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ARTICLE I

GENERAL PROVISIONS

Section 101. Short Title

This Ordinance shall be known and may be cited as the "Ontelaunee Township Stormwater Management Ordinance".

Ord. 2010-2, 2/4/2010, §101.

Section 102. Statement of Findings

The Board of Supervisors finds that:

- A. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed increases flood flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of existing streams and storm sewers, greatly increases the cost of public facilities to convey and manage stormwater, undermines floodplain management and flood reduction efforts in upstream and downstream communities, reduces groundwater recharge, and threatens public health and safety.
- B. Inadequate planning and management of stormwater runoff resulting from land development and redevelopment throughout a watershed can also harm surface water resources by changing the natural hydrologic patterns, accelerating stream flows (which increase scour and erosion of stream-beds and stream-banks thereby elevating sedimentation), destroying aquatic habitat and elevating aquatic pollutant concentrations and loadings such as sediments, nutrients, heavy metals and pathogens. Groundwater resources are also impacted through loss of recharge.
- C. A comprehensive program of stormwater management (SWM), including minimization of impacts of development, redevelopment and activities causing accelerated erosion, is fundamental to the public health, safety, welfare, and the protection of the people of the Township and all the people of the Commonwealth, their resources, and the environment.
- D. Inadequate management of accelerated stormwater runoff resulting from development throughout a watershed poses a threat to surface and groundwater quality.
- E. Stormwater can be an important water resource by providing groundwater recharge for water supplies and base flow of streams, which also protects and maintains surface water quality.
- F. Through project design, impacts from stormwater runoff can be minimized to maintain the natural hydrologic regime, and sustain high water quality,

groundwater recharge, stream base flow and aquatic ecosystems. The most cost effective and environmentally advantageous way to manage storm water runoff is through nonstructural project design, minimizing impervious surfaces and sprawl, avoiding sensitive areas (i.e. stream buffers, floodplains, steep slopes), and designing to topography and soils to maintain the natural hydrologic regime.

- G. Public education on the control of pollution from stormwater is an essential component in successfully addressing stormwater.
- H. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES).
- I. Non-stormwater discharges to municipal separate storm sewer systems can contribute to pollution of waters of the Commonwealth by the Township.
- J. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.

Ord. 2010-2, 2/4/2010, §102; as amended by Ord. 2023-3, 8/3/2023, § 1.

Section 103. Purpose

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

- A. Promote alternative project designs and layout that minimizes impacts to surface and ground water.
- B. Promote nonstructural BMPs.
- C. Minimize increases in stormwater volume.
- D. Minimize impervious surfaces.
- E. Manage accelerated runoff and erosion and sedimentation problems at their source by regulating activities that cause these problems.
- F. Utilize and preserve the existing natural drainage systems.

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- G. Manage stormwater impacts close to the runoff source; which requires a minimum of structures and relies on natural processes.
- H. Focus on infiltration of stormwater, to maintain groundwater recharge, to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- I. Strive to maintain existing base flows and quality of streams and watercourses.
- J. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93.4a to protect and maintain "existing uses" and maintain the level of water quality to support those uses in all streams, and to protect and maintain water quality in "special protection" streams.
- K. Address the quality and quantity of stormwater discharges from the development site.
- L. Provide a mechanism to identify controls necessary to meet the NPDES permit requirements.
- M. Implement an illegal discharge detection and elimination program to address non-stormwater discharges into the Township's separate storm sewer system.
- N. Preserve and restore the flood-carrying capacity of streams.
- O. Prevent scour and erosion of streambanks and streambeds.
- P. Provide proper maintenance of all permanent stormwater management facilities and BMPs that are implemented in the Township.
- Q. Provide performance standards and design criteria for watershed-wide stormwater management and planning.
- R. Ensure adequate drainage of streets.
- S. NPDES Requirements

Federal regulations approved October 1999 require operators of small municipal separate storm sewer systems (MS4s) to obtain NPDES Phase II permits from DEP by March 2003. (NPDES II is an acronym for the National Pollutant Discharge Elimination System Phase II Stormwater Permitting Regulations.) Therefore, Ontelaunee Township is subject to the NPDES Phase II requirements mandated by the Federal Clean Water Act as administered by DEP. For more information on NPDES II requirements, contact the DEP Regional Office.

Ord. 2010-2, 2/4/2010, §103.

Section 104. Statutory Authority

Primary Authority:

The Township is empowered to regulate these activities by the authority of the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, the "Storm Water Management Act" and the (appropriate municipal code). .

Secondary Authority:

The Township also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended.

Ord. 2010-2, 2/4/2010, §104.

Section 105. Applicability/Regulated Activities

All Regulated Activities and all activities that may affect stormwater runoff, including Land Development and Earth Disturbance Activity, are subject to regulation by this Ordinance.

Ord. 2010-2, 2/4/2010, §105.

Section 106. Compatibility With Other Ordinance Requirements

Approvals issued and actions taken under this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities by any other code, law, regulation or ordinance.

Ord. 2010-2, 2/4/2010, §106.

Section 107. Repealer

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Ord. 2023-3, 8/3/2023, § 2.

Section 108. Severability

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

Ord. 2023-3, 8/3/2023, § 3.

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Section 109. Erroneous Permit

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

Ord. 2023-3, 8/3/2023, § 4.

Section 110. Waivers

- A. If the Municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the Municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 110, paragraphs B and C.
- B. Waivers or modifications of the requirements of this Ordinance may be approved by the Municipality if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification.
- C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Municipality unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

Ord. 2023-3, 8/3/2023, § 5.

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ARTICLE II

DEFINITIONS

Section 201. Interpretation

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

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

Ord. 2010-2, 2/4/2010, §201.

Section 202. Definitions

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

AGRICULTURAL ACTIVITIES – The work of producing crops and raising livestock including tillage, plowing, disking, harrowing, pasturing and installation of conservation measures. For purposes of regulation by this Ordinance construction of new buildings or impervious area is not considered an agricultural activity.

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

AS-BUILT DRAWINGS – Those maintained by the Contractor as he constructs the project and upon which he documents the actual locations of the building components and changes to the original contract documents. These, or a copy of same, are turned over to the Engineer at the completion of the project

APPLICANT – A person who has filed an application for approval to engage in any Regulated Activities as defined in Section 105 of this Ordinance.

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

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

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

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

BOARD OF SUPERVISORS – The Governing Body of Ontelaunee Township, Berks County, Pennsylvania

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

CARBONATE BEDROCK (AREAS) – Rock consisting chiefly of carbonate minerals, such as limestone and dolomite; specifically a sedimentary rock composed of more than fifty percent (50%) by weight of carbonate minerals that underlies soil or other unconsolidated, superficial material.

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

CHANNEL EROSION – The widening, deepening, and headward cutting of small channels and waterways, caused by stormwater runoff or bankfull flows.

CISTERN – An underground reservoir or tank for storing rainwater.

CONSERVATION DISTRICT – The Berks County Conservation District.

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

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

DEPARTMENT – The Pennsylvania Department of Environmental Protection.

DESIGNEE – The agent of the Berks County Planning Commission, Berks County Conservation District and/or agent of Ontelaunee Township involved with the administration, review or enforcement of any provisions of this ordinance by contract or memorandum of understanding.

DESIGN PROFESSIONAL (QUALIFIED) – Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by the Ordinance

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

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

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

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

DEVELOPER – A person that seeks to undertake any Regulated Earth Disturbance activities at a project site in the Township.

DEVELOPMENT – See “Earth Disturbance Activity”. The term includes redevelopment.

DEVELOPMENT SITE – The specific tract of land where any Earth Disturbance activities in the Township are planned, conducted or maintained.

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

DISCHARGE – To release water from a project, site, aquifer, drainage basin or other point of interest (verb); The rate and volume of flow of water such as in a stream, generally expressed in cubic feet per second (volume per unit of time) (noun). See also “Peak Discharge”.

DISCHARGE POINT – The point where stormwater flows to.

DISTURBED AREAS – Unstabilized land area where an earth disturbance activity is occurring or has occurred.

DITCH – An artificial waterway for irrigation or stormwater conveyance.

DOWNSLOPE PROPERTY LINE – That portion of the property line, of the lot, tract, or parcels of land being developed located such that overland or pipe flow from the site would be directed towards it.

DRAINAGE CONVEYANCE FACILITY – A Stormwater Management Facility designed to transmit stormwater runoff and shall include channels, swales, pipes, conduits, culverts, storm sewers, etc.

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

DRAINAGE PERMIT – A permit issued by the Township Supervisors after the Drainage Plan has been approved.

DRAINAGE PLAN – The documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in Section 403.

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

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

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

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

EROSION AND SEDIMENT CONTROL PLAN – A plan for a project site which identifies BMPs to minimize accelerated erosion and sedimentation.

EXCEPTIONAL VALUE WATERS – Surface waters of high quality which satisfy Pennsylvania Code Title 25 Environmental Protection, Chapter 93, Water Quality Standards, § 93.4b(b) (relating to antidegradation).

EXISTING CONDITIONS – The initial condition of a project site prior to the proposed alteration. If the initial condition of the site is undeveloped land, the land use shall be considered as "meadow" unless the natural land cover is proven to generate lower curve numbers or Rational "C" value, such as forested lands.

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

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

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

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

FOREST MANAGEMENT/TIMBER OPERATIONS – Planning and activities necessary for the management of forest land with no change of land use proposed. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting and reforestation.

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

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

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

GREEN INFRASTRUCTURE – Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

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

GROUNDWATER RECHARGE – Replenishment of existing natural underground water supplies without degrading groundwater quality.

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

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

HOTSPOTS – Areas where land use or activities generate highly contaminated runoff, with concentrations of pollutants in excess of those typically found in stormwater.

HYDROGRAPH – A graph of discharge versus time for a selected point in the drainage system.

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

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

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

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

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

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

INFILTRATION STRUCTURES – A structure designed to direct runoff into the underground water (e.g., french drains, seepage pits, seepage trench).

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

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

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

LIMITING ZONE – A soil horizon or condition in the soil profile or underlying strata which includes one of the following:

- (i) A seasonal high water table, whether perched or regional, determined by direct observation of the water table or indicated by soil mottling.
- (ii) A rock with open joints, fracture or solution channels, or masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments.
- (iii) A rock formation, other stratum or soil condition which is so slowly permeable that it effectively limits downward passage of effluent.

LOT – A part of a subdivision or a parcel of land used as a building site or intended to be used for building purposes, whether immediate or future, which would not be further subdivided.

LOW IMPACT DEVELOPMENT (LID) – Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site

MAIN STEM (MAIN CHANNEL) – Any stream segment or other runoff conveyance facility used as a reach in the Maiden 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 based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.

MUNICIPALITY – Ontelaunee Township, Berks County, Pennsylvania.

NATURAL HYDROLOGIC REGIME – (see hydrologic regime)

NATURAL RECHARGE AREA – Undisturbed surface area or depression where stormwater collects, and a portion of which infiltrates and replenishes the underground and groundwater.

