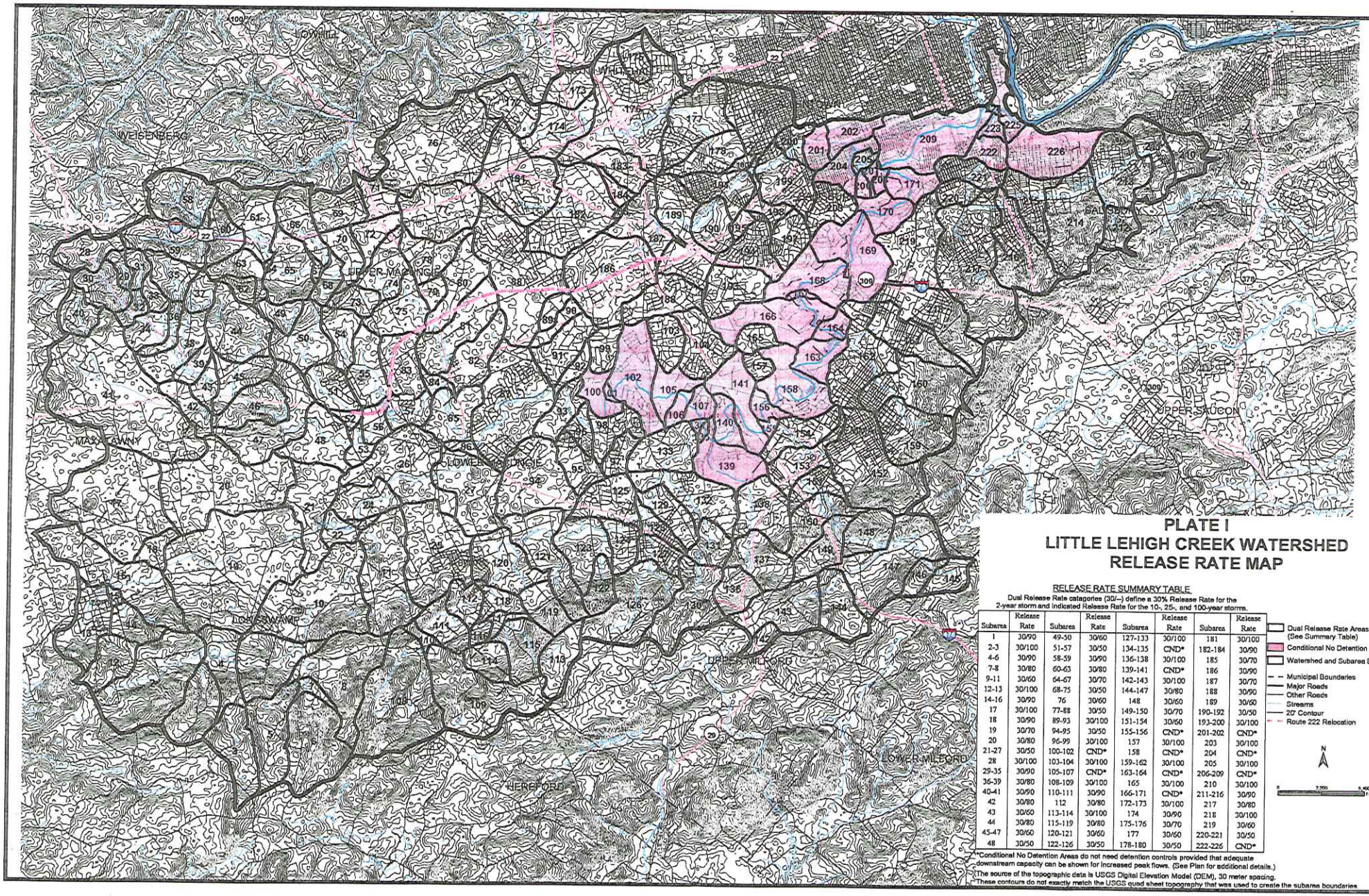


PLATE I
LITTLE LEHIGH CREEK WATERSHED
RELEASE RATE MAP

RELEASE RATE SUMMARY TABLE

Dual Release Rate categories (30/–) define a 30% Release Rate for the 2-year storm and indicated Release Rate for the 10-, 25-, and 100-year storms.

Subarea	Release Rate	Subarea	Release Rate	Subarea	Release Rate	Subarea	Release Rate
1	30/90	49-50	30/60	127-133	30/100	181	30/100
2-3	30/100	51-57	30/50	134-135	CND*	182-184	30/90
4-6	30/90	58-59	30/90	136-138	30/100	185	30/70
7-8	30/80	60-63	30/80	139-141	CND*	186	30/90
9-11	30/60	64-67	30/70	142-143	30/100	187	30/70
12-13	30/100	68-75	30/50	144-147	30/80	188	30/90
14-16	30/90	76	30/60	148	30/60	189	30/60
17	30/100	77-88	30/50	149-150	30/70	190-192	30/50
18	30/90	89-93	30/100	151-154	30/60	193-200	30/100
19	30/70	94-95	30/50	155-156	CND*	201-202	CND*
20	30/80	96-99	30/100	157	30/100	203	30/100
21-27	30/50	100-102	CND*	158	CND*	204	CND*
28	30/100	103-104	30/100	159-162	30/100	205	30/100
29-35	30/90	105-107	CND*	163-164	CND*	206-209	CND*
36-39	30/80	108-109	30/100	165	30/100	210	30/100
40-41	30/90	110-111	30/90	166-171	CND*	211-216	30/90
42	30/80	112	30/80	172-173	30/100	217	30/80
43	30/60	113-114	30/100	174	30/90	218	30/100
44	30/80	115-119	30/80	175-176	30/70	219	30/60
45-47	30/60	120-121	30/60	177	30/60	220-221	30/50
48	30/50	122-126	30/50	178-180	30/50	222-226	CND*

*Conditional No Detention Areas do not need detention controls provided that adequate downstream capacity can be shown for increased peak flows. (See Plan for additional details.)

The source of the topographic data is USGS Digital Elevation Model (DEM), 30 meter spacing.
These contours do not exactly match the USGS quad sheet topography that was used to create the subarea boundaries.

- Dual Release Rate Areas (See Summary Table)
- Conditional No Detention
- Watershed and Subarea Boundaries
- Municipal Boundaries
- Major Roads
- Other Roads
- Streams
- 20' Contour
- Route 222 Relocation

N

0 3,200 6,400 Feet

APPENDIX B

B-1 MAP OF STORM DRAINAGE PROBLEM AREAS

B-2 DESCRIPTION OF STORMWATER DRAINAGE PROBLEM AREAS

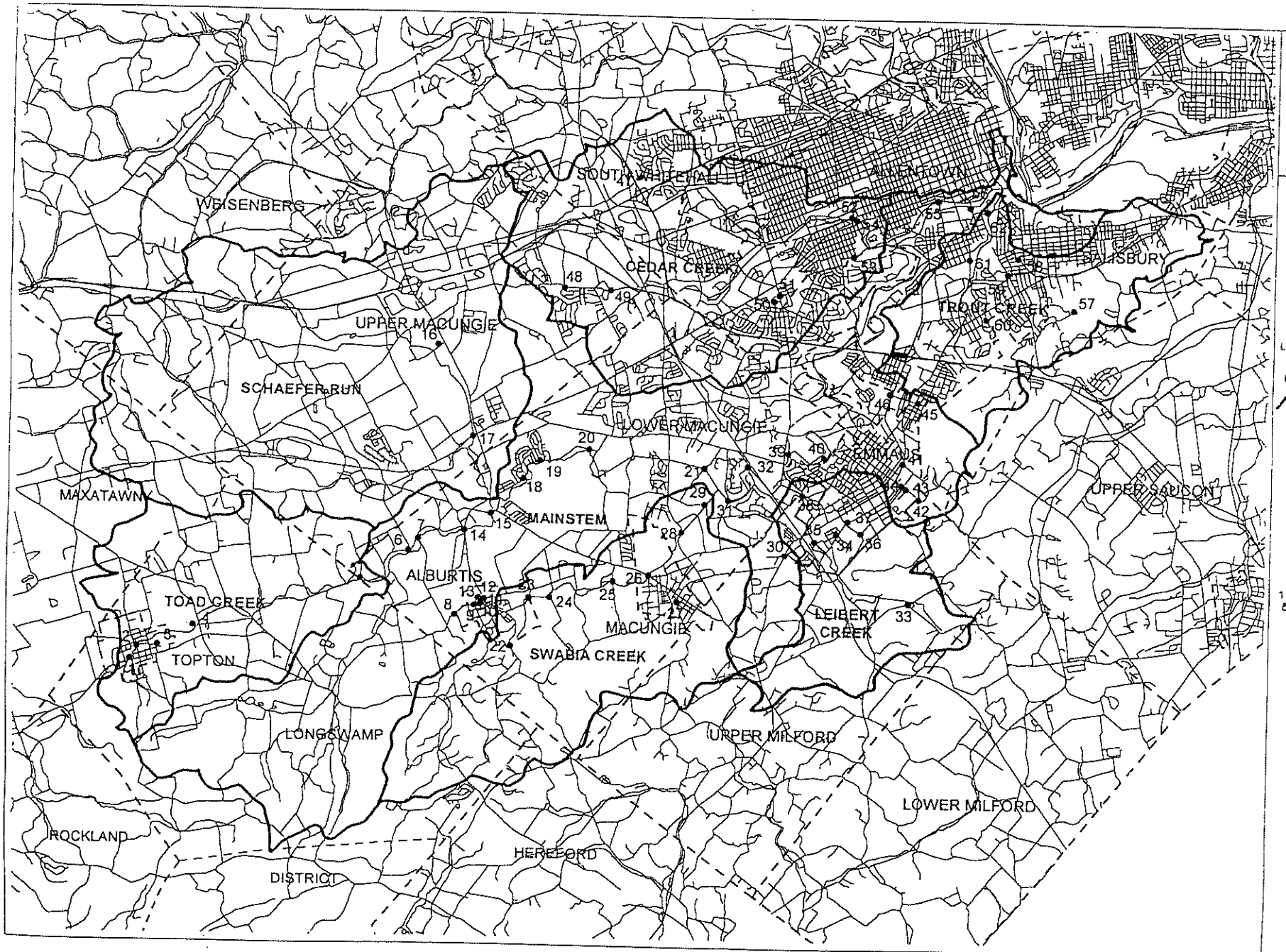

WEISENBERG
SOUTH WHITEHALL
ALLENTOWN
CEDAR CREEK
TROUT CREEK
SALISBURY
UPPER MACUNGIE
SCHAEFER RUN
LOWER MACUNGIE
EMMAUS
MAXATAWNY
MAINSTEM
UPPER SAUCON
ALBURTIS
TOAD CREEK
MACUNGIE
LEIBERT CREEK
TOPTON
SWABIA CREEK
LONGSWAMP
UPPER MILFORD
LOWER MILFORD
ROCKLAND
HEREFORD
DISTRICT
LVPC
Prepared by
LEHIGH VALLEY PLANNING COMMISSION
Figure 7
Little Lehigh Creek
Problem Area Map
Legend
Drainage Problem Location
00 Drainage Problem Number Keyed to Table 12
Watershed Basins
N
W
E
S
1
0
1
Miles