NON-POINT SOURCE POLLUTION – Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

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

NONSTRUCTURAL BEST MANAGEMENT PRACTICES (BMPS) – Methods of controlling stormwater runoff quantity and quality, such as innovative site planning, impervious area and grading reduction, protection of natural depression areas, temporary ponding on site and other techniques.

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

NRCS – Natural Resource Conservation Service (previously SCS).

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

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

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

PARKING LOT STORAGE – Involves the use of parking areas as temporary impoundments with controlled release rates during rainstorms.

PEAK DISCHARGE – The maximum rate of stormwater runoff from a specific storm event.

PENN STATE RUNOFF MODEL – The computer-based hydrologic model developed at the Pennsylvania State University.

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

PLANNING COMMISSION – The planning commission of Ontelaunee Township.

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

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

PREDEVELOPMENT – Undeveloped/Natural Condition.

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

PROJECT SITE – The specific area of land where any Regulated Earth Disturbance activities in the Township are planned, conducted or maintained.

RATIONAL FORMULA – A rainfall-runoff relation used to estimate peak flow.

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

RECORD DRAWINGS – Original documents revised to suit the as-built conditions and subsequently provided by the Engineer to the Client. The Engineer takes the Contractor's as-builts, reviews them in detail with his/her own records for

completeness, then either turns these over to the Client or transfers the information to a set of reproducibles, in both cases for the Client's permanent records.

REDEVELOPMENT – The demolition, construction, reconstruction, alteration, or improvement exceeding two thousand square feet (2,000 sq. ft.) of land disturbance performed on sites where existing land use is commercial, industrial, institutional, or multifamily residential. Maintenance activities such as top-layer grinding and re-paving are not considered to be redevelopment. Interior remodeling projects and tenant improvements are also not considered to be redevelopment. Utility trenches in streets are not considered redevelopment unless more than fifty percent (50%) of the street width is removed and re-paved.

REGULATED ACTIVITIES – Any actions or proposed actions that involve the alteration or development of land in a manner that may affect stormwater runoff.

REGULATED EARTH DISTURBANCE ACTIVITY – Activity involving Earth Disturbance subject to regulation under 25 PA Code Chapters 92, Chapter 102, or the Clean Streams Law.

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

RETENTION BASIN – A structure in which stormwater is stored and not released during the storm event. Retention basins do not have an outlet other than recharge and must infiltrate stored water in no more than four (4) days.

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

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

ROAD MAINTENANCE – earth disturbance activities within the existing road cross-section, such as grading and repairing existing unpaved road surfaces, cutting road banks, cleaning or clearing drainage ditches and other similar activities.

ROOF DRAINS – A drainage conduit or pipe that collects water runoff from a roof and leads it away from the structure.

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

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

SALDO – Subdivision and Land Development Ordinance.

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

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

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

SEEPAGE PIT/SEEPAGE TRENCH – An area of excavated earth filled with loose stone or similar coarse material, into which surface water is directed for infiltration into the underground water.

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

SHALLOW CONCENTRATED FLOW – Stormwater runoff flowing in shallow, defined ruts prior to entering a defined channel or waterway.

SHEET FLOW – A flow process associated with broad, shallow water movement on sloping ground surfaces that is not channeling or concentrated.

SOIL-COVER COMPLEX METHOD – A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN).

SOURCE WATER PROTECTION AREAS (SWPA) – The zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake.

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

SPECIAL PROTECTION SUBWATERSHEDS – Watersheds for which the receiving waters are exceptional value (EV) or high quality (HQ) waters.

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

STATE WATER QUALITY REQUIREMENTS – The regulatory requirements to protect, maintain, reclaim and restore water quality under PA Code Title 25 and the Clean Streams Law.

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

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

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

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

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

STORMWATER MANAGEMENT PLAN – The plan for managing those land use activities that will influence stormwater runoff quality and quantity and that would impact the either the Tributaries to the Schuylkill River Watershed adopted by Berks County or the Maiden Creek Watershed adopted by Berks County, and Lehigh County as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "The Tributaries to The Schuylkill River in Berks County Act 167 Stormwater Management Plan" and as the "Maiden Creek Watershed Act 167 Stormwater Management Plan".

STORMWATER MANAGEMENT SITE PLAN – The plan prepared by the Applicant or his representative indicating how stormwater runoff will be managed at the particular site of interest according to this Ordinance.

STREAM – A natural watercourse.

STREAM BUFFER – The land area adjacent to each side of a stream, essential to maintaining water quality. See "Buffer".

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

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SUBAREA (SUBWATERSHED) – The smallest drainage unit of a watershed for which stormwater management criteria have been established in the Stormwater Management Plan.

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

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

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

TIMBER OPERATIONS – See “Forest Management”.

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

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

TOWNSHIP – Ontelaunee Township, Berks County, Pennsylvania.

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

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

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

WATERS OF THE COMMONWEALTH – Any and all rivers, streams, creeks, rivulets, ditches, watercourses, storm sewers, lakes, dammed water, wetlands,

ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth.

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

WELLHEAD – 1. A structure built over a well; 2. The source of water for a well.

WELLHEAD PROTECTION AREA – The surface and subsurface area surrounding a water supply well, well field, spring or infiltration gallery supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water source.

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

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

Ord. 2010-2, 2/4/2010, §202; as amended by Ord. 2023-3, 8/3/2023, § 6.

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ARTICLE III

STORMWATER MANAGEMENT

Section 301. General Requirements

- A. Applicants proposing regulated activities in the Tributaries to the Schuylkill River Watershed or in the Maiden Creek Watershed which do not fall under the exemption criteria shown in Section 402 shall submit a Drainage Plan consistent with the Tributaries to the Schuylkill River Watershed or the Maiden Creek Watershed Stormwater Management Plan to the Township for review. These criteria shall apply to the total proposed development even if development is to take place in stages.
- B. The Applicant is required to evaluate practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime.
- C. The Drainage Plan must be designed consistent with the sequencing provisions of Section 304 to ensure maintenance of the natural hydrologic regime and to promote groundwater recharge, and protect groundwater and surface water quality and quantity. The Drainage Plan designer must proceed sequentially in accordance with Article III of this Ordinance.
- D. The existing points of concentrated drainage that discharge onto adjacent property shall not be altered in any manner which could cause property damage without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this Ordinance.
- E. Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by this Ordinance. If diffused drainage discharge is proposed to be concentrated and discharged onto adjacent property, the Applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other impacts will result from the concentrated discharge.
- F. Where a development site is traversed by existing watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall conform to the stream buffer requirements contained in Section 306.D of this Ordinance.
- G. Any stormwater management facilities regulated by this Ordinance that would be located in or adjacent to waters of the Commonwealth or wetlands shall be subject to approval by PaDEP through the Joint Permit Application process, or, where deemed appropriate by PaDEP, the General Permit process. When there is a

question whether wetlands may be involved, it is the responsibility of the Applicant or his agent to show that the land in question cannot be classified as wetlands, otherwise approval to work in the area must be obtained from PaDEP.

- H. Any alteration that affects stormwater flow directly or indirectly toward a PennDOT facility shall be subject to PennDOT regulations.
- I. Minimization of impervious surfaces and infiltration of runoff through seepage beds, infiltration trenches, etc. are encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities or other structural BMPs.
- J. Roof drains shall not be connected to impervious surfaces in order to promote overland flow and infiltration/ percolation of stormwater where advantageous to do so. When site conditions preclude infiltration/percolation, then it shall be permitted on a case by case basis by the Township.
- K. All stormwater runoff shall be treated for water quality.
- L. Transference of runoff to or from an EV/HQ watershed is prohibited unless otherwise authorized by DEP, DRBC or SRBC.
- M. Any changes in an existing drainage way shall be subject to the approval of the Pennsylvania Department of Environmental Protection, the Army Corps of Engineers, or the Federal Emergency Management Agency when each or all have jurisdiction. All permits and approvals shall be issued prior to construction of storm drainage-related improvements.
- N. No Regulated Earth Disturbance activities within the Township shall commence until the Drainage Plan is approved by the Township.
- O. Incorporate methods described in the Pennsylvania Stormwater Best Management Practices Manual (BMP Manual). If methods other than green infrastructure and LID methods are proposed to achieve the volume and rate controls required under this Ordinance, the SWM Site Plan must include a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.

Ord. 2010-2, 2/4/2010, §301; as amended by Ord. 2023-3, 8/3/2023, § 7.

Section 302. Permit Requirements by Other Government Entities

Permits must comply with any and all applicable local, county, state and federal regulations.

Ord. 2010-2, 2/4/2010, §302.

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

- A. No Regulated Earth Disturbance activities within the Township shall commence until the Township receives evidence of approval by the Conservation District of an Erosion and Sediment Control Plan for construction activities.
- B. DEP has regulations that require an Erosion and Sediment Control Plan for any earth disturbance activity of five thousand square feet (5,000 sq. ft.) or more, under 25 Pa. Code § 102.4(b).
- C. In addition, under 25 Pa. Code Chapter 92, a DEP "NPDES Construction Activities" permit is required for Regulated Earth Disturbance activities.
- D. Evidence of any necessary permit(s) for Regulated Earth Disturbance activities from the South Central DEP regional office or Berks County Conservation District must be provided to the Township. The issuance of an NPDES Construction Permit [or permit coverage under the statewide General Permit (PAG-2)] satisfies the requirements of Section 303.A.
- E. A copy of the Erosion and Sediment Control plan and any required permit, as required by DEP regulations, shall be available at the project site at all times.
- F. Additional erosion and sediment control design standards and criteria are recommended to be applied where infiltration BMPs are proposed shall include the following:
 - 1. Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase to maintain maximum infiltration capacity.
 - 2. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has achieved final stabilization

Ord. 2010-2, 2/4/2010, §303.

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

- A. For projects disturbing one (1) acre or more, the design of all Regulated Activities shall include evaluation of practicable alternatives to the surface discharge of stormwater, the creation of impervious surfaces, and the degradation of waters of the Commonwealth, and must maintain as much as possible the natural hydrologic regime of the site.

1. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes, and other municipal requirements.
- B. The Applicant shall demonstrate that the design of the Regulated Activities that disturb one (1) acre or more included consideration of the following issues:
1. Prepare an Existing Resource and Site Analysis Map (ERSAM), showing environmentally sensitive areas including, but not limited to, steep slopes, ponds, lakes, streams, wetlands, hydric soils, vernal pools, flood plains, stream buffer zones, hydrologic soil groups A and B (areas conducive to infiltration), special geologic features, any existing recharge areas and any other requirements outlined in the municipal Subdivision and Land Development ordinance.
 2. Establish appropriate buffers for each of the delineated environmentally sensitive areas (See Section 306.D. for stream buffers and Section 315.H for special geologic feature buffers).
 3. Prepare a draft project layout avoiding sensitive areas identified in Section 304.B.1.
 4. Identify site specific existing conditions drainage areas, discharge points, recharge areas and hydrologic soil groups A and B.
 5. Evaluate Nonstructural Stormwater Management Alternatives
 - a. Minimize earth disturbance
 - b. Minimize impervious surfaces
 - c. Break up large impervious surfaces.
 6. Satisfy infiltration objective (Section 305) and provide for stormwater pretreatment prior to infiltration. Pretreatment may not be necessary for rooftop runoff which enters the infiltration facility directly from a roof leader (rain spout/drain).
 7. Satisfy water quality (Section 306) and streambank erosion protection objective (Section 307).
 8. Determine what Management District the site falls into (Appendix C) and conduct an existing conditions runoff analysis.
 9. Prepare final project design to maintain existing conditions drainage areas and discharge points, to minimize earth disturbance and impervious surfaces, and to the maximum extent possible, to ensure the remaining site development has no surface or point discharge.

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10. Conduct a proposed condition runoff analysis based on the final design and to meet the release rate and in turn the overbank flow and extreme event requirements (Section 308).
11. Manage any remaining runoff through treatment prior to discharge, as part of detention, bioretention, direct discharge or other structural control.

Ord. 2010-2, 2/4/2010, §304.

Section 305. Ground Water Recharge (Infiltration/Recharge/Bioretention)

Maximizing the ground water recharge capacity of the area being developed is required. Design of the infiltration stormwater management facilities shall give consideration to providing ground water recharge to compensate for the reduction in the percolation that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs which can be over-designed to compensate for the infiltration losses due to parking areas. These measures are required to be consistent with Section 103, and take advantage of utilizing any existing recharge areas.

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

- A. Infiltration BMPs shall meet the following minimum requirements:
 1. Infiltration Requirements:
 - a. Regulated activities will be required to infiltrate, where site conditions permit, a portion of the runoff created by the development as part of an overall stormwater management plan designed for the site. The volume of runoff to be infiltrated shall be determined from Sections 305.A.3.a. or 305.A.3.b., depending upon demonstrated site conditions.
 2. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:
 - a. A minimum depth of twenty four inches (24") between the bottom of the BMP and the limiting zone.

- b. An infiltration and/or percolation rate sufficient to accept the additional stormwater load and drain completely as determined by field tests conducted by the Applicant's design professional.
 - c. The infiltration facility shall be capable of completely infiltrating the required retention (infiltration) volume within four (4) days (ninety six (96) hours).
 - d. Pretreatment shall be provided prior to infiltration.
3. The size of the infiltration facility shall be based upon the following volume criteria:
- a. NRCS Curve Number equation.

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

$I \text{ (Infiltration requirement, in inches)} = (200 / CN) - 2$	Eqn: 305.1
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where:

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

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

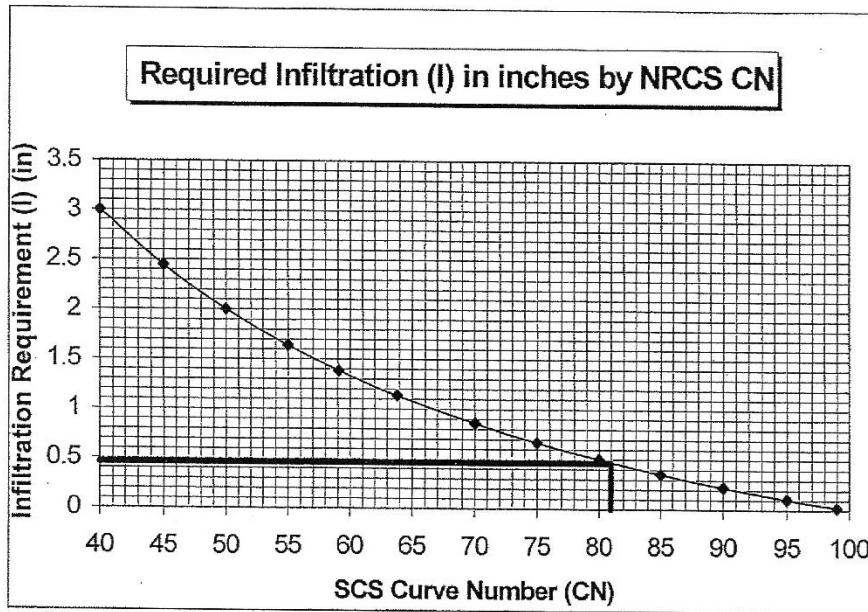


Figure 305.1. Infiltration requirement based upon NRCS Curve Number.

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

Re_v (Cubic Feet) = I * impervious area (square feet) / (12 in/ft)	Eqn: 305.2
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Where:

I = infiltration requirements (in inches)

b. Annual Recharge -Water Budget Approach.

It has been determined that infiltrating 0.46 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. If the goals of Section 305.A.3.a cannot be achieved, then 0.46 inches of rainfall shall be infiltrated from all impervious areas, up to a an existing site conditions curve number of 81. Above a curve number of 81, Equation 305.1 or the curve in Figure 305.1 should be used to determine the infiltration requirement.

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

1. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of sub-grade stability; infiltration is not permitted to be ruled out without conducting these tests.
2. Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.
3. Design the infiltration structure for the required retention (Re_v) volume based on field determined capacity at the level of the proposed infiltration surface.
4. If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the Township that the soils are conducive to infiltrate on the lots identified.

C. Carbonate Areas - The Applicant shall investigate non-carbonate areas of the site for the suitability of infiltration and, if feasible, proceed to undertake infiltration

pursuant to Section 305.A. If infiltration in non-carbonate areas is not feasible, the Applicant shall investigate areas of the site underlain by carbonate bedrock for infiltration purposes. If a suitable area is identified that meets the requirements of this provision and Table B-5, infiltration shall be conducted in accordance with the requirements of this ordinance. Only if infiltration proves infeasible in both carbonate and non-carbonate areas of the site may the applicant be granted a waiver from the infiltration requirements of the ordinance without structural BMP's.

Infiltration BMP loading rate percentages in Table B-5 in Ordinance Appendix B shall be calculated as follows:

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

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

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

Soil thickness is to be measured from the bottom of any proposed infiltration BMP. The effective soil thickness in Table B-5 in Ordinance Appendix B is the measured soil thickness multiplied by the thickness factor based on soil permeability, as follows:

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

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

- D. Stormwater Hotspots - Following is a list of examples of designated hotspots. If a site is designated as a hotspot, it has important implications for how stormwater is managed. First and foremost, untreated stormwater runoff from hotspots shall not be allowed to recharge into groundwater where it may contaminate water supplies. Therefore, the Rev requirement shall NOT applied to development sites that fit into the hotspot category (the entire WQv must still be treated). Second, a greater level of stormwater treatment shall be considered at hotspot sites to prevent pollutant washoff after construction. EPA's NPDES stormwater program requires some industrial sites as well as nine hundred twenty three (923)

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municipalities and other entities to prepare and implement a stormwater pollution prevention plan.

Examples of Hotspots:

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

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

- Residential streets and rural highways
- Residential development
- Institutional development
- Office developments
- Non-industrial rooftops
- Pervious areas, except golf courses and nurseries (which may need an Integrated Pest Management (IPM) Plan).

While large highways (average daily traffic volume (ADT) greater than thirty thousand (30,000)) are not designated as a stormwater hotspot; however, it is important to ensure that highway stormwater management plans adequately protect groundwater.

- E. Caution shall be exercised where infiltration is proposed in Source Water Protection Areas as defined by the local Municipality or Water Authority.
- F. The use of multiple, small, unconnected infiltration BMP's on a site, rather than one large infiltration facility, is encouraged. The design specifications of infiltration facilities shall follow the guidelines of the Maryland Stormwater Design Manual (latest edition), or other design manuals as approved by the Township Engineer, on a case-by-case basis.
- G. Caution shall be exercised where salt or chloride (municipal salt storage) would be a pollutant since soils do little to filter this pollutant and it may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration facility and perform a

hydrogeologic justification study if necessary. A hydrogeologic justification study would entail: Field reconnaissance, in which local geology, topographic features, local wall characteristics, surface water flows, potential contamination, and nature of impermeable areas are determined. Data review of collected pertinent information such as geologic information, hydrologic data concerning both surface and groundwater, and geophysical data. With the collected data, a hydrologic model may be developed to determine the extent to which salt or chloride affects the groundwater.

- H. The infiltration requirement in High Quality or Exceptional Value waters shall be subject to the Department's Chapter 93 Antidegradation Regulations.
- I. Dependent upon certain land use or hotspots an impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Township.
- J. The Township shall require the Applicant to provide safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or spill.
- K. For projects that disturb one (1) acre or more, unless otherwise specified in the zoning ordinance, the following setbacks for infiltration facilities shall apply;
 - One hundred feet (100') from water supply wells
 - Ten feet (10') downslope or one hundred feet (100') upslope from building foundations
 - Fifty feet (50') from septic system drainfields
 - Fifty feet (50') 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;
 - One hundred feet (100') from the property line unless documentation is provided to show all setbacks from wells, foundations and drainfields on the neighboring property will be met.

Ord. 2010-2, 2/4/2010, §305.

Section 306. Water Quality Requirements

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

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

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water quality volume (WQ_v) is the storage capacity needed to capture and treat a portion of stormwater runoff from the developed areas of the site.

To achieve this goal, the following criterion is established:

The following calculation formula is to be used to determine the water quality storage volume, (WQ_v), in acre-feet of storage for the Tributaries to the Schuylkill River Watershed and the Maiden Creek watershed:

$WQ_v = [(P)(R_v)(A)]/12$	Eqn: 306.1
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WQ_v = Water Quality Volume (acre-feet)

P = 1 inch

A = Total contributing drainage area to the water quality BMP (acres)

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

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

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

- B. For areas within defined Special Protection subwatersheds which include Exceptional Value (EV) and High Quality (HQ) waters, Cold Water Fishery (CWF) the temperature and quality of water and streams shall be maintained.
- C. The water quality objectives shall be achieved through a combination of BMP's. The use of multiple, small, unconnected BMP's on a site, rather than one large stormwater management facility, is encouraged. The design specifications of water quality facilities shall follow the guidelines of the Maryland Stormwater Design Manual (latest edition), or other design manuals as approved by the Township Engineer, on a case-by-case basis.
- D. If a perennial or intermittent stream passes through the site, the applicant shall create a stream buffer extending a minimum of fifty feet (50') to either side of the top-of-bank of the channel. The buffer area shall be maintained with appropriate native vegetation (Reference to Appendix F of Pennsylvania Handbook of Best Management Practices for Developing Area for plant lists). If the applicable rear or side yard setback is less than fifty feet (50'), the buffer width may be reduced to twenty five percent (25%) of the setback to a minimum of ten feet (10'). If an existing buffer is legally prescribed (i.e. deed, covenant, easement, etc.) and it exceeds the requirements of this Ordinance, the existing buffer shall be maintained. This does not include lakes or wetlands.

- E. Evidence of any necessary permit(s) for regulated earth disturbance activities from the South Central DEP regional office or the Berks County Conservation District must be provided to the Township.

Ord. 2010-2, 2/4/2010, §306.