TABLE 12

LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
TOAD CREEK						
1.	Borough Park	Topton	Flooding and bank erosion	13	12	Dredging and Rip-Rap
2.	W. Franklin St. and Haas St.	Topton	Street flooding	13	12	Dredging and Rip-Rap
3.	Furnace Street	Topton	Street flooding	16	15	Dredging and Channel Modification
4.	Topton Sewage Treatment Plant	Longswamp	Flooding	16	15	Dredging and Rip-Rap
5.	Ash Lane north of Mertztown Rd.	Lower Macungie	Street Flooding	22	21	Channel Dredging/Realignment
LITTLE LEHIGH MAINSTEM						
6.	Mertztown Rd. west of Butz Rd.	Lower Macungie	Street Flooding	24	23	Channel Dredging/Realignment
7.	Smith Lane south of Mertztown Rd.	Lower Macungie	Street Flooding	24	23	Channel Dredging/Realignment
8.	Front Street - west end	Alburtis	Street Flooding	25	-	Enlarged Culvert
9.	Front and Walnut Streets	Alburtis	Street and field flooding	25	-	Enlarged Culvert
10.	Front and Chestnut Streets	Alburtis	Street Flooding	25	-	Enlarged Culvert
11.	Main and East Penn. Ave.	Alburtis	Street and property flooding	25	-	Storm Sewers
12.	West Penn Ave.	Alburtis	Street and building flooding	25	-	Enlarged Culvert

TABLE 12

LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
13.	North of West Penn. Ave	Alburtis	Field flooding	25	-	Channel Improvement
14.	Weilers Rd. at Little Lehigh Creek	Lower Macungie	Street Flooding	27	26	Channel Dredging/Realignment
15.	Creamery Road at Little Lehigh Creek	Lower Macungie	Street Flooding	27	26	Channel Dredging/Realignment
			SCHAEFER RUN			
16.	Iron Run near Township School	Upper Macungie	Property flooding	75	74	Stream Cleaning
17.	Rt. 222 west of Trexlertown	Upper Macungie	Street flooding	84	57, 82, 83	Stream Cleaning
			LITTLE LEHIGH MAINSTEM			
18.	Spring Creek Rd. between Beech and Laurel	Lower Macungie	Street Flooding	87	86	Channel Dredging/Realignment
19.	Spring Creek Rd. between Heather and Oak	Lower Macungie	Street Flooding	87	86	Channel Dredging/Realignment
20.	Spring Creek Rd.- West of Mill Creek Road	Lower Macungie	Street and field flooding	93	-	Channel Dredging/Realignment
21.	Wild Cherry Lane at Little Lehigh	Lower Macungie	Street Flooding	106	105	Channel Dredging/Realignment

TABLE 12

LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
SWABIA CREEK						
22.	Franklin St. at Borough line South	Alburtis	Street flooding	112	111	Church St. Bridge Replacement
23.	Church St. at Borough line East	Alburtis/Lower Macungie	Street flooding	120	118	Bridge Replacement and Channel Dredging/Realignment
24.	Schoeneck Road at Swabia Creek	Lower Macungie	Street flooding	121	120	Channel Dredging/Realignment
25.	Gehman`s Road at Swabia Creek	Lower Macungie	Street flooding	123	121	Channel Dredging/Realignment
26.	West Main Street	Macungie	Street flooding	125	124	None Proposed
27.	Vine Street and Carpenter Street	Macungie	Street flooding	127		Storm Sewers
28.	Brookside Road at Swabia Creek	Lower Macungie	Street flooding	132	129	Channel Dredging/Realignment
29.	Sauerkraut Lane at Swabia Creek	Lower Macungie	Street flooding	133	132	Channel Dredging/Realignment

TABLE 12

LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
LITTLE LEHIGH MAINSTEM						
30.	Chestnut Street	Upper Milford	Street Flooding	138	-	Storm Sewers
31.	Macungie Road at Little Lehigh	Lower Macungie	Street Flooding	139	135	Channel Dredging/Realignment
32.	Millrace Road at Little Lehigh	Lower Macungie	Street Flooding	140	139	Channel Dredging/Realignment
LEIBERT CREEK						
33	East Main Rd. at Acorn Drive	Upper Milford	Street flooding	147	146	Enlarged Culvert
34.	South 12th Street	Emmaus	Street flooding	151	-	Storm Sewers
35.	Emmaus Community Park and Pool	Emmaus	Pool and property flooding	151	150	Channelize/Dredge Stream
36.	Furnace Dam at 10th and Furnace	Emmaus	Property flooding North of dam	152	-	Detention Facility and Enlarged Conveyor Pipe
37.	Broad St. at Fir Street	Emmaus	Street and property flooding	152	-	Enlarged Culvert and Dredge Stream
38.	Indian Creek Road	Upper Milford	Street flooding	154	153	Replace PennDOT Culverts with Bridge

TABLE 12

LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
LITTLE LEHIGH MAINSTEM						
39.	Farr Road at Little Lehigh	Lower Macungie	Street Flooding	158	156	Channel Dredging/Realignment
40.	Orchid Place - West Of Orchid Circle	Lower Macungie	Street Flooding	158	156	Channel Dredging/Realignment
41.	Main Street at Klines Lane	Emmaus	Street Flooding	159	159	Enlarged Culverts
42.	South Second Street	Upper Milford	Street and property flooding	159	-	None proposed.
43.	Foundry Alley	Emmaus	Street and property flooding	159	-	None proposed.
44.	South Second St. at Adrian/ Peach/Keystone Sts.	Emmaus	Street and property flooding	159	-	Property Acquisition and Detention Facility
45.	Fox Street	Emmaus	Street Flooding	161	-	Storm Sewers and Detention Facility
46.	Lehigh Street (at South Mall)	Salisbury	Property Flooding	161	-	None proposed.
CEDAR CREEK						
47	Crackersport Rd. near Days Inn	South Whitehall	Street flooding	176	-	None Proposed
48.	Holiday Hills Area (Schantz Rd.)	Upper Macungie	Street, field and lawn flooding	181	-	Strom Sewers
49.	Muth Rd. / Schantz Rd. / Cetronia Rd. area	Upper Macungie	Street and field flooding/erosion	182	181	None Proposed

TABLE 12

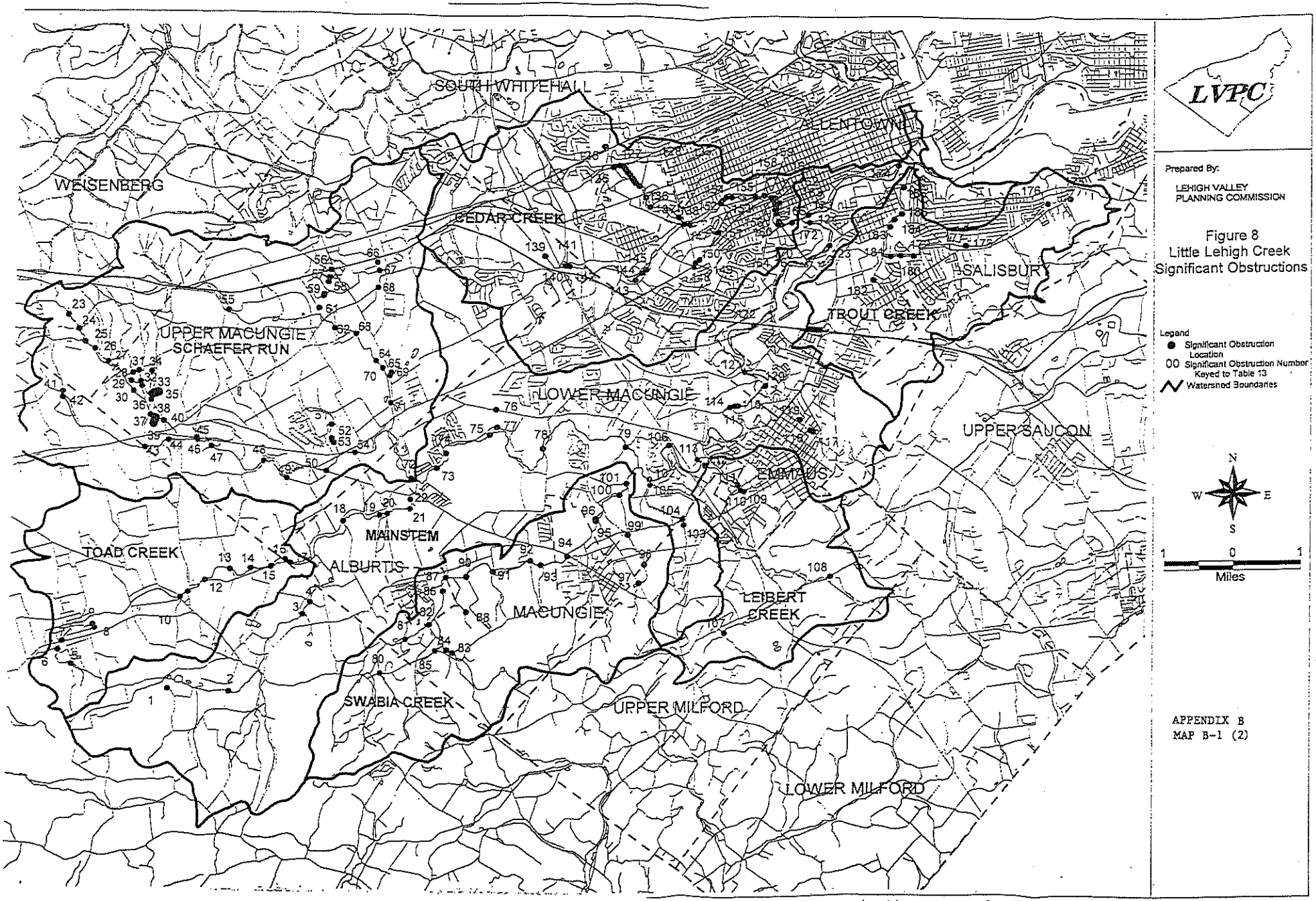
LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
50.	Glick Avenue	South Whitehall	Street flooding	194	193	Storm Sewers
51.	Mosser Drive and Cedar Crest Blvd.	South Whitehall	Street flooding	198	-	Storm Sewers
52.	Hamilton St. between Saint Elmo and 21st Streets	Allentown	Stream overbanking	202	201	Stream Cleaning, Straightening, Widening
53.	Greenwood Rd. and Mosser St.	Allentown	Property flooding	204	203	Detention Facility
54.	Walnut St. between Lafayette and Saint Elmo Streets	Allentown	Stream overbanking	205	202	Stream Cleaning, Straightening, Widening
			LITTLE LEHIGH MAINSTEM			
55.	10th and Martin Luther King Jr. Blvd.	Allentown	Street Flooding	209	-	None proposed.
56.	Lehigh Street at Mill Street	Allentown	Street Flooding and Stream Overbanking	209	208	Stream cleaning at bridge.
			TROUT CREEK			
57.	East Mountain Road	Salisbury	Property flooding	215	-	Diversion Ditch
58.	Floodplain in vicinity of Paoli & Chapel Ave. and Trout Creek	Allentown	Street flooding and stream overbanking	215	-	Storm Sewers
59.	South 4th and Brookdale Sts.	Allentown	Street flooding	215	214	None Proposed

TABLE 12

LITTLE LEHIGH CREEK WATERSHED
STORM DRAINAGE PROBLEM AREAS

No.	Location	Municipality	Problem Description	Subarea No.	Reach No.	Proposed Solution
60.	Mountainville - Areas Downstream of Walden Park area (S. Church, Euclid, So. 8th Sts.)	Allentown	Street flooding	217	-	Storm Sewers
61.	8th St. at Underpass (Mack Blvd.)	Allentown	Street flooding	220	217, 219	New Culvert
62.	4th St. and Harrison, 4th St. and Auburn	Allentown	Street overbanking	223	222	Future channel improvements