Section 307. Streambank Erosion Requirements

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

The minimum orifice size in the outlet structure to the BMP shall be a three inch (3") diameter orifice and a trash rack shall be installed to prevent clogging. On sites with small contributing drainage areas to this BMP that do not provide enough runoff volume to allow a twenty four (24) hour attenuation with the three inch (3") orifice, the calculations shall be submitted showing this condition. Orifice sizes less than three inches (3") can be utilized provided that the design will prevent clogging of the intake.

Ord. 2010-2, 2/4/2010, §307.

Section 308. Stormwater Management Districts

- A. The Tributaries to the Maiden Creek Watershed and the Schuylkill River Watershed have been divided into stormwater management districts as shown on the Management District Maps in Appendix C. Corresponding release rate percentages associated with each Stormwater Management District are provided as well.

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

Standards for managing runoff from each subarea in the Tributaries to the Maiden Creek Watershed and the Schuylkill River Watershed for the relevant design storms are shown in Table 308.1. Development sites located in each of the Districts must control proposed condition runoff rates to existing conditions runoff rates for the design storms in accordance with Table 308.1.

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TABLE 308.1 – Water Quantity Requirements

MAIDEN CREEK WATERSHED DISTRICTS				
Management District	Proposed Condition Design Storm		Existing Condition Design Storm	Equivalent Release Rate
A	2 - year	Reduce To	1 - year	-
	5 - year		5 - year	100 %
	10 - year		10 - year	100 %
	25 - year		25 - year	100 %
	100 - year		100 - year	100 %
B-1	2 - year	Reduce To	1 - year	-
	10 - year		5 - year	75 %
	25 - year		10 - year	75 %
	50 - year		25 - year	75 %
	100 - year		100 - year	100 %
B-2	2 - year	Reduce To	1 - year	-
	5 - year		2 - year	30 %
	25 - year		5 - year	50 %
	50 - year		10 - year	50 %
	100 - year		100 - year	100 %
B-3	2 - year	Reduce To	1 - year	-
	5 - year		2 - year	30 %
	10 - year		5 - year	75 %
	50 - year		25 - year	75 %
	100 - year		100 - year	100 %
C	2 - year	Reduce To	1 - year	100%
	5 - year		5 - year	100%
	10 - year		10 - year	100%
	25 - year		25 - year	100%
	50 - year		50 - year	100%
	100 - year		100 - year	100%

TRIBUTARIES TO THE SCHUYLKILL RIVER WATERSHED DISTRICTS				
Management District	Proposed Condition Design Storm		Existing Condition Design Storm	Equivalent Release Rate
A	2 - year	Reduce To	1 - year	-
	5 - year		5 - year	100 %
	10 - year		10 - year	100 %
	25 - year		25 - year	100 %
	50 - year		50 - year	100 %
	100 - year		100 - year	100 %
B	2 - year	Reduce To	1 - year	-
	5 - year		2 - year	30 %
	10 - year		5 - year	75 %
	25 - year		10 - year	75 %
	50 - year		25 - year	75 %
	100 - year		50 - year	75 %
C	2 - year	Reduce To	1 - year	-
	5 - year		5 - year	100 %
	10 - year		10 - year	100 %
	25 - year		25 - year	100 %
	50 - year		50 - year	100 %
	100 - year		100 - year	100 %

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

- B. General - Proposed condition rates of runoff from any regulated activity shall not exceed the peak release rates of runoff prior to development for the design storms specified on the Stormwater Management District Watershed Maps (Ordinance Appendix C) and Section 308, of this Ordinance.
- C. District Boundaries - The boundaries of the Stormwater Management Districts are shown on the official maps that are available for inspection at the municipal office. Copies of the official maps at a reduced scale are included in the Ordinance Appendix 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 (or most accurate data required) provided as part of the Drainage Plan.
- D. Sites Located in More Than One District - For a proposed development site located within two or more stormwater management district category subareas, the peak discharge rate from any subarea shall meet the Management District Criteria for which the discharge is located, as indicated in Section 308. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by subarea. An exception to the above may be granted if discharges from multiple subareas recombine in proximity to the discharge site. In this case, peak discharge in any direction shall follow Management District A criteria provided that the overall site discharge meets the Management District Criteria for which the discharge is located.

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- E. Off-Site Areas - Off-site areas that drain through a proposed development site are not subject to release rate criteria when determining allowable peak runoff rates. However, on-site drainage facilities shall be designed to safely convey off-site flows through the development site.
- F. Site Areas - Where the site area to be impacted by a proposed development activity differs significantly from the total site area, only the proposed impact area utilizing stormwater management measures shall be subject to the Management District Criteria. In other words, unimpacted areas bypassing the stormwater management facilities would not be subject to the Management District Criteria.

Ord. 2010-2, 2/4/2010, §308.

Section 309. Calculation Methodology

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

**TABLE 309-1
Acceptable Computation Methodologies For
Stormwater Management Plans**

<u>METHOD</u>	<u>METHOD DEVELOPED BY</u>	<u>APPLICABILITY</u>
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary.
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans within limitations described in TR-55.
HEC-1 / HEC-HMS	US Army Corps of Engineers	Applicable where use of full hydrologic computer model is desirable or necessary.
PSRM	Penn State University	Applicable where use of a hydrologic computer model is desirable or necessary; simpler than TR-20 or HEC-1.

Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling(1889)	For sites less than 200 acres and with time of concentration less than 60 minutes ($t_c < 60$ min), or as approved by the Township
Other Methods	Varies	Other computation methodologies approved by the Township

*** Note: Successors to the above methods are also acceptable. These successors include WINNTR55 for TR55 and WINTR20 for TR20 and SWMM.**

- B. All calculations consistent with this Ordinance using the soil cover complex method shall use the appropriate design rainfall depths for the various return period storms according to the region in which they are located as presented in the PennDOT Drainage Manual (Publication 584), Chapter 7, Appendix A, Field Manual for Pennsylvania Design Rainfall Intensity Charts from NOAA Atlas 14 Version 3 Data. If a hydrologic computer model such as PSRM or HEC-1 I HEC-HMS is used for stormwater runoff calculations, then the duration of rainfall shall be twenty four (24) hours. The SCS 'S' curve shown in Figure B-1, Appendix B of this Ordinance shall be used for the rainfall distribution.
- C. For the purposes of existing conditions flow rate determination, undeveloped land shall be considered as "meadow" in good condition, unless the natural ground cover generates a lower curve number or Rational 'C' value (i.e., forest), as listed in Table B-2 or B-3 in Appendix B of this Ordinance.
- D. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times-of-concentration for overland flow and return periods from the Design Storm Curves from the PennDOT Drainage Manual (Publication 584), Chapter 7, Appendix A, Field Manual for Pennsylvania Design Rainfall Intensity Charts from NOAA Atlas 14 Version 3 Data. Times-of-concentration for overland flow shall be calculated using the methodology presented in Chapter 3 of Urban Hydrology for Small Watersheds, NRCS, TR- 55 (as amended or replaced from time to time by NRCS). Times-of-concentration for channel and pipe flow shall be computed using Manning's equation. NRCS lag equation divided by 0.6 as acceptable method for T_c in undeveloped areas.
- E. Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be obtained from Table B-2 in Appendix B of this Ordinance.
- F. Runoff coefficients (c) for both existing and proposed conditions for use in the Rational Method shall be obtained from Table B-3 in Appendix B of this Ordinance.
- G. Where uniform flow is anticipated, the Manning equation shall be used for hydraulic computations, and to determine the capacity of open channels, pipes,

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and storm sewers. Values for Manning's roughness coefficient (n) shall be consistent with Table B-4 in Appendix B of the Ordinance. Full flow shall be assumed for closed conduits.

- H. Outlet structures for stormwater management facilities shall be designed to meet the performance standards of this Ordinance using any generally accepted hydraulic analysis technique or method.
- I. The design of any stormwater detention facilities intended to meet the performance standards of this Ordinance shall be verified by routing the design storm hydrograph through these facilities using the Storage-Indication Method. For drainage areas greater than two hundred (200) acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph (i.e. TR-20, TR-55, HEC-1, PSRM). The Township may approve the use of any generally accepted full hydrograph approximation technique that shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

Ord. 2010-2, 2/4/2010, §309.

Section 310. Design Criteria for Stormwater Management Facilities

- A. Any stormwater facility located on state highway rights-of-way shall be subject to approval by PennDOT.
- B. Any stormwater management facility (e.g., detention basin) designed to store runoff and requiring a berm or earthen embankment required or regulated by this Ordinance shall be designed to provide an emergency spillway to handle flow up to and including the one-hundred-year postdevelopment conditions. The height of embankment must be set as to provide a minimum 1.0 foot of freeboard above the maximum pool elevation computed when the facility functions for the one-hundred-year postdevelopment inflow. Should any stormwater management facility require a dam safety permit under PADEP Chapter 105, the facility shall be designed in accordance with Chapter 105 and meet the regulations of Chapter 105 concerning dam safety which may be required to pass storms larger than one-hundred-year event. The Applicant shall provide evidence of PADEP approval prior to Final Plan approval.
- C. 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 or replaced from time to time by PADEP), shall be designed in accordance with Chapter 105 and will require a permit from PADEP. Any other drainage conveyance facility that does not fall under Chapter 105 regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the twenty-five-year design storm with a minimum 1.0 foot of freeboard measured below the lowest point along the top of the roadway.

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

- D. Any drainage conveyance facility and/or channel that does not fall under Chapter 105 regulations, must be able to convey, without damage to the drainage structure or roadway, runoff from the twenty-five-year design storm. Conveyance facilities to or exiting from stormwater 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 one-hundred-year design storm. Any facility located within a PennDOT right-of-way must meet PennDOT minimum design standards and permit submission requirements.
- E. Adequate erosion protection shall be provided along all open channels, and at all points of discharge.
- F. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Township shall reserve the right to disapprove any design that would result in the occupancy or continuation of an adverse hydrologic or hydraulic condition within the watershed.

Ord. 2010-2, 2/4/2010, §310.

Section 311. Floodplain Methodology

- A. All existing and proposed one-hundred-year floodplains shall be delineated on the Stormwater Management Site Plan. If the one-hundred-year floodplain is not mapped by the Federal Emergency Management Agency as part of the National Flood Insurance Program, the horizontal and vertical limits of the floodplain shall be determined utilizing the standard step method (i.e., HEC-RAS or similar approved computer model). If the HEC-RAS model is used, the Applicant shall submit a computer disc containing all input files for the calculations, in order to expedite the floodplain review. If the drainage area is less than one hundred (100) acres, the Manning equation may be used.
- B. The methods below shall be used to compute the design flow(s) in the drainage course although other methods may be used with approval of the Township. A conservative average of two methods shall be used, and the design flow is subject to approval by the Township.
 - 1. The graphical and tabular methods in TR-55. The graphical method may be used for streams whose drainage area at the point of interest is no larger than two thousand (2,000) acres, and the tabular hydrograph method may be used for drainage areas up to twenty (20) square miles (twelve thousand eight hundred (12,800) acres)).

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2. The rational method may be used for streams whose drainage area at the point of interest is no larger than three hundred twenty (320) acres.
3. The method in Water Resources Bulletin Number 13, Floods in Pennsylvania, issued by the Pennsylvania Department of Environmental Resources (now Protection) may be used for streams whose drainage area at the point of interest is larger than two square miles.
4. The "Procedure PSU-IV for Estimating Design Flood Peaks on Ungaged Pennsylvania Watersheds."
5. The Penn State Runoff Model (PSRM).

Ord. 2010-2, 2/4/2010, §311.

Section 312. Additional Stormwater Management System Design Criteria for Selected Best Management Practices

- A. Infiltration devices shall be selected based on suitability of soils and site conditions. Suitability of soils shall be determined by soil infiltration testing, with suitability typically defined as having minimum percolation rates of 0.50 inches per hour at the elevation of the bottom of the facility (lower rates can be acceptable in special situations).
- B. Soil infiltration testing shall be performed for all proposed infiltration areas; soil testing shall include evaluation of appropriate soil horizons with deep pits and percolation measurements, making sure to assess percolation rates at the proposed infiltration device bed bottom. Soil testing, including the frequency and locations of the tests, are subject to review and approval by the Township. The design soil infiltration rate shall be the average infiltration rate measured at each proposed area
- C. The lowest elevation of the infiltration area shall be at least two feet above any limiting zones (including seasonal high water table and bedrock), except in the case of limestone formations, in which case the distance from bedrock shall be four feet.
- D. All roof drains which discharge to infiltration systems shall have appropriate measures to prevent clogging by vegetation and prevent sinkhole formation.
- E. All infiltration systems shall have appropriate positive overflow controls within one foot of the finished surface or grade.
- F. All infiltration systems shall have a setback of fifteen feet (15') from all residential structures and property lines. Seepage into subgrade structures shall be prevented.

- G. All infiltration systems shall be designed to infiltrate the stored volume within forty eight (48) hours.
- H. All surface inflows shall be designed to minimize the discharge of sediment into the infiltration system in order to prevent sediment accumulation, which reduces stormwater storage capacity and ultimately clogs the infiltration mechanism.

Special provisions are required when using infiltration BMPs in carbonate areas in order to avoid groundwater contamination and solution channel/sinkhole formation. In these cases, the Township may require that a detailed geologic evaluation of the project site be performed to determine the suitability for recharge, including both the potential for groundwater contamination and potential for sinkhole formation. The evaluation shall be performed by a qualified geologist and/or soil scientist, and at a minimum, address soil permeability, depth to bedrock, susceptibility to sinkhole formation, and subgrade stability.

1. Because potential for these problems to develop increases as soil thickness decreases, the soil mantle should be determined to be a minimum of four feet in thickness, in order to both remove pollutants and uniformly disperse groundwater movement, which is important to avoid solution channel formation.
2. In carbonate areas, BMPs which disperse stormwater over the largest feasible area should be used (e.g., subtle berms and level spreaders) so as not to significantly modify the natural hydrologic regime. Use of infiltration BMPs which result in significant increases (more than a one hundred percent (100%) increase) in the predevelopment rate of infiltration per unit area should be avoided in carbonate areas, unless a detailed geologic evaluation (see below) demonstrates that the potential for sinkhole formation is minimal.
3. Stormwater runoff from significant pollutant producing sources (so called hot spots such as industrial uses, gas stations, fast food and other commercial uses generating large numbers of vehicle trips, and other uses at the determination of the Township) shall be filtered and/or pretreated using a stormwater quality BMP before being discharged in carbonate areas.

Ord. 2010-2, 2/4/2010, §312.

Section 313. Need for Basins, Storm Sewers, Culverts, Bridges and Other Structural Installations

Basins, storm sewers, culverts, bridges and other structural installations shall be provided to safely accommodate stormwater, where natural nonstructural practices are not feasible and where stormwater flows otherwise would have adverse impact on the

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environment and the general welfare of the Ontelaunee Township and its citizens in order to:

- A. Maintain natural hydrologic regimes of streams and watercourses. Such flows may be redirected as required, subject to the approval of PADEP.
- B. Promote drainage of all low points along the line of streets. Overflow swales shall be designed to convey the full one-hundred-year storm flows away from all street low points. These swales shall be located to prevent flooding of the downslope lots.
- C. Intercept stormwater runoff along streets at intervals reasonably related to the extent and grade of the area drained, and to prevent substantial flow of water across intersections or flooding of intersections during the design storm stipulated elsewhere in this Ordinance.
- D. Insure adequate and unimpeded flow of stormwater under driveways in, near, or across natural watercourses or drainage swales. Suitable pipes or other waterway openings shall be provided as necessary.

Ord. 2010-2, 2/4/2010, §313.

Section 314. Design of Basins (Detention and Retention), Storm Sewers, Culverts, Bridges and Other Structural Installations

- A. Standards for conventional basins shall meet requirements listed in this section.
 - 1. Basins shall be installed prior to any earthmoving or land disturbances that they will serve. The phasing of their construction shall be noted on the erosion and sediment control plan. Permanent vegetation shall be established prior to denuding any other land, unless the basin functions as an erosion and sediment control device.
 - 2. Basins shall be designed to provide for groundwater recharge wherever feasible. For basins located in the carbonate area, a detailed geologic evaluation of the project site shall be performed to determine the suitability for recharge, including both the potential for groundwater contamination and potential for sinkhole formation. The evaluation shall be performed by a qualified geologist and/or soil scientist, and at a minimum, address soil permeability, depth to bedrock, susceptibility to sinkhole formation and subgrade stability. Soils used for the construction of basins shall have low-erodibility factors (K factors). The Township may require an impermeable liner to be installed up to the one-hundred-year design water surface elevation.
 - 3. Energy dissipaters and/or level spreaders shall be installed at points where pipes or drainage ways discharge from basins. Multiple outlet structures

and multiple outlet piping from the basin may be required by the Township to reduce the impact of point discharges.

4. The following slope restrictions shall apply to basins:
 - a. Exterior slopes of compacted soil shall not exceed one foot vertical for three feet horizontal, and may be further reduced if the soil has unstable characteristics.
 - b. Interior slopes of the basin shall not exceed one foot vertical in three feet horizontal except with approval of the Township and:
 - (i) Where maximum water depth will not exceed three feet (3'); or
 - (ii) When a two inch (2") rainfall in one (1) hour will not exceed the capacity of the basin in one (1) hour; or
 - (iii) Where concrete, stone or brick walls are used with side slopes proposed to be steeper than one-foot vertical in three-foot horizontal, in which case the basin shall be fenced by a permanent fence forty two inches (42") in height and a ramp of durable, nonslip materials for maintenance vehicles shall be provided for access into the basin.
 - c. The minimum bottom slope shall be three percent (3%) for grass, and three-quarters percent (0.75%) for concrete paving. The minimum bottom slope may be reduced to zero percent (0%) for grass to meet infiltration requirements, if approved by the Township engineer on a case by case basis. One percent (1%) may be used for grass if an underdrain system is provided and if basin is not designed for infiltration. A concrete low flow channel may be required for basins where the distance from the inlet pipe to the outlet structure exceeds one hundred feet (100'), depending upon site conditions. The minimum channel width shall be four feet (4'). The channel shall be constructed of four inch (4") thick concrete (3,300 psi twenty-eight-day strength) over four inches (4") of PennDOT No. 2A stone.
5. Basins shall also be designed to meet the following requirements:
 - a. The maximum berm height shall be fifteen feet (15'), unless otherwise approved by the Township Supervisors and the PADEP.
 - b. The minimum top of berm width shall be eight feet.
 - c. Outlet pipes shall have a minimum diameter of 12 inches (12"). For pipe lengths exceeding one hundred feet (100'), the minimum diameter shall be 15 inches (15").

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- d. Properly spaced antiseep collars (eight inch (8") minimum thickness) shall be installed on all basin outlet pipes. Design calculations shall be provided.
 - e. All berms shall be constructed with a compacted relatively impervious (Unified Soil Classification CL-ML or CL) key trench and core. The key trench shall extend at least two feet into undisturbed subsoil (below topsoil layer). The minimum bottom width of the trench shall be four feet (4') and the minimum top width of the core shall be eight feet (8'). The side slopes of the compacted core and trench shall not exceed one horizontal to one vertical, and the top elevation of the core shall be set at or above the twenty-five-year design water elevation.
 - f. The top of berm shall be constructed at least six inches (6") above the design elevations to allow for settlement of the embankment.
6. Basin outlet structures and emergency spillways
- a. Outlet structures within basins which will control peak discharge flows and distribute the flows by pipes to discharge areas shall be constructed primarily of concrete or masonry material and shall have childproof, nonclogging trash racks overall design openings, except those openings designed to carry perennial stream flows. Trash rack material should be epoxy-coated galvanized or stainless steel. Other materials are subject to the approval of the Township.
 - b. Six inches (6") of freeboard shall be provided between the crest of the primary outlet structure and the invert of the emergency spillway.
 - c. Emergency spillways shall be constructed in undisturbed earth wherever possible. When constructed in fill, sod, precast concrete paving blocks, concrete or permanent erosion-control matting shall be used. Design calculations shall be submitted indicating that the specified material can withstand velocities based on the one-hundred-year design storm event. When using sod, it shall be applied along the inside slope above the twenty-five-year water surface elevation, along the face and sides of the spillway and down the outside slope to existing grade. Emergency spillways shall be designed to safely convey the one-hundred-year basin inflow hydrograph through the basin assuming the principal outlet is completely blocked and the basin water surface elevation is equal to the spillway invert elevation.
7. Basin inlet and outlet structures should be located at maximum distances from one another. The Township may require a rock filter berm or rock

filled gabions between inlet and outlet areas when the distance is deemed insufficient for sediment trappings.

8. Permanent grasses or stabilization measures shall be established on the sides of all earthen basins by hydroseeding within five (5) days of initial construction (or conversion from sediment basin or sediment trap). The Township may require jute or erosion control matting to be installed inside the basin or on the basin embankment.
9. Stormwater runoff shall discharge to a suitable natural drainage course (except where prohibited by riparian buffer area regulations of this Ordinance) or storm sewer system. Where not possible or not permitted, level spreading devices or other suitable facilities (e.g., swale) shall be designed with sufficient capacity to convey the one-hundred-year storm event without creating any safety flooding, or property hazard. Securing of necessary drainage easements for this purpose shall be the sole responsibility of the Developer.
10. The Township may require soil samples from the site to be analyzed to determine if these soils are suitable for berm embankment construction. If the soils are found to be unsuitable, the Developer shall import suitable soils for constructing the basin.

B. Swale design.

1. Grass swales not specifically designed as BMP devices shall have a minimum bottom slope of two percent (2%). Swale lining shall be designed based on the ten-year velocity. Swales shall have sufficient freeboard to convey the one-hundred-year storm discharge without creating any safety or property hazard.
2. Swales, when located outside of the Township right-of-way, shall be located within an easement not less than twenty feet (20') wide, but of sufficient width to allow access for maintenance and to convey the one-hundred-year storm. A note on the plan shall indicate that the easement allows the Township the right, though not the responsibility, to perform needed maintenance and/or repairs.