SOUTH WHITEHALL
ALLENTOWN
WEISENBERG
CEDAR CREEK
SALISBURY
TROUT CREEK
UPPER MACUNGIE
SCHAEFER RUN
LOWER MACUNGIE
UPPER SAUCON
EMMAUS
MAINSTEM
TOAD CREEK
ALBURTIS
MACUNGIE
LEIBERT CREEK
SWABIA CREEK
UPPER MILFORD
LOWER MILFORD
LVPC
Prepared By:
LEHIGH VALLEY PLANNING COMMISSION
Figure 8
Little Lehigh Creek
Significant Obstructions
Legend
Significant Obstruction Location
00 Significant Obstruction Number Keyed to Table 13
Watershed Boundaries
N
W
E
S
1 0 1
Miles
APPENDIX B
MAP B-1 (2)

APPENDIX B
TABLE B-2 (2)

LITTLE LEHIGH CREEK WATERSHED SIGNIFICANT OBSTRUCTIONS

Number*	Obstruction	Municipality	Approximate Flow Capacity (cfs)**
1	Longsdale Road	Longswamp Township	51
2	Private Road	Longswamp Township	645
3	Hilltop Road	Longswamp Township	598
4	Ash Lane	Longswamp Township	153
5	Woodside Avenue	Longswamp Township	93
6	Callow Hill	Borough of Topton	32
7	Main Street	Borough of Topton	93
8	Smith Road	Borough of Topton	90
9	Penn Street	Borough of Topton	98
10	Barclay Street	Longswamp Township	150
11	Farmington Road	Longswamp Township	55
12	Brooksdale Road	Longswamp Township	53
13	Mertz Road	Longswamp Township	133
14	Private Road	Longswamp Township	482
15	Private Road	Longswamp Township	747
16	Ash Lane[1]	Lower Macungie Township	636
17	Mertztown Road[2]	Lower Macungie Township	777
18	Smith Lane[3]	Lower Macungie Township	1,265
19	Private Road	Lower Macungie Township	160
20	Spring Creek Road	Lower Macungie Township	2,271
21	Rail Road Bridge	Lower Macungie Township	1,671
22	Creamery Road[4]	Lower Macungie Township	253
23	Route 863 (Independent Road)	Weisenberg Township	59
24	Route 863 (Independent Road)	Weisenberg Township	88
25	Helfrich Road	Weisenberg Township	41
26	Route 863 (Independent Road)	Weisenberg Township	30
27	Route 863 (Independent Road)	Weisenberg Township	79
28	Private Drive	Upper Macungie Township	8
29	Route 863 (Independent Road)	Upper Macungie Township	18
30	Private Drive	Upper Macungie Township	251
31	Private Drive	Upper Macungie Township	15
32	Private Drive	Upper Macungie Township	45
33	Route 863 (Independent Road)	Upper Macungie Township	15
34	Private Drive	Upper Macungie Township	15
35	Zeigel's Church Rd.	Upper Macungie Township	15
36	Route 863 (Independent Drive)	Upper Macungie Township	15
37	Folk Road	Upper Macungie Township	122
38	Private Drive	Upper Macungie Township	58
39	Private Drive	Upper Macungie Township	43
40	Route 863 (Independent Drive)	Upper Macungie Township	444
41	Private Drive	Maxatawny Township	33

LITTLE LEHIGH CREEK WATERSHED SIGNIFICANT OBSTRUCTIONS

Number*	Obstruction	Municipality	Approximate Flow Capacity (cfs)**
42	Albright Road	Maxatawny Township	98
43	Folk Road	Upper Macungie Township	71
44	Route 863 (Independent Drive)	Upper Macungie Township	136
45	Route 222	Upper Macungie Township	43
46	Picnic Grove Lane	Upper Macungie Township	511
47	Private Drive	Upper Macungie Township	86
48	Trexler Road	Upper Macungie Township	135
49	Wentz Road	Upper Macungie Township	139
50	Brookdale Road	Upper Macungie Township	379
51	Private Drive	Upper Macungie Township	14
52	Pond Inlet	Upper Macungie Township	326
53	Private Drive	Upper Macungie Township	292
54	Weiler's Road	Upper Macungie Township	128
55	Nestlé Way	Upper Macungie Township	237
56	Route 78	Upper Macungie Township	69
57	Route 78 Ramp	Upper Macungie Township	60
58	Sycamore Road	Upper Macungie Township	199
59	Stroh Drive	Upper Macungie Township	259
60	Railroad	Upper Macungie Township	66
61	Private Drive	Upper Macungie Township	249
62	Private Drive	Upper Macungie Township	417
63	Farm Lane near Twp. School	Upper Macungie Township	32
64	Private Drive	Upper Macungie Township	243
65	Private Drive	Upper Macungie Township	41
66	Off Mancor Drive	Upper Macungie Township	418
67	Penn Drive	Upper Macungie Township	418
68	Schantz Road	Upper Macungie Township	79
69	Parking Lot	Upper Macungie Township	13
70	Route 100	Upper Macungie Township	35
71	Railroad Street	Upper Macungie Township	157
72	Railroad	Lower Macungie Township	2,762
73	Private Drive	Lower Macungie Township	2,874
74	Private Drive	Lower Macungie Township	1,150
75	Seem Road	Lower Macungie Township	1,222
76	Lower Macungie Road	Lower Macungie Township	226
77	Spring Creek Road[5]	Lower Macungie Township	1
78	Private Drive	Lower Macungie Township	282
79	Wild Cherry Lane[6]	Lower Macungie Township	630
80	Mountain Street	Longswamp township	8
81	Gun Club Road	Lower Macungie Township	680
82	Chestnut Road	Lower Macungie Township	759

APPENDIX C

C-1 NRCS TYPE II 24-HOUR RAINFALL DISTRIBUTION (GRAPH & TABULAR)