C. Storm sewer design.

1. Storm sewer lines within street rights-of-way shall be placed immediately in front of the curb when parallel to the right-of-way. Locating storm sewers under curbs in curves or at street intersections shall be avoided.
2. Storm sewers shall have a minimum diameter of fifteen inches (15"). The minimum grade of the pipe shall be one-half percent (0.50%).

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3. Storm sewer pipe material for pipes up to a maximum diameter of forty eight inches (48") shall be either reinforced cement concrete (of the proper class for the intended installation) or smooth-lined high density polyethylene (HDPE) pipe. Storm sewer pipe material for pipes of a diameter larger than forty eight inches (48") shall be either reinforced cement concrete (of the proper class for the intended installation).
4. In carbonate areas, watertight pipe connections are required and appropriate specifications shall be specified on the plans.
5. Headwalls, endwalls, or end sections shall be required on all open pipes, shall be of concrete construction and shall be set on a minimum of twelve inches (12") of AASHTO No. 57 (PennDOT 2B) coarse aggregate.
6. All storm sewer components (pipes, inlets, manholes, etc.) shall be constructed per current PennDOT standards and criteria as outlined in Publication 408 (Specifications), Publication 13M (Design Manual Part 2 Highway Design) and Publication 72M (Roadway Construction Standards), latest editions.
7. All storm sewer inlets in paved areas shall be constructed with bicycle safe grates.
8. When there is a change in pipe size through an inlet, the top inside elevation of the outlet pipe shall be at or below the top inside elevations of all incoming pipes.
9. Storm sewer sizes shall be determined based upon the following design storm frequencies:
 - a. Ten (10) years for single-family, residential subdivisions.
 - b. Twenty-five (25) years in all other subdivisions or land developments, unless otherwise specified by the Township.
 - c. The design of storm sewer systems within the drainage area of detention or retention facilities must be analyzed for adequacy during the one-hundred-year storm, including the effects of the control facility tailwater. This may require a hydraulic grade line analysis. When approved by the Township, overflow swales may be provided at low points in streets to safely convey the full one-hundred-year peak flow to the control facility, in lieu of providing the full capacity in the storm sewer.
10. Storm sewer design shall be based upon PennDOT design methods. Inlet efficiency and bypass flow shall be determined for all inlets, and the gutter flow spread shall not exceed one-half the travel lane width or to a maximum

of eight feet (8') where parking is permitted. The Township may require that a hydraulic grade-line analysis be performed on storm sewer systems.

11. Culverts shall be evaluated for inlet and outlet control restrictions.
12. Rainfall intensity curves and other hydraulic design data, provided by PennDOT and/or manufacturers of storm drainage structures, shall be used for design purposes.
13. Subsurface drainage systems shall have manholes, inlets or junction boxes spaced at intervals not exceeding three hundred feet (300') and located wherever branches are connected or sizes are changed and wherever there is a change in alignment or grade. Whether a manhole, inlet or junction box is used at any particular location is subject to approval by the Township Supervisors.
14. For drainage lines of forty eight inches (48") diameter or greater, manholes may be spaced at intervals greater than three hundred feet (300') with the approval of the Township Supervisors.
15. When precast concrete inlets or manholes are used within a street, a minimum of two (2) courses of brick masonry or grade ring shall be placed to bring the grate or cover to proper elevation. If brick is used, every third vertical joint shall be left open; if grade rings are used, the horizontal joints shall be left open to facilitate drainage of the base course. Geotextile fabric shall be wrapped around the outside of the brick masonry or grade rings to prevent the washing of fines into the structure.
16. Precast inlet tops and boxes shall meet the requirements of PennDOT Publication 408. PennDOT Type "C" precast concrete inlet top units are to be provided with a five-inch-by-twenty-four-inch cast iron "Dump No Waste - Drains To Waterway" (with one-half-inch raised lettering) plate with trout logo as manufactured by E. Jordan Iron Works or approved equal. PennDOT Type "M" precast concrete inlet top units are to be provided with a three-inch-by-twenty-four-inch cast iron "Dump No Waste - Drains To Waterway" (with one-half-inch raised lettering) plate with trout logo as manufactured by E. Jordan Iron Works or approved equal. Bottom of covers are to be clearly marked with grade of iron (ASTM A48, Class 35B), product number and date of manufacture.
17. The words "Dump No Waste - Drains To Waterway" in one-and-one-quarter-inch raised letters with bass logo shall be cast or stamped into the storm sewer manhole covers as manufactured by E. Jordan Iron Works or approved equal. Bottoms of covers are to be clearly marked with grade of iron (ASTM A48, Class 35B), product number and date of manufacture.
18. Provisions shall be made to minimize erosion at points of discharge from storm drainage facilities through the use of proper ground cover or riprap.

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D. Roof drains.

1. Stormwater roof drains shall not discharge water directly over a sidewalk or into any sanitary sewer line.
2. Except for single-family homes, proposed roof drains and collector locations shall be shown on the storm drainage plans. Roof drains and collectors shall meet all BOCA Codes and the Township Code.

E. Design of bridges and culverts.

1. Bridges and culverts shall have ample waterway to carry the design flows, based on a minimum storm frequency of twenty five (25) years, unless a larger design flow is required by PADEP. One-hundred-year water depths shall not exceed six inches (6") above the roadway centerline elevation. Bridge and/or culvert construction shall be in accordance with the PennDOT specifications and shall meet the requirements of the PADEP. The appropriate permits and approvals must be acquired by the Applicant prior to Final Plan approval.
2. Culverts shall be provided with wing walls and constructed for the full width of the right-of-way. If the character of the road is expected to change for future planning, the cartway of the bridge shall be made to anticipate this condition. On each side of the bridge cartway, the bridge railing must be set back from the edge of the final cartway and this area may be used to place sidewalks, present or future.

Ord. 2010-2, 2/4/2010, §314; amended by Ord. 2021-2, 4/1/21, § 1.

Section 315. Various Other Site Development Requirements

- A. Procedures for protecting soils or geologic structures with water supply potential from contamination by surface water or other disruption by construction activity shall be established in consultation with the Township and such areas shall include, at minimum, those underlain by carbonate limestone formations. The Township may require pollution control facilities to be provided on existing or proposed stormwater management systems within or adjacent to the project site.
- B. Provisions for protecting existing wells or other water supplies shall be established.
- C. All wet basin designs shall incorporate biologic minimization controls consistent with the West Nile Guidance found in Appendix E.
- D. Any stormwater management facility (e.g., detention basin) designed to store runoff and requiring a berm or earthen embankment required or regulated by this

Ordinance shall be designed to provide an emergency spillway to handle flow up to and including the 100-year proposed conditions and may be subject to PADEP Chapter 105 regulations.

- E. Graded slopes shall not be steeper than three horizontal units to one vertical unit.
- F. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), water encroachments, and any work involving wetlands governed by PADEP Chapter 105 regulations (as amended or replaced from time to time by PADEP), are subject to PADEP Chapter 105 regulations.
- G. A minimum of four inches of topsoil shall be provided on all disturbed areas prior to final seeding and mulching.
- H. No stormwater detention facility shall be placed within fifty feet (50') of a special geologic feature. No stormwater conveyance facility shall be constructed within fifty feet (50') of a special geologic feature, unless it is constructed of durable pipe utilizing watertight joints.

Ord. 2010-2, 2/4/2010, §315.

ARTICLE IV

DRAINAGE PLAN REQUIREMENTS

Section 401. General Requirements

For any of the activities regulated by this Ordinance, the preliminary or final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any earth disturbance activity may not proceed until the Property Owner or Applicant or his/her agent has received written approval of a Drainage Plan from the Township unless the project qualifies for an exemption from the requirements to submit a Drainage Plan.

Ord. 2010-2, 2/4/2010, §401.

Section 402. Exemptions

A. General Exemptions

The following land use activities are exempt from the Drainage Plan submission requirements of this ordinance.

1. Use of land for gardening for home consumption.
2. Agricultural plowing and tilling are exempt from the rate control and SWM site plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 PA Code, Chapter 102.
3. Forest Management and timber operations are exempt from the rate control and SWM site plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 PA Code, Chapter 102.

B. Stormwater Quantity Control Exemption

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

**TABLE 402-1
Impervious Area Exemption Criteria**

Total Parcel Size	Impervious Area Exemption (sq. ft.)
0 to <0.125 ac	1,000 sq. ft.
0.125 to <0.5 ac	2,500 sq. ft.
0.5 to <1 ac	5,000 sq. ft.
1 to <2 ac	7,500 sq. ft.
2 to <3 ac	10,000 sq. ft.
3 to <4 ac	12,500 sq. ft.
≥4 ac	15,000 sq. ft.

C. Minor Subdivision Exemption

Residential subdivision plans for three or less lots are exempt from the requirement to submit a Drainage Plan at the time of the subdivision; however, development of the individual lots created by the subdivision is subject to all other provisions of this Ordinance.

D. Requirements for Exempt Activities

1. Exemption does 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.
2. Exemption does not relieve the Applicant from meeting the water quality requirements of this Ordinance.
3. Exemptions based on Section 402.B (Impervious Area Exemption) shall be designed and constructed in accordance with the techniques and requirements contained in Appendix G of this Ordinance. For exempted activities which require a building or zoning permit, the Applicant shall submit the information required in Appendix G to the Township Code Enforcement Officer as part of their permit application.
4. HQ and EV streams - Exemptions shall not relieve the Applicant from meeting the special requirements for watersheds draining to high quality (HQ) or exceptional value (EV) waters, identified and Source Water Protection Areas (SWPA) and requirements for nonstructural project design sequencing (Section 304), groundwater recharge (Section 305), water quality (Section 306), and streambank erosion (Section 307). The volume and rate of the net increase in stormwater runoff from 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;

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

5. If a drainage problem is documented or known to exist downstream of the proposed activity, the Township may determine the activity to be non-exempt and require a Drainage Plan submittal.
6. If a drainage problem is expected, in the Township's opinion, to be created by the proposed activity, the Township may determine the activity to be non-exempt and require a Drainage Plan submittal.

Ord. 2010-2, 2/4/2010, §402.

Section 403. Drainage Plan Contents

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

The following items shall be included in the Drainage Plan:

- A. Stormwater Management Report
 1. A general description of the project including those areas described in Section 304.
 2. A description of the overall stormwater management concept for the project, including how it satisfies Section 304 of this Ordinance.
 3. A general description of permanent stormwater management techniques to be applied both during and after development, including construction specifications of the materials to be used for stormwater management facilities.
 4. A general description of nonpoint source pollution controls.
 5. The expected project time schedule.
 6. Development stages (project phases) if so proposed.

7. Complete hydrologic, hydraulic, and structural computations for all stormwater management facilities.
8. A geologic assessment of the effects of runoff on sinkholes/karst features as specified in this Ordinance.
9. The effect of the project (in terms of runoff volumes and peak flows) on adjacent properties and on any existing municipal stormwater collection system that may receive runoff from the project site.
10. Pre- and Post-Development drainage area maps, which shall include the paths of all calculated times of concentration.
11. A justification must be included in the SWM Site Plan if BMPs other than green infrastructure methods and LID practices are proposed to achieve the volume, rate and water quality controls under this Ordinance.

B. Post Construction Stormwater Management (PCSM) Plan

Map(s) of the project area shall be submitted on sheets no smaller than eighteen inches (18") by twenty-four inches (24") and no larger than thirty inches (30") by forty-two inches (42") and shall be prepared in a form that meets the requirements for recording at the offices of the Berks County Recorder of Deeds. If the Regulated Activity is also subject to the Subdivision and Land Development Ordinance (SALDO), the plan requirements of the SALDO shall also apply. In the case of a conflict between the two, the more stringent criteria shall apply. The contents of the map(s) shall include, but not be limited to:

1. 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.
2. The date of submission.
3. A graphic and written scale of one inch (1") equals no more than fifty feet (50'); for tracts of five (5) acres or less, the scale shall be one inch (1") equals no more than thirty feet (30').
4. A north arrow.
5. A key map showing all existing man-made features beyond the property boundary that would be affected by the project.
6. The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.
7. The location of the project relative to highways, municipalities or other identifiable landmarks.

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8. Existing and proposed contours at intervals of not more than two feet (2'). In areas of steep slopes (greater than 15 percent), five-foot contour intervals may be used.
9. Existing streams, lakes, ponds or other Waters of the Commonwealth within the project area.
10. Other physical features including flood hazard boundaries, sinkholes/karst features, stream buffers, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.
11. The locations of all existing and proposed utilities, sanitary sewers, and water lines within fifty feet (50') of the property.
12. Existing and proposed structures, roads, paved areas, and buildings.
13. Existing and proposed land use(s).
14. Location of all open channels.
15. Overland drainage patterns and swales.
16. All existing and proposed stormwater management facilities.
17. When infiltration facilities such as seepage pits, beds or trenches are used, the locations of all existing and proposed septic tank infiltration areas and wells within fifty feet (50') of the property.
18. An overlay showing soil names and boundaries.
19. Limits of earth disturbance, including the type and amount of impervious area that would be added.
20. The location of all permanent erosion and sediment control facilities.
21. Existing and proposed easements for stormwater management facilities.
22. Profiles (including cross-country systems) of proposed storm water management facilities (storm sewers, swales, etc.) showing the location, size, and type of material. This information shall provide sufficient information required for the construction of the facilities.
23. A note on the plan indicating the location and responsibility for maintenance of all stormwater management facilities. All on/off-site facilities shall meet the performance standards and design criteria specified in this Ordinance.

24. A statement, signed by the landowner, acknowledging that any revision to the approved Drainage Plan is subject to approval by the Township and the Conservation District.

25. The following signature block for the Design Engineer:

“I, (Design Engineer), on this date (date of signature), hereby certify that the Drainage Plan meets all design standards and criteria of the Tributaries to the Schuylkill River Watershed or Maiden Creek Watershed (as appropriate] Act 167 Stormwater Management Ordinance.”

C. Stormwater Control and BMP Operations and Maintenance Plan

Map(s) of the project area shall be submitted on sheets no smaller than eighteen inches (18”) by twenty-four inches (24”) and no larger than thirty inches (30”) by forty-two inches (42”) and shall be prepared in a form that meets the requirements for recording at the offices of the Berks County Recorder of Deeds. If the Regulated Activity is also subject to the Subdivision and Land Development Ordinance (SALDO), the plan requirements of the SALDO shall also apply. In the case of a conflict between the two, the more stringent criteria shall apply. The contents of the map(s) shall include, but not be limited to:

1. 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.
2. The date of submission.
3. A graphic and written scale of one inch (1”) equals no more than fifty feet (50’); for tracts of five (5) acres or less, the scale shall be one inch (1”) equals no more than thirty feet (30’).
4. A north arrow.
5. The location of the project relative to highways, municipalities or other identifiable landmarks.
6. Existing and proposed contours at intervals of not more than two feet. In areas of steep slopes (greater than 15 percent (15%)), five foot (5’) contour intervals may be used.
7. Existing streams, lakes, ponds or other Waters of the Commonwealth within the project area.
8. Other physical features including flood hazard boundaries, sinkholes/karst features, stream buffers, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.

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9. The locations of all existing and proposed utilities, sanitary sewers, and water lines within fifty feet (50') of the property.
10. When infiltration facilities such as seepage pits, beds or trenches are used, the locations of all existing and proposed septic tank infiltration areas and wells within fifty feet (50') of the property.
11. Proposed final structures, roads, paved areas, and buildings.
12. The location and nature of all permanent stormwater controls and BMPs.
13. Proposed final changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added.
14. Existing and proposed easements for stormwater management facilities.
15. A statement, signed by the landowner, acknowledging that the stormwater controls and BMPs are fixtures that can be altered or removed only after approval by the Township.
16. A description of how each permanent stormwater control and BMP will be operated and maintained, and establishment of the party responsible for operations and maintenance, as follows:
 - a. If a plan includes structures or lots which are to be separately owned and in which streets, storm sewers and other public improvements are to be dedicated to the Township, stormwater controls and BMPs may also be dedicated to and maintained by the Township, if the Township agrees to do so.
 - b. If a plan includes structures and/or operations under single ownership and/or maintenance, or if storm sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater controls and BMPs shall be the responsibility of the owner or private management entity.

D. Erosion and Sediment Control Plan

1. An Erosion and Sediment Control Plan (E&SCP), including the narrative, shall be submitted as part of the Drainage Plan. It shall meet all applicable PaDEP requirements.
2. If the E&SCP is subject to Conservation District approval, all submissions to, and review letters from the Conservation District shall be provided as part of the Drainage Plan. A copy of the Conservation District approval letter shall also be provided, upon receipt.

Ord. 2010-2, 2/4/2010, §403; as amended by Ord. 2023-3, 8/3/2023, § 8.

Section 404. Plan Submission

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

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

- A. For projects which require SALDO approval, the Drainage Plan shall be submitted by the Applicant as part of the Preliminary Plan submission, where applicable for the Regulated Activity.
- B. For these regulated activities that do not require SALDO approval, See Section 401, General Requirements.
- C. Three (3) copies of the Drainage Plan shall be submitted and distributed as follows:
 - 1. Two (2) copies to the Township accompanied by the requisite Municipal Review Fee.
 - 2. One (1) copy to the Township Engineer.
- D. The Drainage Plan shall be accompanied by the applicable Municipal Review Fee.

Ord. 2010-2, 2/4/2010, §404.

Section 405. Drainage Plan Review

- A. All Drainage Plan materials shall be submitted to the Township in a format that is clear, concise, legible, neat, and well organized; otherwise, the Drainage Plan shall not be accepted for review and shall be returned to the Applicant as administratively incomplete.
- B. The Township shall review the Drainage Plan for consistency with the adopted Stormwater Management Ordinance, and any permits issued by DEP.
- C. The Township shall make the final determination of the continuing operations and maintenance responsibilities. . The Township reserves the right to accept or reject the operations and maintenance responsibility for any or all of the approved stormwater controls and BMPs.

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- D. For activities regulated by this Ordinance, the Township shall notify the Applicant in writing, within sixty (60) calendar days, whether the Drainage Plan is consistent with the Stormwater Management Ordinance.
1. Should the Drainage Plan be determined to be consistent with the Stormwater Management Ordinance, the Township Engineer shall forward an approval letter to the Municipal Secretary who will then forward a copy to the Applicant.
 2. Should the Drainage Plan be determined to be inconsistent with the Stormwater Management Ordinance, the Township Engineer shall forward a disapproval letter to the Municipal Secretary who will then forward a copy to the Applicant. The disapproval letter shall cite the reason(s) for disapproval and the specific Ordinance sections to which they relate. Disapproval may be based upon the inadequacy of the submitted information to allow for a reasonable judgment as to compliance with the Stormwater Management Ordinance. Any disapproved Drainage Plans may be revised by the Applicant and resubmitted consistent with this Ordinance.
- E. The Township's approval of a Drainage Plan shall be valid for a period not to exceed five (5) years, commencing on the date that the Township signs the approved Drainage Plan. If stormwater management facilities included on the approved Drainage Plan have not been constructed, or if constructed, and record drawings of these facilities have not been approved within this five (5) year time period, the Township may consider the Drainage Plan disapproved and may revoke any or all permits that were issued based upon approval of the Drainage Plan. Drainage Plans that are considered disapproved by the Township shall be resubmitted in accordance with Section 407 of this Ordinance.
- F. For any SWM Site Plan that proposes to use any BMPs other than green infrastructure and LID practices to achieve the volume and rate controls required under this Ordinance, the Municipality will not approve the SWM Site Plan unless it determines that green infrastructure and LID practices are not practicable

Ord. 2010-2, 2/4/2010, §405; as amended by Ord. 2023-3, 8/3/2023, § 9.

Section 406. Modification of Plans

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

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

Ord. 2010-2, 2/4/2010, §406.

Section 407. Resubmission of Disapproved Drainage Plans

A disapproved Drainage Plan may be resubmitted, with revisions addressing the Township's stated deficiencies documented in writing and addressed to the Municipal Secretary in accordance with Section 404 of this Ordinance and be subject to review as specified in Section 405 of this Ordinance. The applicable Municipal Review Fee must accompany the resubmission.

Ord. 2010-2, 2/4/2010, §407.

Section 408. Record Drawings

- A. The Township may require the applicant to submit a Record Drawing of all required stormwater controls and BMPs.
- B. If required, the Record Drawing shall be in the form of the approved Drainage Plan, annotated so as to accurately document the as-constructed condition of all required stormwater controls and BMPs. The Record Drawings and an explanation of any discrepancies with the design plans shall be submitted to the Township for review and approval.
- C. The Record Drawing shall include a certification of completion signed by a Qualified Professional verifying that all permanent Stormwater Management BMPs have been constructed according to the approved plans and specifications. If a licensed Qualified Professional contributed to the design plans, then a licensed Qualified Professional must sign the completion certificate.
- D. The Record Drawing shall be subject to review and approval by the Township. The Township may withhold permits and/or financial security related to the required stormwater controls and BMPs until a Record Drawing is submitted that meets with Township approval.

Ord. 2010-2, 2/4/2010, §408.

STORMWATER MANAGEMENT

ARTICLE V

INSPECTIONS

Section 501. Schedule of Inspections

- A. The Township or their designee shall inspect all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Township.
- B. During any stage of the work, if the Township or their designee determines that the permanent stormwater management facilities are not being installed in accordance with the approved Drainage Plan, the Township may revoke any related building permits and/or issue a cease and desist order until a revised Drainage Plan is submitted and approved, as specified in this Ordinance.
- C. A final inspection of all stormwater management facilities shall be conducted by the Township or their designee in order to confirm compliance with the approved Drainage Plan, prior to the issuance of any related Occupancy Permit.
- D. The landowner or the owner's designee (including the Municipality for dedicated and owned facilities) shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:
 - 1. Annually for the first 5 years.
 - 2. Once every 3 years thereafter.
 - 3. During or immediately after the cessation of a 10-year or greater storm.