C-2 INTENSITY-DURATION-FREQUENCY CURVES

C-3 RUNOFF CURVE NUMBERS AND PERCENT IMPERVIOUSNESS VALUES

C-4 RUNOFF COEFFICIENTS FOR THE RATIONAL METHOD

C-5 MANNING "n" VALUES

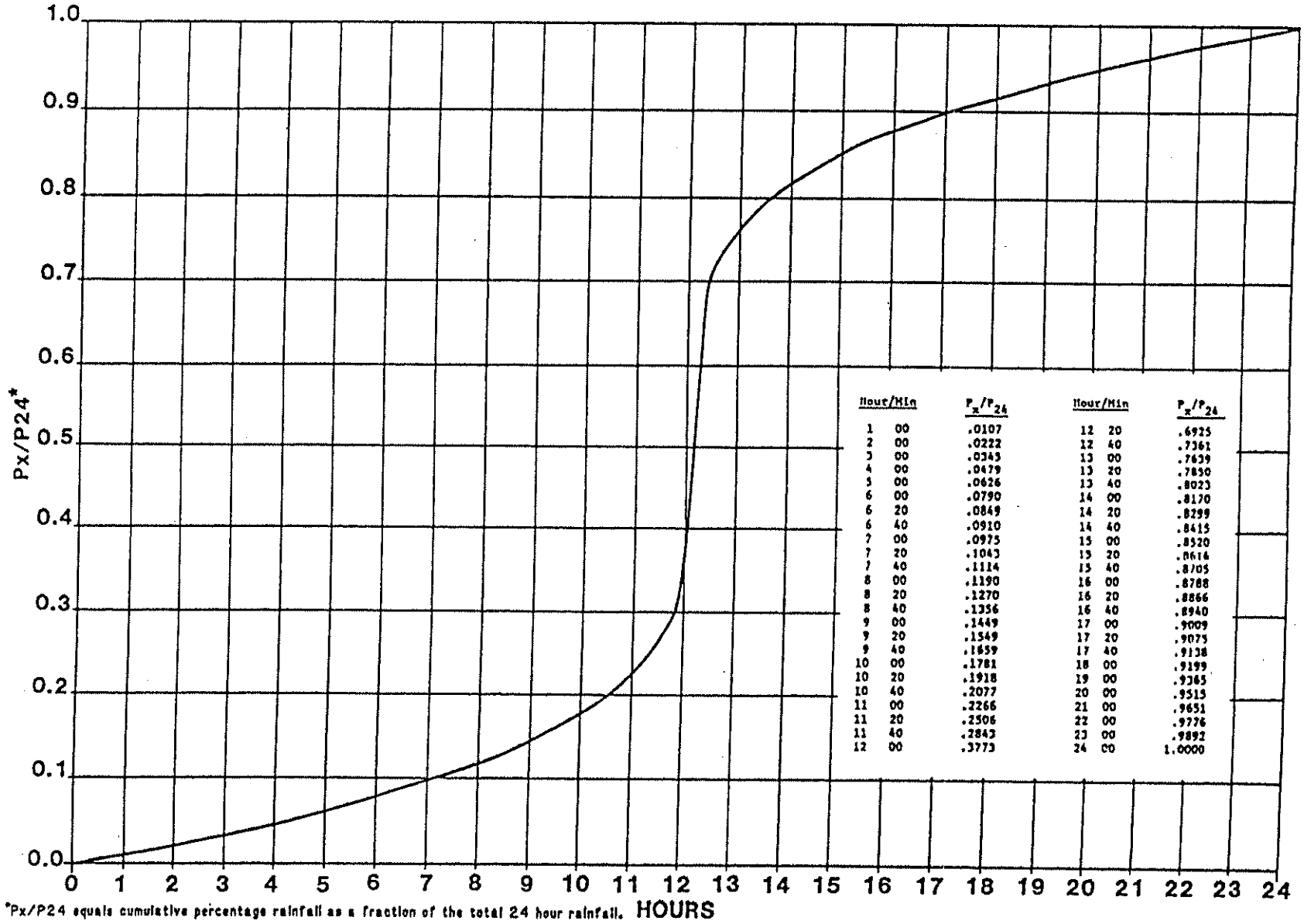
C-6 PERMISSIBLE VELOCITIES FOR CHANNELS

C-7 MINIMUM STREET CONSTRUCTION STANDARDS

C-8 ROAD STORM DRAINAGE DESIGN STANDARDS

C-9 DETENTION BASIN STANDARDS

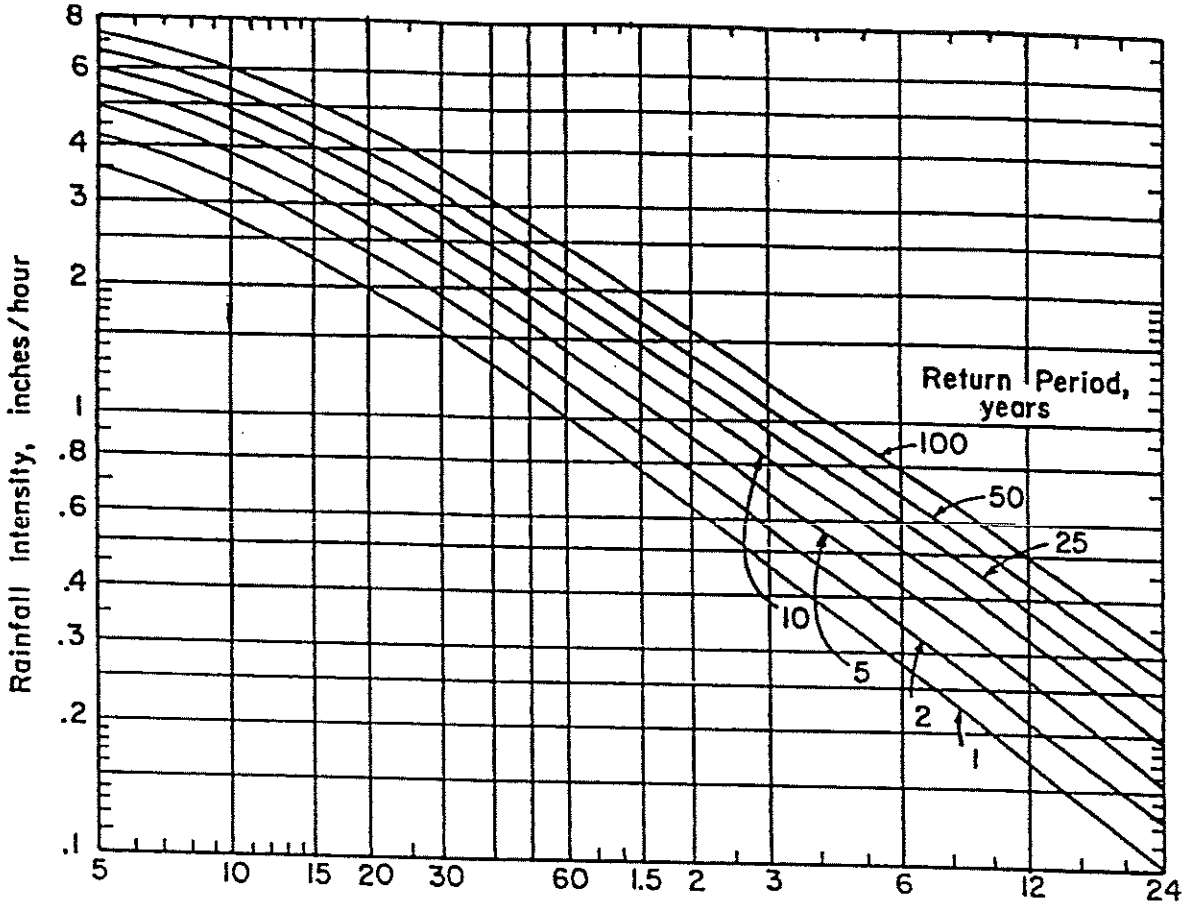
NRCS TYPE II RAINFALL DISTRIBUTION

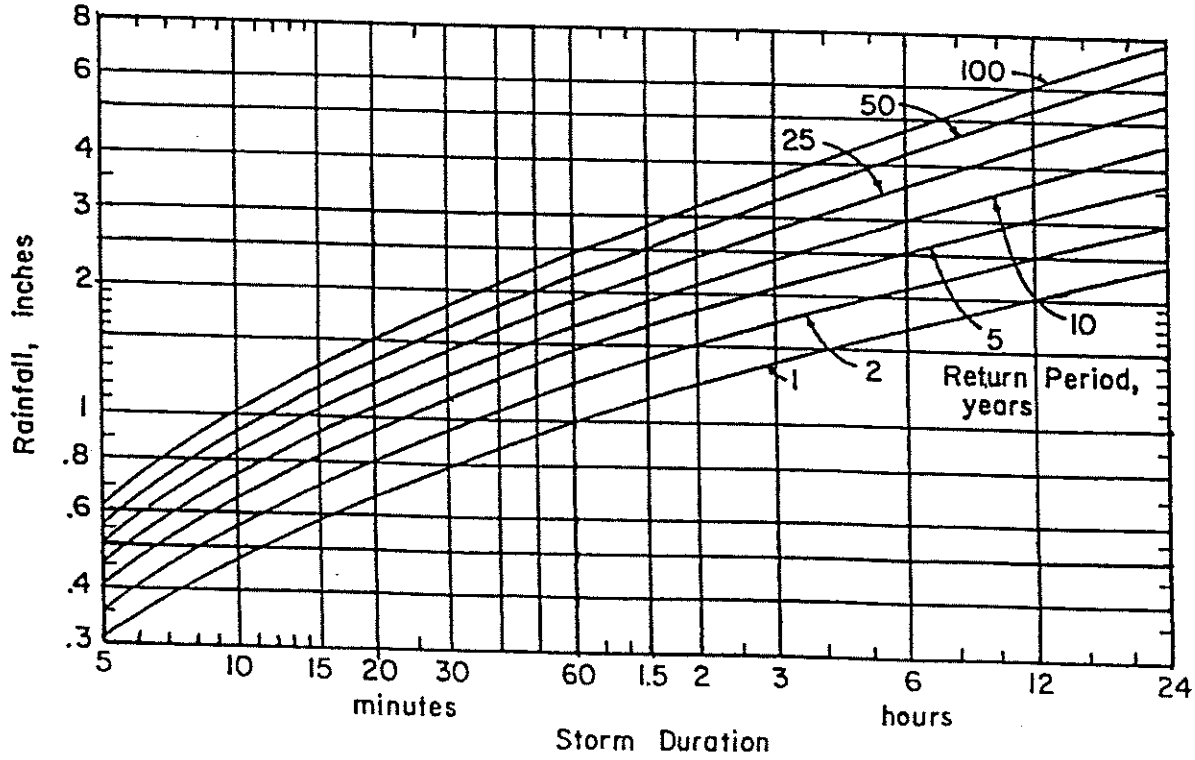


Hour/Min	P_x/P_{24}	Hour/Min	P_x/P_{24}
1 00	.0107	12 20	.6925
2 00	.0222	12 40	.7361
3 00	.0345	13 00	.7639
4 00	.0479	13 20	.7850
5 00	.0626	13 40	.8023
6 00	.0790	14 00	.8170
6 20	.0849	14 20	.8299
6 40	.0910	14 40	.8415
7 00	.0975	15 00	.8520
7 20	.1043	15 20	.8614
7 40	.1114	15 40	.8705
8 00	.1190	16 00	.8788
8 20	.1270	16 20	.8866
8 40	.1356	16 40	.8940
9 00	.1449	17 00	.9009
9 20	.1549	17 20	.9075
9 40	.1659	17 40	.9138
10 00	.1781	18 00	.9199
10 20	.1918	19 00	.9365
10 40	.2077	20 00	.9515
11 00	.2266	21 00	.9651
11 20	.2506	22 00	.9776
11 40	.2843	23 00	.9892
12 00	.3773	24 00	1.0000

*Px/P24 equals cumulative percentage rainfall as a fraction of the total 24 hour rainfall.

INTENSITY–DURATION–FREQUENCY CURVES*





*Source:Pennsylvania Dept. of Transp. Design Rainfall Curves (1986).

RUNOFF CURVE NUMBERS AND PERCENT IMPERVIOUSNESS VALUES*

Cover Description		Curve numbers for hydrologic soil group**			
Land Use/Cover Type	Average percent impervious area	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.):					
Good condition (grass cover greater than 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
⅛ acre or less (townhouses)	65	77	85	90	92
¼ acre	38	61	75	83	87
⅓ acre	30	57	72	81	86
½ acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Woods		30	55	70	77
Agriculture		Refer to Table 2-2b in source document (TR55) by crop type and treatment.			

*Source: Natural Resources Conservation Service Technical Release No. 55, Second Edition, June 1986.

**Hydrologic Soil Group based on the County Soil Survey latest edition.

RUNOFF COEFFICIENTS FOR THE RATIONAL METHOD*												
HYDROLOGIC SOIL GROUP AND SLOPE RANGE**												
	A			B			C			D		
LAND USE	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated[A]	[a]0.18 [b]0.23	0.23 0.29	0.28 0.34	0.24 0.30	0.29 0.36	0.33 0.40	0.30 0.36	0.34 0.41	0.38 0.45	0.33 0.39	0.37 0.44	0.41 0.48
Pasture[B]	0.09 0.12	0.13 0.17	0.17 0.23	0.19 0.24	0.24 0.30	0.29 0.36	0.27 0.33	0.31 0.38	0.36 0.43	0.31 0.37	0.35 0.42	0.39 0.46
Meadow, Lawn[C]	0.05 0.07	0.08 0.12	0.12 0.17	0.15 0.19	0.20 0.25	0.24 0.30	0.23 0.28	0.28 0.34	0.32 0.39	0.28 0.33	0.32 0.39	0.36 0.43
Forest, Woods	0.03 0.04	0.05 0.08	0.08 0.12	0.11 0.15	0.16 0.21	0.20 0.26	0.20 0.25	0.25 0.31	0.29 0.36	0.25 0.31	0.30 0.37	0.34 0.41
Gravel	0.24 0.30	0.29 0.36	0.33 0.40	0.32 0.38	0.36 0.43	0.40 0.47	0.35 0.42	0.39 0.46	0.43 0.50	0.37 0.44	0.41 0.48	0.44 0.51
Parking, Other Impervious	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97
Residential, Commercial, Industrial And Other "Developed"	Runoff coefficients should be calculated based upon weighted average of impervious area coefficients and pervious area coefficients from above based upon soil type, slope and the particular development proposal.											

*Based on Rossmiller Equation for translating NRCS curve numbers into Rational Method 'c' values.
**Hydrologic Soil Group based on the county soil survey latest edition.

a – Runoff coefficients for storm recurrence intervals less than 25 years.
b – Runoff coefficients for storm recurrence intervals of 25 years or more.

[A]Represents average of cultivated land with and without conservation treatment from TR-55, January 1975. These values are consistent with several categories of cultivated lands from TR-55, June 1986.
[B]Represents grasslands in fair condition with 50% to 75% grass cover.
[C]Represents grasslands in good condition with greater than 75% grass cover.

MANNING 'n' VALUES BY TYPICAL REACH DESCRIPTION

Reach Description	Manning 'n'
Natural stream, clean, straight, no rifts Or pools	0.030
Natural stream, clean, winding, some pools And shoals	0.040
Natural stream, winding, pools, shoals, Stony with some weeds	0.050
Natural stream, sluggish with deep pools And weeds	0.070
Natural stream or swale, very weedy or With timber under brush	0.100
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027*

*Depending upon type and diameter.

ROUGHNESS COEFFICIENTS (MANNING 'n') FOR SHEET FLOW

Surface Description	Manning 'n'[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.050
Cultivated soils:	
Residue cover <= 20%	0.060
Residue cover > 20%	0.170
Grass:	
Short grass prairie	0.150
Dense grasses[2]	0.240
Bermuda grass	0.410
Range (natural)	0.130
Woods:[3]	
Light underbrush	0.400
Dense underbrush	0.800

[1]The n values are a composite of information compiled by Engman (1986).
[2]Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass and native grass mixtures.
[3]When selecting n, consider cover to a height of about 0.1 ft. this is the only part of the plant cover that will obstruct sheet flow.

PERMISSIBLE VELOCITIES FOR SELECTED CHANNELS

CHANNEL LINING	PERMISSIBLE CHANNEL VELOCITY (FEET PER SECOND)
Vegetation[1]	
Grass Mixture	4.0 - 5.0
Kentucky Bluegrass	5.0 - 7.0
Red Fescue	2.5 - 3.5
Redtop	2.5 - 3.5
Reed Canarygrass	3.0 - 4.0
Serecea Lespedeza	2.5 - 3.5
Sudangrass	2.5 - 3.5
Tall Fescue	3.0 - 6.0
Weeping Lovegrass	2.5 - 3.5
Bare Earth, Easily Eroded[2]	
Fine Sand	1.5
Sand Loam	1.75
Silt Loam or Alluvial Silts, Loose	2.0
Firm Loam	2.50
Bare Earth, Erosion Resistant[2]	
Fine Gravel	2.5
Stiff Clay or Alluvial Silts, Firm	3.75
Loam to Cobbles (Graded)	3.75
Silt to Cobbles (Graded or Course Gravel)	4.0
Cobbles and Stones or Shales and Hardpans	6.0
Rock Lined	
6" Rip Rap	9.0
9" Rip Rap	11.5
12" Rip Rap	13.0

[1] Maximum permissible velocities dependent on soil erodibility and slope.

[2] Maximum permissible velocities in bare earth channels - for straight channels where slopes <0.02 ft./ft.

Source: Department of Environmental Protection, *Erosion and Sediment Pollution Control Program Manual*, April 15, 2000.

MINIMUM STREET CONSTRUCTION STANDARDS

	MINOR STREET			COLLECTOR STREET			MAJOR STREET		
	STANDARD	ALTERNATE		STANDARD	ALTERNATE		STANDARD	ALTERNATE	
ID-2 Surface Course	1½"	1"	1½"	1"	1½"	1½"	1½"	1½"	1½"
ID-2 Binder Course	--	2"	--	2"	2"	2"	2"	2"	2"
Bituminous Concrete Base Course	4½"	--	--	4"	--	--	4"	--	--
Crushed Aggregate Base Course or Crushed Aggregate Base Course, DG	--	6"	--	--	8"	--	--	8"	--
Aggregate-Bituminous Base Course	--	--	5"	--	--	4"	--	--	5"
Penn DOT No. 2A Coarse Aggregate Subbase	4"	4"	6"	4"	4"	6"	4"	6"	6"
Minimum Structural Number	2.8 +/-			3.4 +/-			3.6 +/-		

NOTES:

(1) All thickness specifications are for compacted materials.
(2) Optional design cross-sections may be approved by the Township Engineer, provided the design has a Structural Number equal to or greater than that shown in the above chart.
(3) Permanent Cul-de-sac Street, Marginal Access Street, Service Street, and Off Street Parking construction shall conform to standards for Minor Streets.

The pavement cross slope on streets shall not be less than 1/4" per foot and not more than 1/2" per foot. The slope of the shoulder areas shall not be less than 3/4" per foot and not more than 1" per foot.

Surface cross drainage at intersections or other roadway sections will not be permitted.

Inlets shall be spaced to limit the gutter flow spread into the travel lanes to one-half (1/4) the lane width during the design storm.

Inlet efficiency and bypass flows, per PennDOT design charts, shall be considered in the design of storm sewer systems.

Storm sewer lines within street rights-of-way shall be placed under or immediately in front of the curb when parallel to the right-of-way. When located in undedicated land, they shall be placed within an easement not less than twenty (20) feet wide and as approved by the Township. Drainage structures within State Highway rights-of-way shall be approved by PennDOT. A letter from PennDOT indicating their approval of such structures shall be provided to the Township.

Storm sewers shall have a minimum diameter of fifteen (15) inches, a minimum slope of one-half (0.5) percent, and shall be constructed of reinforced concrete. If approved by the Township Engineer, corrugated polyethylene pipe (smooth bore) may be permitted for diameters of fifteen (15) inches to twenty-four (24) inches. The use of corrugated metal pipe or any other type of storm sewer material is prohibited. All storm sewer pipe within street cartways or other paved areas shall be backfilled with 2RC stone placed in six (6) inch lifts and compacted to the satisfaction of the Township Engineer. All storm sewers shall be constructed to the specifications of PennDOT form 408 unless otherwise directed by the Township.

Open ditches shall be avoided. Properly designed, graded, and turfed drainage swales may be permitted in lieu of storm sewers with the specific approval of the Board of Supervisors. Swales shall be designed to carry the required discharge without excessive erosion, to increase the time of concentration, to reduce the peak discharge and velocity, and to permit water to percolate into the soil.

When proposed, manholes and Inlets (catch basins) shall not be spaced more than four hundred (400) feet apart for pipes of less than or equal to twenty-four (24) inch diameter and five hundred (500) feet apart for pipes of greater than twenty-four (24) inch diameter. Additionally, manholes or inlets shall be placed at all changes in alignment, grade, pipe size, and at all points of convergence of two (2) or more influent storm sewer lines. Inlets may be substituted for manholes where they will serve a useful purpose. In addition, the following standards shall apply:

1. Manholes and inlets must conform to the standards established by the Pennsylvania Department of Transportation.

2. At street intersections, inlets shall be placed in the tangent and not in the curved portion of the curbing.

Inlets and manhole cover frames shall conform to Pennsylvania Department of Transportation Specifications. Manhole covers shall have the word "STORM" cast in two (2) inch high letters on the top of the cover.

DETENTION BASIN STANDARDS

a. The height of the dam shall not exceed six (6) feet unless approved by the Township.

b. The minimum top width of all dams up to six (6) feet in height shall be no less than five (5) feet.

c. The side slopes of the settled earth fill shall not be steeper than three (3) horizontal to one (1) vertical.

d. A cutoff trench of compacted, relatively impervious material shall be provided under all dams. A compacted impervious core at least three (3) feet wide at the top, having a maximum side slope of one (1) horizontal to one (1) vertical, shall extend for the full length of the embankment, and the top elevation shall be set at the 10-year design water surface elevation.

e. All pipes and culverts through dams shall have properly spaced concrete cutoff collars or factory-welded anti-seep collars.

f. A minimum one (1) foot freeboard above the maximum design water surface elevation at the emergency spillway shall be provided.

g. Where concrete, stone, or brick walls are used with side slopes proposed to be steeper than one (1) foot vertical in three (3) feet horizontal, the basin shall be fenced by a permanent wire fence forty-two (42) inches in height and a ramp of durable, non-slip materials for maintenance vehicles shall be provided for access into the basin.

Outlet structures within basins which will control peak discharge flows and distribute the flows by plans to discharge areas shall be constructed of reinforced concrete, and shall have childproof, non-clogging trash racks over all design openings larger than or equal to nine (9) inches in diameter, except those openings designed to carry perennial stream flows. Where spillways will be used to control peak discharges in excess of the ten (10) year storm, the control weirs shall be constructed of concrete of sufficient mass and structural stability to withstand the pressures of impounded waters and outlet velocities. Concrete outlet aprons shall be designed as level spreaders and shall extend at a minimum to the toe of the basin slope.

The Board of Supervisors may require a landscaped screen planting around any stormwater management facility.

APPENDIX D

Recommendation Chart for Infiltration Stormwater Management BMP's in Carbonate Bedrock

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

RECOMMENDED

NOT RECOMMENDED

* Special Geologic Feature Buffer widths are as follows:

Low Buffer is less than 50 feet

Medium Buffer is 50 feet to 100 feet

High Buffer is greater than 100 feet

** Rates greater than 500% not recommended.

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

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

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

APPENDIX E

STORM WATER EASEMENT
AND MAINTENANCE AGREEMENT

This Agreement made this _____ day of _____, 200__, by and between Developer, a Pennsylvania _____, with offices situate at _____, Pennsylvania ("Developer"); and Owner (hereinafter jointly and severally called "Owner").

WITNESSETH:

WHEREAS, Developer is the equitable owner of a certain tract or parcel of land consisting of _____ acres more or less, located at _____ and more fully described in Deed Book Volume _____, page _____ and situate in the Township of _____, _____ County, Pennsylvania, bearing tax map identification numbers _____ (the "Tract").

Owner desires to acquire a parcel of land (the "Parcel") from Developer, which contains storm water detention and transmission facilities, as shown on a plan which is or will be recorded, for a subdivision or land development known as _____ (the "Plan").

The Parcel is down gradient from the Tract, in whole or in part, and therefore is obligated to take storm water flows from the Tract in accordance with the Plan.

Owner understands the obligation of the Parcel to accommodate storm water flow from the Tract and from other land at higher elevations in the drainage area in which the Parcel is a part, pursuant to the terms and conditions of this Agreement.

The purpose of this Agreement is to grant and convey to Developer an easement over the Parcel such that storm water from the Tract can pass over and through the Parcel in a manner acceptable to both Owner and Developer, and pursuant to the terms and conditions hereof.

NOW, THEREFORE, in consideration of One Dollar ($1.00) in hand paid and other good and valuable consideration, and intending to be legally bound hereby, Owner hereby grants, bargains and conveys to Developer a permanent and perpetual right of passage in, over and through the Parcel at the location set forth in Exhibit A, which is attached hereto, and made a part hereof, subject to the terms and conditions which follow:

1. The sole purpose of this grant is to provide a storm water easement over a portion of the Parcel which will allow storm water from the Tract to be retained upon and channeled through the Parcel and henceforth, into the storm drainage system of Lower Macungie Township (the "Township"), in accordance with the Act 167 Plan of the Township, all as shown on Exhibit A, which is attached hereto and made a part hereof.

2. This easement includes the right for Developer, its agents, successors and assigns, to enter upon the Parcel at such time or times as is necessary, reasonable or appropriate to channel storm water from a point or points adjacent to the Parcel into the storm drainage

facilities on the Parcel, and if necessary, to channel storm water from the facilities to a location or locations down grade of the Parcel.

3. The rights conveyed hereby shall include, but are not limited to, the right to install, construct, lay, operate, renew, alter, inspect, maintain, repair, replace, change, add to or remove, including piping, inlet and outlet structures, and manholes, as Developer, its agents, successors and assigns, may deem necessary or appropriate for the proper drainage of the Plan.

4. The Parcel and the storm water structures thereon shall be maintained, repaired, augmented and restored, in perpetuity, in a manner which permits the proper detention and transmission of storm water from the Plan, in accordance with the Ordinances and regulations of the Township, and the approved plan.

5. The Parcel shall be maintained, in perpetuity, to avoid the growth and accumulation of noxious and other weeds and the harboring of vermin. No vegetation shall exceed one (1) foot in height. No structures nor objects, except those necessary and authorized by Township for storm water control, shall be stored, placed, or maintained on the Parcel.

6. The rights of Owner are and shall remain subordinate to the right (but not the obligation) of the Township, after due notice, to enter upon the Parcel and perform such work as is necessary to assure the proper maintenance, repair, augmentation or restoration of the storm water structure and of the surface of the Parcel (the "Actions") and to charge the costs thereof to Owner, together with an administration charge, in the manner of a municipal claim or lien.

7. This Agreement shall bind the heirs, executors, administrators, successors and assigns of the Owner and Developer, and shall be effective upon commencement of site work or such disturbance in conjunction with the Plan.

8. The transmission of storm water to and through the Parcel shall be accomplished in accordance with good industry practices, shall be and shall remain in compliance with the Act 167 storm water management plan of the Township, and in accordance with all applicable Commonwealth and Township Ordinances and regulations.

9. Developer and Township, and their agents, successors and assigns, are hereby granted the right and privilege (but not the duty) to enter upon said Parcel with or by its agents, servants, workmen or hired contractors, together with their tools, equipment, appliances, vehicles and materials at all times as may be necessary or convenient for the purpose of constructing, inspecting, repairing, replacing, renewing, maintaining or removing facilities, appurtenances and structures necessary or useful for the transmission of storm water, and for vermin, vector and mosquito control. Specifically, but not by way of limitation, Township and its agents are expressly authorized to apply larvacides for mosquito control at any time or times.

10. Owner hereby covenants and agrees that the surface of said Parcel shall remain unencumbered by him/her/them and either or any of them, of all structures or buildings of any kind (except those necessary for storm water control), and that the grade will not be changed following the commencement of use for storm water drainage purposes without the permission of the Township.

Reserving unto Owner, his/her/their heirs, administrators, executors, successors and assigns, the right to use and enjoy the surface of the land covered by this easement for any lawful purpose; provided that such use and enjoyment shall not infringe upon, damage or obstruct the operations or maintenance of facilities installed or to be installed in the easement hereby conveyed; and further provided that Owner shall not have benefit of the use of, nor the right to change the grade of those portions of the surface of the Parcel over which storm water is, or is to be, conveyed.

To have and to hold all and singular the aforesaid easement, rights and privileges hereby granted or mentioned and intended so to be, with the appurtenances, unto Developer, its agents, successors and assigns to and for only the proper use and benefit of Developer, Township, and their agents, successors and assigns, forever.

The covenants and conditions set forth herein are supported by consideration independent of the price paid for Lot #____ and shall inure to the benefit of and shall be enforceable by any Lot owner in the Plan and by the Township. This Agreement may not be amended without the express written consent of the Township.

IN WITNESS WHEREOF, the parties hereunto have set their hands and seals the day and year first above written.

DEVELOPER

By_____
, President

_____(SEAL)
Owner

_____(SEAL)
Owner

COMMONWEALTH OF PENNSYLVANIA :
:ss.
COUNTY OF :

On this _____ day of _____, 200__, before me, a notary public, the undersigned officer, personally appeared _____, who acknowledged himself to be President of _____, a Pennsylvania _____, and that he as such officer, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the company by himself as such officer.

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

_____
Notary Public

COMMONWEALTH OF PENNSYLVANIA :
:ss.
COUNTY OF :

On this _____ day of _____, 200__, before me, a notary public, the undersigned officer, personally appeared _____, known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument and acknowledged that he executed the same for the purposes therein contained.

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

_____
Notary Public

COMMONWEALTH OF PENNSYLVANIA :
:ss.
COUNTY OF :

On this _____ day of _____, 2004__, before me, a notary public, the undersigned officer, personally appeared _____, known to me (or satisfactorily proven) to be the person whose name is subscribed to the within instrument and acknowledged that she executed the same for the purposes therein contained.

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

_____
Notary Public

APPENDIX F

LOW IMPACT DEVELOPMENT PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

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

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

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

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

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

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

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

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

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

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

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

- **Constructing Cluster Developments**. Cluster developments can also reduce the amount of impervious area for a given number of lots. The biggest savings is in street length, which also will reduce costs of the development. Cluster development clusters the construction activity onto less-sensitive areas without substantially affecting the gross density of development.

APPENDIX G

PRELIMINARY SITE INVESTIGATION AND TESTING REQUIRMENTS

Required Data and Site Information: The following data shall be gathered utilizing standard testing procedures as part of a Preliminary Site Investigation:

- Bedrock composition – Any apparent boundaries between carbonate and non-carbonate bedrock must be verified by a qualified geotechnical professional.
- Bedrock structural geology – This includes the possible presence of faults and mapping of conspicuous fracture traces or lineaments.
- Overburden and soil mantle composition and thickness
- Permeability of the soil
- Depth to the seasonal high water table
- Presence of special geologic features – This includes sinkholes, closed depressions, fracture traces, lineaments and geologic contacts between carbonate and non-carbonate bedrock

Investigation Required for All Sites

Review of Available Data, Maps and Reports: Some of the required information, as listed above, can be found in existing published data. Suggested resources include the following:

- Geologic maps and references for the development area
- The Little Lehigh Creek Basin Carbonate Prototype Area Closed Depression Map – available at the LVPC
- USGS topographic maps
- Lehigh and Berks County soil survey maps
- Aerial photographs from the LVPC or other sources
- Relevant Pennsylvania Geologic Survey Open File Reports (Kochanov 1987a, 1987b) that provide maps of sinkholes and Karst features for Lehigh and Berks counties

Field Inspections: In addition to gathering data from published sources, a field inspection of the proposed site is required. A field inspection can provide additional information relating to site features such as carbonate bedrock features, indicators of seasonal high stream-level or water table levels, streams, springs, etc.

Soil Test Pit and Percolation Test Requirements: A minimum of one test pit and a minimum of 2 percolation tests are required for every site. A test pit is a 2-3 foot wide, 8 foot deep trench excavated with a backhoe for observing subsurface conditions. The test pits will be used to describe soil depth and quality, including soil horizons, and testing of permeability or percolation rates.

Percolation tests are to be conducted as follows (adapted from § 73.15. "Percolation Tests" of the Pennsylvania Code):

1. The percolation tests shall be made in separate holes uniformly spaced over the possible infiltration area.

2. An "Initial Presoak" should not be performed.

3. Percolation holes located within the possible infiltration area shall be used in the calculation of the average percolation rate.

4. Holes having a uniform diameter of 6 to 10-inches shall be bored or dug as follows:
   a. To the depth of the bottom of the possible infiltration BMP
   b. Alternate depths if the test pits/auger holes indicate that the soils are more suitable at a different depth (i.e., if a clay horizon is identified and more suitable soils are located beneath the horizon, and infiltration test should be performed in the suitable horizon).

5. The bottom and sides of the hole shall be scarified with a knife blade or sharp-pointed instrument to completely remove any smeared soil surfaces and to provide a natural soil interface into which water may percolate. Loose material shall be removed from the hole. Two inches of coarse sand or fine gravel shall be placed in the bottom of the hole to protect the soil from scouring and clogging of the pores.

6. Immediately before the percolation test, as a final presoak, water shall be placed in the hole to a minimum depth of 6-inches over the gravel and readjusted every 30 minutes for 1 hour.

7. The drop in the water level during the last 30 minutes of the final presoaking period shall be applied to the following standard to determine the time interval between readings for each percolation hole:
   a. If water remains in the hole, the interval for readings during the percolation test shall be 30 minutes.
   b. If no water remains in the hole, the interval for readings during the percolation test may be reduced to 10 minutes.

8. After the final presoaking period, water in the hole shall again be adjusted to approximately 6-inches over the gravel and readjusted when necessary after each reading.
   a. Measurement to the water level in the individual percolation holes shall be made from a fixed reference point and shall continue at the interval determined from step No. 7 (above) for each individual percolation hole until a minimum of eight readings are completed or until a stabilized rate of drop is obtained, whichever occurs first. A stabilized rate of drop means a difference of ¼-inch or less of drop between the highest and lowest readings of four consecutive readings.
   b. The drop that occurs in the final period in percolation test holes, expressed as inches per hour, shall be used to calculate the average percolation rate.
   c. When the rate of drop in a percolation test is too slow to obtain a measurable rate, the rate of 0.25 inches per hour shall be assigned to that hole for use in calculating the average percolation rate. The infiltration area may be placed over holes with no measurable rate when the average percolation rate for the possible infiltration area is within the acceptable range.

When a percolation test hole yields a percolation rate of greater than 12-inches per hour, the proposed infiltration area may not be designed or installed within 25-feet of this hole unless the

municipality determines that a testing anomaly caused the fast percolation rate and a retest of the area yields acceptable percolation rates. This percolation rate limit is established to protect groundwater quality and to minimize the risk of subsidence.

Additional Site Investigation and Testing Required if Infiltration is Proposed

Soil Test Pit Requirements: The required number of test pits varies with Effective Soil Thickness. As risk factors increase, the number of test pits increases. A minimum of 2 test pits, uniformly spaced within the proposed infiltration area (e.g. the 2 pits should be centered on each half of the proposed infiltration area), are required for any site proposing infiltration unless the applicant can demonstrate that one test pit is adequately representative of the area proposed for infiltration. For larger infiltration areas, multiple test pits shall be developed at the densities as listed below:

Effective Soil Thickness (ft.)	Test Pit Density (per acre of proposed infiltration area)*	Percolation Tests (per acre of proposed infiltration area)**	Auger Grid Spacing (Feet On-Center)
8	4	8	50
4 to 8	6	12	35
2 to 4	8	16	25

*No. of Test Pits required = Infiltration sq. ft./43,560 sq. ft. x test pit density from chart rounded up to the nearest whole number

** No. of Percolation Tests required = Infiltration sq. ft./43,560 sq. ft. x percolation tests from chart rounded up to the nearest whole number

Soil Auger Testing Requirements for Carbonate Areas: Because soil depth is not uniform in many carbonate areas, test pits will not be sufficient to accurately determine the depth to bedrock. Augering provides this essential data as inexpensively as possible. Track-rig rotary soil auger test drilling allows relatively inexpensive, qualitative determination of the presence of overburden voids and will generally penetrate to the top-of-bedrock. Augers typically extend to depths of 20 feet. Special augers extend to as much as 50 feet. Augers do not extend into the bedrock. Auger testing should be performed in a grid pattern across the proposed infiltration area, spaced as indicated in the above table.

Percolation Testing Requirements: A minimum of six percolation tests shall be conducted in accordance with the procedures listed above unless the applicant can demonstrate that fewer tests accurately represent the percolation rate of the proposed infiltration area. Additional testing shall be required if the initial test results show significant variability in percolation rate. For larger infiltration areas, percolation tests shall be conducted at the densities listed in the table above.

APPENDIX H

D-1 TO D-6 CALIBRATED WATERSHED PEAK FLOW VALUES

CALIBRATED *WATERSHED* PEAK FLOW VALUES FOR THE LITTLE LEHIGH CREEK WATERSHED

	1 YEAR		2 YEAR		10 YEAR		25 YEAR		100 YEAR	
SUBAREA NO.	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK
Little Lehigh Creek										
1	20.1 (cfs)	20.1	41.6 (cfs)	41.6	157.8 (cfs)	157.8	253.2 (cfs)	253.2	504.4 (cfs)	504.4
2	26.3	43.6	58.4	96.7	226.9	378.6	364.7	608.4	730.9	1210.4
3	26.4	26.4	51.1	51.1	158.6	158.6	250.7	250.7	488.1	488.1
4	39.8	101.5	71.0	202.9	192.6	684.6	295.3	1071.2	551.5	2036.5
5	30.8	30.8	47.9	47.9	140.1	140.1	217.8	217.8	405.7	405.7
6	52.8	52.8	81.6	81.6	194.6	194.6	304.8	304.8	692.9	692.9
7	8.8	90.3	16.6	144.2	48.2	356.6	73.8	554.9	133.2	1128.8
8	38.3	117.7	81.7	206.6	254.8	571.3	405.7	884.7	801.6	1738.8
9	45.8	213.8	74.7	423.9	185.4	1361.7	275.4	2087.5	509.2	3811.4
10	61.6	232.2	107.9	477.3	266.0	1482.3	395.1	2225.6	728.1	3938.5
11	31.1	251.0	54.5	518.5	149.7	1572.0	229.5	2341.3	439.1	4073.5
Toad Creek										
12	32.5	32.5	54.9	54.9	122.2	122.2	176.1	176.1	314.5	314.5
13	87.0	114.5	126.6	171.2	250.6	346.7	338.4	475.8	541.0	782.5
14	44.4	44.4	65.3	65.3	131.4	131.4	181.7	181.7	302.5	302.5
15	17.8	175.6	24.4	258.3	44.4	509.4	58.2	690.4	88.2	1113.2
16	48.9	212.3	75.9	316.8	166.5	623.4	235.9	844.5	405.3	1384.2
17	39.9	39.9	65.1	65.1	160.8	160.8	235.8	235.8	427.1	427.1
18	4.5	241.5	9.8	367.5	31.7	790.0	50.2	1104.5	98.1	1875.1
19	100.0	227.0	160.6	370.6	384.4	886.4	562.4	1272.5	1007.9	2125.6
20	28.9	28.9	54.9	54.9	175.8	175.8	277.1	277.1	537.1	537.1
21	14.7	261.8	33.1	448.3	109.9	1113.6	175.1	1597.0	345.3	2639.7
22	7.2	260.1	15.4	445.2	48.6	1102.7	77.1	1578.7	147.6	2604.9
Little Lehigh Creek										
23	3.5	469.5	7.1	930.7	21.2	2476.0	33.1	3534.3	61.4	5882.1
24	14.0	472.1	29.4	930.5	91.2	2464.8	143.2	3519.0	275.6	5841.5
25	56.2	56.2	87.7	87.7	197.8	197.8	283.3	283.3	495.1	495.1
26	35.8	505.0	62.4	983.2	167.9	2561.6	256.2	3644.7	486.0	6005.5
27	22.3	510.6	36.1	991.7	86.7	2572.4	127.2	3656.7	228.7	6010.8
Schaefer Run										
28	31.0	31.0	48.2	48.2	108.0	108.0	158.2	158.2	286.8	286.8
29	23.6	22.0	38.4	38.4	91.5	91.5	135.0	135.0	228.4	228.4
30	50.5	98.1	84.7	160.8	217.1	360.0	327.9	518.9	585.6	862.4
31	20.6	20.6	35.4	35.4	88.0	88.0	127.1	127.1	220.1	220.1
32	23.0	141.1	39.6	229.2	98.9	515.4	142.9	740.0	238.5	1237.2
33	15.4	15.4	26.8	26.8	70.1	70.1	106.1	106.1	186.9	186.9
34	21.3	171.6	39.7	288.0	115.1	664.8	176.5	943.0	326.8	1569.8
35	21.6	21.6	36.5	36.5	91.5	91.5	139.8	139.8	265.6	265.6
36	16.9	206.7	30.4	349.3	80.7	807.3	122.8	1149.2	222.9	1917.8
37	19.5	19.5	34.8	34.8	89.6	89.6	134.5	134.5	239.8	239.8
38	16.7	235.8	33.4	404.4	98.9	955.2	154.4	1371.0	295.7	2281.9
39	3.7	235.3	7.7	403.8	23.3	955.4	36.5	1365.9	69.8	2279.5
40	24.6	24.6	42.9	42.9	109.2	109.2	162.1	162.1	293.1	293.1
41	67.2	87.0	115.0	150.1	295.8	394.3	445.2	595.5	837.8	1100.2

CALIBRATED *WATERSHED* PEAK FLOW VALUES FOR THE LITTLE LEHIGH CREEK WATERSHED

SUBAREA NO.	1 YEAR SUBAREA PEAK	1 YEAR TOTAL PEAK	2 YEAR SUBAREA PEAK	2 YEAR TOTAL PEAK	10 YEAR SUBAREA PEAK	10 YEAR TOTAL PEAK	25 YEAR SUBAREA PEAK	25 YEAR TOTAL PEAK	100 YEAR SUBAREA PEAK	100 YEAR TOTAL PEAK
Schaefer Run, cont.										
42	8.7 (cfs)	94.0	16.9 (cfs)	164.9	48.5 (cfs)	441.0	74.6 (cfs)	666.7	141.3 (cfs)	1229.0
43	7.1	331.8	14.7	573.7	45.0	1393.9	70.5	2023.4	134.5	3449.8
44	27.7	27.7	51.3	51.3	138.9	138.9	210.0	210.0	389.8	389.8
45	67.1	373.7	100.1	650.2	200.4	1578.1	276.7	2281.5	457.7	3867.2
46	133.2	393.3	185.6	673.6	345.2	1599.8	458.7	2296.5	710.8	3851.1
47	15.2	404.9	30.5	696.5	89.0	1665.1	137.6	2387.2	261.3	4004.1
48	11.6	404.5	22.0	699.3	68.0	1674.7	104.7	2394.9	205.9	3992.4
49	18.1	18.1	31.3	31.3	79.8	79.8	119.2	119.2	213.2	213.2
50	22.0	39.3	39.7	69.2	106.6	181.7	161.1	273.5	298.6	501.0
51	56.6	73.5	84.4	114.8	166.3	263.2	225.5	371.8	366.0	658.2
52	6.0	77.9	9.6	121.3	23.1	277.6	34.0	391.8	61.9	682.5
53	12.4	448.3	20.6	770.0	50.6	1811.8	75.5	2566.2	139.3	4231.8
54	23.0	457.2	38.7	779.7	97.8	1817.7	146.9	2562.2	273.2	4216.8
55	25.7	25.7	39.9	39.9	88.3	88.3	125.9	125.9	218.9	218.9
56	16.4	468.4	25.9	795.4	61.7	1838.6	90.4	2581.4	163.2	4222.4
57	17.2	469.7	28.9	793.8	75.3	1824.5	113.7	2557.8	212.7	4170.1
58	35.9	35.9	61.0	61.0	158.4	158.4	238.8	238.8	443.5	443.5
59	71.2	100.4	119.4	169.6	293.1	428.6	437.9	645.2	795.9	1160.5
60	24.1	123.7	40.5	207.7	103.5	528.9	157.5	785.1	297.2	1410.5
61	23.9	131.2	42.5	233.8	116.7	612.1	179.3	914.4	343.2	1603.5
62	12.8	12.8	21.7	21.7	57.0	57.0	86.6	86.6	159.1	159.1
63	28.7	40.8	53.4	73.5	146.5	192.6	224.5	286.3	406.2	505.2
64	2.2	171.8	4.2	300.4	10.9	753.1	15.5	1093.9	24.9	1867.2
65	16.5	184.7	32.1	325.8	93.4	820.5	144.6	1194.0	276.5	2030.3
66	28.9	5.6	48.7	11.3	124.4	46.2	188.4	69.4	353.8	95.4
67	4.6	190.3	8.0	333.3	24.3	852.9	36.5	1254.2	66.3	2120.1
68	8.3	197.3	15.7	345.7	43.1	878.2	66.1	1285.9	126.9	2159.1
69	37.9	37.9	58.0	58.0	127.6	127.6	181.7	181.7	316.4	316.4
70	34.4	218.3	56.9	388.4	124.3	970.4	179.1	1403.4	314.9	2324.5
71	73.9	73.9	103.1	103.1	188.0	188.0	242.9	242.9	361.4	361.4
72	59.3	235.7	86.4	410.6	165.2	1011.5	218.9	1455.2	336.3	2396.1
73	20.5	20.5	38.2	38.2	104.3	104.3	158.6	158.6	285.7	285.7
74	35.1	252.5	53.4	434.7	115.9	1050.5	163.8	1503.6	280.5	2447.8
75	13.1	263.8	26.8	453.1	82.2	1083.5	128.6	1538.0	246.6	2489.7
76	232.6	232.6	342.7	342.7	673.1	673.1	904.7	904.7	1427.2	1427.2
77	175.1	400.0	251.1	578.1	482.1	1099.7	639.0	1455.0	979.5	2229.8
78	84.7	429.6	120.9	603.1	232.8	1107.1	309.0	1450.6	476.7	2205.1
79	25.0	409.8	36.4	571.6	69.1	1032.2	92.4	1348.1	146.1	2040.2
80	40.7	640.8	62.6	906.7	133.9	1708.2	187.6	2269.2	317.6	3510.5
81	73.8	654.0	110.1	923.1	222.0	1746.8	301.9	2323.7	483.8	3605.2
82	158.7	668.7	218.6	948.3	390.6	1797.4	500.9	2385.8	762.3	3698.0
83	12.2	12.2	26.5	26.5	85.6	85.6	135.9	135.9	265.7	265.7
84	20.2	891.8	29.0	1347.1	56.3	3064.5	76.6	4264.9	124.5	6809.1
85	27.5	890.6	47.1	1351.3	123.4	3061.3	188.0	4257.2	355.6	6787.4
Little Lehigh Creek										
86	11.5	1263.7	16.9	2164.2	34.4	5079.1	47.3	7120.2	77.8	11576.6

CALIBRATED *WATERSHED* PEAK FLOW VALUES FOR THE LITTLE LEHIGH CREEK WATERSHED

	1 YEAR		2 YEAR		10 YEAR		25 YEAR		100 YEAR	
SUBAREA NO.	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK
Little Lehigh Creek, cont.										
87	100.8	1275.1	150.2	2186.2	315.0	5128.1	434.7	7180.4	714.0	11649.5
88	62.7	62.7	97.6	97.6	222.8	222.8	319.2	319.2	557.5	557.5
89	18.6	18.6	27.7	27.7	57.5	57.5	80.2	80.2	135.8	135.8
90	34.7	98.7	49.4	146.9	91.3	312.0	120.3	437.1	183.9	744.7
91	34.1	106.8	52.1	160.1	112.5	351.2	158.1	499.9	268.6	866.9
92	12.9	1305.2	19.4	2241.4	41.6	5243.9	58.4	7330.0	99.4	11860.6
93	11.8	1306.9	20.8	2242.7	54.6	5242.7	83.4	7324.0	159.3	11840.3
94	32.9	32.9	54.8	54.8	137.1	137.1	205.4	205.4	381.3	381.3
95	6.8	36.9	14.4	64.0	46.3	172.3	73.2	266.2	142.5	507.7
96	13.5	1328.0	22.8	2276.7	55.3	5299.5	81.7	7389.4	149.4	11919.2
97	22.9	22.9	34.3	34.3	68.1	68.1	92.5	92.5	149.3	149.3
98	20.0	1333.7	32.0	2284.6	75.6	5309.2	110.3	7402.6	197.8	11931.7
99	44.6	44.6	63.7	63.7	123.6	123.6	166.4	166.4	266.5	266.5
100	9.0	1336.1	17.2	2287.4	48.6	5311.0	75.9	7399.3	148.7	11917.6
101	2.9	1335.8	4.5	2286.8	10.9	5309.2	15.7	7395.8	27.6	11910.3
102	87.9	1337.2	128.9	2288.4	261.0	5304.4	355.6	7382.0	576.2	11873.1
103	43.0	43.0	63.0	63.0	126.4	126.4	171.2	171.2	276.1	276.1
104	43.8	43.8	65.4	65.4	140.6	140.6	195.4	195.4	327.0	327.0
105	18.8	1344.0	31.5	2298.4	81.7	5316.4	123.0	7392.8	229.9	11879.5
106	3.0	1343.0	6.3	2295.9	20.0	5308.3	31.5	7379.4	61.5	11852.4
107	15.8	1342.2	25.2	2294.3	56.5	5302.5	80.5	7369.8	141.2	11832.9
Swabia Creek										
108	99.5	99.5	172.7	172.7	489.6	489.6	738.3	738.3	1402.1	1402.1
109	78.0	75.6	144.6	137.2	368.7	343.4	555.8	514.8	1043.3	972.0
110	15.0	189.8	26.8	333.7	61.8	881.2	88.4	1352.5	148.5	2533.5
111	26.1	199.9	46.8	353.1	109.2	948.3	159.9	1439.5	292.7	2696.0
112	27.1	210.8	44.4	379.8	104.2	1016.8	150.5	1544.2	268.9	2780.6
113	22.7	22.7	36.1	36.1	87.3	87.3	122.3	122.3	212.7	212.7
114	21.9	21.9	35.7	35.7	91.3	91.3	129.1	129.1	230.9	230.9
115	26.4	67.3	54.8	116.9	190.7	349.8	293.9	518.4	554.0	947.9
116	9.7	9.7	18.4	18.4	50.8	50.8	75.2	75.2	132.9	132.9
117	11.3	86.4	20.2	152.7	52.8	450.4	79.1	645.0	141.1	1172.8
118	16.1	304.3	27.2	530.4	71.5	1482.6	108.2	2237.8	200.9	4015.1
119	16.0	16.0	28.3	28.3	81.3	81.3	128.1	128.1	251.5	251.5
120	51.5	296.4	81.5	552.4	194.0	1588.7	284.4	2376.5	517.9	4239.6
121	28.0	294.3	46.2	557.7	115.1	1620.8	171.7	2413.5	316.1	4272.2
122	13.8	13.8	29.4	29.4	91.4	91.4	143.2	143.2	274.4	274.4
123	39.2	206.4	64.8	583.8	163.7	1638.8	247.6	2401.2	464.0	4156.5
124	53.8	309.3	77.5	588.2	147.4	1642.2	195.9	2395.0	305.1	4116.8
125	100.6	318.6	143.8	605.8	270.8	1667.9	357.3	2426.2	549.0	4150.6
126	37.0	37.0	68.1	68.1	205.0	205.0	308.1	308.1	586.9	586.9
127	58.3	93.6	80.8	143.1	155.3	337.5	205.5	475.1	328.1	827.5
128	45.7	337.0	64.3	652.2	125.1	1763.8	169.1	2542.9	265.6	4311.1
129	30.0	338.7	45.5	657.9	95.3	1772.5	131.7	2551.5	218.2	4306.0
130	50.7	50.7	84.6	84.6	203.7	203.7	292.9	292.9	529.6	529.6
131	53.1	92.8	78.1	142.1	158.5	301.9	220.5	418.7	370.9	739.1

CALIBRATED *WATERSHED* PEAK FLOW VALUES FOR THE LITTLE LEHIGH CREEK WATERSHED

	1 YEAR		2 YEAR		10 YEAR		25 YEAR		100 YEAR	
SUBAREA NO.	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK
Swabis Creek , cont.										
132	111.5	437.4	160.6	718.9	317.9	1877.1	426.8	2672.8	682.1	4449.8
133	43.7	432.1	67.0	727.0	147.8	1871.0	210.4	2649.9	364.7	4381.5
Little Lehigh Creek										
134	1.8	1450.5	6.1	2473.2	18.3	5642.7	28.2	7816.6	49.7	12476.2
135	2.6	1450.3	6.8	2472.4	19.8	5640.8	29.3	7815.3	49.7	12474.2
136	27.5	27.5	45.7	45.7	106.2	106.2	153.7	153.7	276.8	276.8
137	31.7	55.5	51.5	90.5	126.1	213.8	181.2	297.6	321.2	530.9
138	88.1	133.4	128.5	200.3	256.4	412.2	346.5	531.7	557.3	862.2
139	32.8	1463.6	53.9	2489.7	135.3	5665.9	201.5	7844.9	372.8	12511.1
140	32.1	1460.3	47.7	2482.9	123.5	5649.7	176.9	7819.6	307.0	12462.9
141	23.6	1461.2	39.7	2483.0	94.0	5646.7	136.4	7808.6	243.7	12437.1
Leibert Creek										
142	15.6	15.6	25.3	25.3	65.7	65.7	97.3	97.3	173.9	173.9
143	50.3	59.6	84.8	97.4	193.0	213.8	276.7	295.3	489.7	519.7
144	16.3	65.3	29.3	112.6	80.3	274.6	126.6	407.2	245.7	732.3
145	15.1	15.1	26.5	26.5	78.2	78.2	122.4	122.4	234.4	234.4
146	5.7	20.4	13.5	39.8	36.5	113.7	57.3	177.9	111.3	335.1
147	52.1	109.6	89.8	202.7	206.0	509.3	297.8	760.6	529.5	1368.1
148	17.9	116.6	34.8	225.0	115.9	572.0	177.6	836.7	342.5	1476.3
149	25.6	130.4	40.2	242.5	91.9	622.8	130.7	913.7	227.0	1612.8
150	35.6	157.2	54.7	265.7	120.2	683.7	167.1	1002.3	280.9	1759.5
151	48.1	187.9	68.5	300.9	133.1	720.4	176.5	1050.0	274.6	1833.8
152	200.0	199.6	288.5	287.0	567.8	561.3	755.1	744.7	1177.4	1156.8
153	81.2	435.1	116.2	635.8	222.2	1192.9	293.8	1517.2	451.7	2325.1
154	41.1	431.0	60.2	626.9	126.0	1197.3	171.8	1554.4	278.6	2433.1
Little Lehigh Creek										
155	2.2	1498.7	6.7	2536.3	20.5	5725.0	32.3	7900.4	62.1	12552.9
156	10.2	1496.9	17.0	2532.3	39.5	5714.1	57.2	7886.0	102.4	12524.9
157	16.7	16.7	24.4	24.4	56.6	56.6	79.5	79.5	137.2	137.2
158	71.4	1495.8	105.8	2527.9	240.7	5701.1	336.8	7863.5	577.5	12481.0
159	100.0	100.0	144.0	144.0	293.9	293.9	392.4	392.4	621.7	621.7
160	74.9	142.7	113.1	204.1	249.8	427.7	343.3	577.3	567.2	941.0
161	151.6	151.6	207.4	207.4	384.5	384.5	496.6	496.6	744.7	744.7
162	179.2	414.3	254.1	575.7	482.1	1021.4	633.4	1289.2	963.9	1901.0
163	9.4	1503.0	20.8	2538.1	84.6	5711.0	131.4	7871.3	258.2	12480.1
164	10.2	1501.6	16.0	2534.9	41.7	5701.8	59.7	7857.9	106.3	12455.0
165	16.6	16.6	25.9	25.9	62.0	62.0	89.3	89.3	159.1	159.1
166	54.8	1503.3	85.0	2536.0	200.9	5700.2	285.5	7853.8	498.0	12443.9
167	1.2	1503.2	3.2	2535.6	14.9	5699.7	23.2	7851.7	44.8	12440.1
168	74.2	1502.6	106.9	2533.5	216.2	5691.0	290.6	7838.0	460.3	12412.3
169	102.8	1502.6	148.2	2532.3	301.7	5685.0	406.7	7825.2	647.2	12385.5
170	61.8	1500.6	88.1	2527.4	180.6	5671.1	248.4	7803.2	403.0	12345.7
171	46.6	1498.8	66.2	2523.0	133.9	5657.8	178.7	7783.2	285.3	12308.9
Cedar Creek										
172	64.0	64.0	93.1	93.1	184.5	184.5	252.3	252.3	413.8	413.8
173	33.1	33.1	49.4	49.4	99.5	99.5	137.1	137.1	227.1	227.1

CALIBRATED *WATERSHED* PEAK FLOW VALUES FOR THE LITTLE LEHIGH CREEK WATERSHED

	1 YEAR		2 YEAR		10 YEAR		25 YEAR		100 YEAR	
SUBAREA NO.	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK
Cedar Creek, cont.										
174	66.6	153.4	102.0	222.3	202.0	420.5	274.6	569.3	445.9	886.0
175	30.0	30.0	44.3	44.3	97.3	97.3	136.0	136.0	230.3	230.3
176	253.2	369.1	372.0	533.1	733.0	998.9	984.6	1301.4	1560.5	1972.5
177	51.4	375.8	77.5	540.7	175.9	1017.1	244.7	1316.1	410.6	2010.4
178	23.9	375.6	38.8	570.9	103.2	1037.1	149.6	1367.4	268.6	2131.5
179	112.1	112.1	163.7	163.7	322.6	322.4	431.1	430.8	673.1	672.5
180	15.6	438.8	22.2	659.7	51.2	1161.2	70.4	1526.4	114.6	2369.7
181	139.4	139.4	203.2	203.2	402.8	402.8	541.1	541.1	854.5	854.5
182	73.9	183.6	112.1	266.7	243.2	527.3	339.1	711.4	568.0	1141.7
183	137.3	137.3	184.3	184.3	319.2	319.2	417.1	417.1	612.9	612.9
184	16.4	104.0	25.6	143.2	54.2	252.4	76.1	322.6	132.1	473.7
185	3.8	270.2	6.2	381.9	14.8	723.4	21.2	963.7	36.1	1510.0
186	92.6	92.6	140.2	140.2	291.1	291.1	400.9	400.9	659.2	659.2
187	66.2	367.6	98.1	535.1	204.5	1059.9	286.6	1436.2	488.3	2291.3
188	133.4	133.4	182.4	182.4	347.7	347.7	460.2	460.2	720.3	720.3
189	158.1	421.6	224.7	608.5	429.1	1260.7	568.6	1713.0	882.7	2779.4
190	117.4	508.7	162.7	619.5	292.5	1290.8	376.1	1756.7	564.7	2803.5
191	75.4	510.6	108.0	628.8	210.7	1315.5	279.8	1798.9	433.5	2869.8
192	12.6	895.8	17.4	1277.0	35.4	2304.5	46.7	3142.1	74.5	5058.2
193	70.3	10.5	101.0	15.3	202.3	47.8	271.3	115.7	427.8	324.4
194	114.6	118.6	157.7	162.6	292.6	299.8	377.5	386.4	576.8	586.3
195	48.1	48.1	66.0	66.0	113.6	113.6	145.1	145.1	209.8	209.8
196	14.7	178.3	19.4	243.4	34.0	428.9	42.2	552.7	60.0	8369.2
197	74.9	74.8	104.9	104.8	197.1	196.7	257.9	257.2	392.8	391.3
198	31.5	276.8	44.1	378.9	94.5	656.5	129.7	854.1	215.0	1306.6
199	163.6	907.4	222.6	1259.2	428.3	2442.2	560.9	3303.2	881.6	5241.4
200	36.0	897.5	51.0	1245.8	98.7	2436.6	130.8	3293.0	202.2	5215.3
201	49.4	899.8	68.8	1246.7	127.9	2446.0	167.0	3290.5	256.2	5205.5
202	68.9	894.2	96.7	1244.1	179.2	2447.9	233.3	3290.2	349.7	5202.1
203	57.1	57.1	81.5	81.5	159.1	159.1	211.3	211.3	328.7	328.7
204	97.1	891.5	10.3	1247.6	254.5	2463.6	334.0	3307.6	525.6	5219.1
205	21.0	21.0	29.4	29.4	56.2	56.2	74.7	74.7	120.6	120.6
206	9.2	888.1	14.1	1244.9	34.5	2462.8	49.6	3303.2	86.9	5207.3
207	12.4	884.8	17.5	1241.1	36.2	2457.1	48.5	3297.5	79.0	5198.0
Little Lehigh Creek										
208	12.7	1545.7	18.9	2588.5	42.2	5753.7	58.8	7895.1	98.5	12443.2
209	336.1	1542.7	456.7	2579.5	819.9	5724.5	1071.7	7851.4	1623.6	12364.5
Trout Creek										
210	24.1	24.1	36.9	36.9	87.5	87.5	123.0	123.0	211.7	211.7
211	52.2	75.9	76.4	111.2	170.2	249.7	232.4	343.0	381.0	569.4
212	10.2	10.2	16.0	16.0	77.1	77.1	119.3	119.3	230.1	230.1
213	122.6	184.0	172.4	249.4	352.6	446.5	472.9	630.1	754.1	1086.6
214	79.5	250.4	116.3	341.9	283.4	682.9	394.2	876.0	664.3	1498.4
215	70.4	306.1	100.0	418.6	197.6	780.6	262.6	1003.0	407.4	1627.4
216	10.7	315.9	17.5	435.4	56.7	831.3	83.4	1072.8	152.7	1760.4
217	196.8	475.9	285.2	668.6	581.9	1133.8	782.7	1451.2	1240.4	2261.9
218	87.2	87.2	127.3	127.3	259.8	259.8	349.9	349.9	552.9	552.9

CALIBRATED *WATERSHED* PEAK FLOW VALUES FOR THE LITTLE LEHIGH CREEK WATERSHED

	1 YEAR		2 YEAR		10 YEAR		25 YEAR		100 YEAR	
SUBAREA NO.	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK	SUBAREA PEAK	TOTAL PEAK
Trout Creek, cont.										
219	223.1	271.0	314.7	378.2	584.5	705.2	762.5	919.3	1142.4	1351.1
220	66.4	704.4	89.5	971.8	165.5	1712.8	215.0	2105.6	332.2	3071.0
221	73.0	718.4	103.3	988.9	194.4	1759.2	354.6	2175.7	386.4	3168.9
222	68.6	704.3	92.6	968.5	175.3	1750.5	228.1	2190.2	353.9	3209.0
223	39.7	705.5	52.1	972.0	97.2	1753.7	127.7	2198.0	196.9	3219.9
Little Lehigh Creek										
224	6.5	1558.8	9.4	2596.9	20.9	5748.8	28.1	7877.3	44.2	12393.2
225	114.1	1551.7	156.6	2593.1	280.9	5737.4	365.5	7859.2	553.2	12360.8
226	132.8	1554.8	188.8	2594.7	367.5	5738.7	487.3	7859.5	753.2	12359.8