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Municipality within 30 days following completion of the inspection

Ord. 2010-2, 2/4/2010, §501; as amended by Ord. 2023-3, 8/3/2023, § 10.

ARTICLE VI

FEES AND EXPENSES

Section 601. Drainage Plan Review and Inspection Fees

Fees shall be established by the Township to defray plan review and construction inspection costs incurred by the Township. A Review and Inspection Fee Schedule may be established by resolution of the Board of Supervisors based on the cost incurred by the Township for reviewing Drainage Plans and conducting inspections pursuant to Section 501. The Township may periodically update the Review and Inspection Fee Schedule to ensure that review costs are adequately covered.

- A. Drainage Plan Review fees shall be paid by the Applicant at the time of Drainage Plan submission.
- B. Drainage Plan Inspection fees shall be paid by the Applicant at the time of Drainage Plan approval.
- C. For Drainage Plans submitted as part of a SALDO regulated project, the fees paid for plan review and posted as part of the financial security with the improvements agreement shall supersede Drainage Plan Review and Inspection Fees, respectively.

Ord. 2010-2, 2/4/2010, §601.

Section 602. Expenses Covered by Fees

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

- A. Administrative costs.
- B. The review of the Drainage Plan by the Township and/or its consultants.
- C. The site inspections needed as part of the Drainage Plan review.
- D. The inspection of stormwater controls and BMPs during construction.
- E. A final inspection upon completion of the stormwater controls and BMPs.
- F. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

Ord. 2010-2, 2/4/2010, §602.

STORMWATER MANAGEMENT

ARTICLE VII

MAINTENANCE RESPONSIBILITIES

Section 701. Performance Guarantee

- A. For Drainage Plans submitted as part of a SALDO regulated project, no performance guarantee beyond that required by the SALDO shall be required.
- B. For other Regulated Activities, the Township may require a financial guarantee from the Applicant, for the implementation of the approved Drainage Plan. The form and amount of the guarantee shall conform to the requirements in the SALDO for improvements security.
- C. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the Applicant or his representatives shall:
 - 1. Provide a certification of completion from an engineer, architect, surveyor or other qualified person verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.
 - 2. Provide a set of record drawings for Township review and subject to Township approval.
- D. After the Township receives the certification, a final inspection shall be conducted by the Township or designee to certify compliance with this Ordinance.

Ord. 2010-2, 2/4/2010, §701.

Section 702. Adherence to Approved Drainage Plan

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

Ord. 2010-2, 2/4/2010, §702.

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

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

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

Ord. 2010-2, 2/4/2010, §703.

Section 704. Stormwater Management Easements

- A. Stormwater management easements shall be provided by the property owner if necessary for access for inspections and maintenance and for preservation of stormwater runoff conveyance, infiltration, and detention areas and other stormwater controls and BMPs, by persons other than the property owner. The purpose of, and any restrictions that apply to the easement shall be specified in any agreement under Section 703.
- B. Access easements shall generally be in the form of a fifteen foot (15') wide easement around all stormwater management facilities, and extending so as to provide ingress to and egress from a public right-of-way. Depending on the physical features of each individual site, the Township may, at its sole discretion, require easements of a different size and configuration.
- C. Where a subdivision or land development is traversed by or contains a pond, lake, watercourse, drainage way, channel, storm drainage system, or stream, there shall be provided a drainage easement that conforms substantially with the line of such pond, lake, watercourse, drainage way, channel, storm drainage system, or stream of such width as will be adequate to preserve the unimpeded flow of drainage (100-yr. flow) and to provide for widening, deepening, relocating, improving or protecting such features or drainage facilities. Minimum easement width shall be ten feet (10') from each side of the water course, water body, stream, pond, lake or drainage facility, but the Township may require a greater easement when necessary. Bearings and distances shall be provided for the boundaries of easements.

Ord. 2010-2, 2/4/2010, §704.

Section 705. Recording of Approved Drainage Plan and Related Agreements

- A. The owner of any land upon which permanent stormwater controls and BMPs will be placed, constructed or implemented, as described in the Drainage Plan, shall record the following documents in the Office of the Recorder of Deeds for Berks County, within fifteen (15) days of approval of the Drainage Plan by the Township:
 - 1. The Stormwater Control and BMP Operations and Maintenance Plan
 - 2. Operations and Maintenance Agreement(s)

STORMWATER MANAGEMENT

3. Easement(s)

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

Ord. 2010-2, 2/4/2010, §705.

ARTICLE VIII

PROHIBITIONS

Section 801. Prohibited Discharges and Connections

- A. Any drain or conveyance, whether on the surface or subsurface, which allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter the waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into surface waters of this Commonwealth which are not composed entirely of stormwater, except (1) as provided in subsection C below, and (2) discharges allowed under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution a regulated small MS4 or to the waters of this Commonwealth:
 - 1. Discharges or flows from firefighting activities.
 - 2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).
 - 3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
 - 4. Diverted stream flows and springs.
 - 5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.
 - 6. Non-contaminated HVAC condensation and water from geothermal systems.
 - 7. Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.
 - 8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
- D. In the event that the Township or PaDEP determines that any of the discharges identified in Subsection C, significantly contribute to pollution of the waters of this Commonwealth, the Township or PaDEP will notify the responsible person(s) to cease the discharge.

Ord. 2010-2, 2/4/2010, §801; as amended by Ord. 2023-3, 8/3/2023, § 11.

STORMWATER MANAGEMENT

Section 802. Roof Drains

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs and to the maximum extent practicable satisfy the criteria for Disconnected Impervious Areas.

Ord. 2010-2, 2/4/2010, §802.

Section 803. Alteration of Stormwater Management BMPs

No person shall modify, remove, fill, landscape, or alter any Stormwater Management BMPs, facilities, areas, or structures, without the written approval of the Township.

Ord. 2010-2, 2/4/2010, §803.

ARTICLE IX

ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry

- A. Upon presentation of proper credentials, duly authorized representatives of the Township may enter at reasonable times upon any property within the Township to inspect the implementation, condition, or operation and maintenance of the stormwater controls or BMPs in regard to any aspect governed by this Ordinance.
- B. Stormwater control and BMP owners and operators shall allow persons working on behalf of the Township ready access to all parts of the premises for the purposes of determining compliance with this Ordinance.
- C. Persons working on behalf of the Township shall have the right to temporarily locate on any stormwater control or BMP in the Township such devices as are necessary to conduct monitoring and/or sampling of the discharges from such stormwater control or BMP.
- D. Unreasonable delays (>24 hrs.) in allowing the Township access to a stormwater control or BMP is a violation of this Article.

Ord. 2010-2, 2/4/2010, §901.

Section 902. Public Nuisance

- A. The violation of any provision of this ordinance is hereby deemed a Public Nuisance.
- B. Each day that a violation continues shall constitute a separate violation.

Ord. 2010-2, 2/4/2010, §902.

Section 903. Enforcement Generally

- A. Whenever the Township finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the Township may order compliance by written notice to the responsible person. Such notice may require without limitation:
 - 1. The performance of monitoring, analyses, and reporting;
 - 2. The elimination of prohibited connections or discharges;
 - 3. Cessation of any violating discharges, practices, or operations;

STORMWATER MANAGEMENT

4. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
 5. Payment of a fine to cover administrative and remediation costs;
 6. The implementation of stormwater controls and BMPs; and
 7. Operation and maintenance of stormwater controls and BMPs.
- B. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work will be done by the Township or designee and the expense thereof shall be charged to the violator.
- C. Failure to comply within the time specified shall also subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Township from pursuing any and all other remedies available in law or equity.

Ord. 2010-2, 2/4/2010, §903.

Section 904. Suspension and Revocation of Permits and Approvals

- A. Any building, land development or other permit or approval issued by the Township may be suspended or revoked, in whole or in part, by the Township for:
1. Non-compliance with or failure to implement any provision of the permit;
 2. A violation of any provision of this Ordinance; or
 3. The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life or property of others.
- B. A suspended permit or approval may be reinstated by the Township, in whole or in part, when:
1. The Township or designee has inspected and approved the corrections to the stormwater controls and BMPs, or the elimination of the hazard or nuisance, and/or;
 2. The Township is satisfied that the violation of the Ordinance, law, or rule and regulation has been corrected.

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

Ord. 2010-2, 2/4/2010, §904.

Section 905. Penalties

- A. Any person violating the provisions of this Ordinance shall be subject to a fine of not less than Five Hundred Dollars (\$500.00) nor more than One Thousand Dollars (\$1,000.00) for each violation, recoverable with costs. Each day that the violation continues shall constitute a separate offense and the applicable fines are cumulative.
- B. The Township may institute injunctive, mandamus, or any other appropriate action or proceeding at law in equity for the enforcement of the ordinance with the court of competent jurisdiction to obtain restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

Ord. 2010-2, 2/4/2010, §905.

Section 906. Notification

In the event that a person fails to comply with the requirements of this Ordinance, or fails to conform to the requirements of any permit issued hereunder, the Township will provide notification of the violation. After notice is provided, failure to correct violations in a timely manner may result in additional violations.

Ord. 2010-2, 2/4/2010, §906.

Section 907. Enforcement

The Board of Supervisors is hereby authorized and directed to enforce all of the provisions of this Ordinance. All inspections regarding compliance with the Drainage Plan shall be the responsibility of the Township Engineer or other qualified persons designated by the Township.

- A. Upon presentation of proper credentials, an agent of the Township may enter at reasonable times upon any property within the Township to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

Ord. 2010-2, 2/4/2010, §907.

STORMWATER MANAGEMENT

Section 908. Appeals

- A. Any person aggrieved by any action of Ontelaunee Township or its designee may appeal to the Board of Supervisors within thirty (30) days of that action.
- B. Any person aggrieved by any decision of the Ontelaunee Township Board of Supervisors may appeal to the County Court of Common Pleas in the County where the activity has taken place within thirty (30) days of the municipal decision.

Ord. 2010-2, 2/4/2010, §908.

ORDINANCE APPENDIX A

**STORMWATER CONTROLS AND BEST MANAGEMENT PRACTICES
OPERATIONS AND MAINTENANCE AGREEMENT**

THIS AGREEMENT, made and entered into this _____ day of _____, 20___, by and between _____, (hereinafter the "Landowner"), and Ontelaunee Township, Berks County, Pennsylvania, (hereinafter "Township");

WITNESSETH

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

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

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

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

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

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

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

STORMWATER MANAGEMENT

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

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

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

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

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

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

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

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Township:

(SEAL)

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

County of _____, Pennsylvania

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

GIVEN UNDER MY HAND THIS _____ day of _____, 20____.

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NOTARY PUBLIC

(SEAL)

2/13/2024

21-76

STORMWATER MANAGEMENT

**ORDINANCE APPENDIX B
STORMWATER MANAGEMENT DESIGN CRITERIA**

FIGURE B-1
NRCS TYPE II RAINFALL DISTRIBUTION -S CURVE
Source: NRCS, TR-55, June 1986

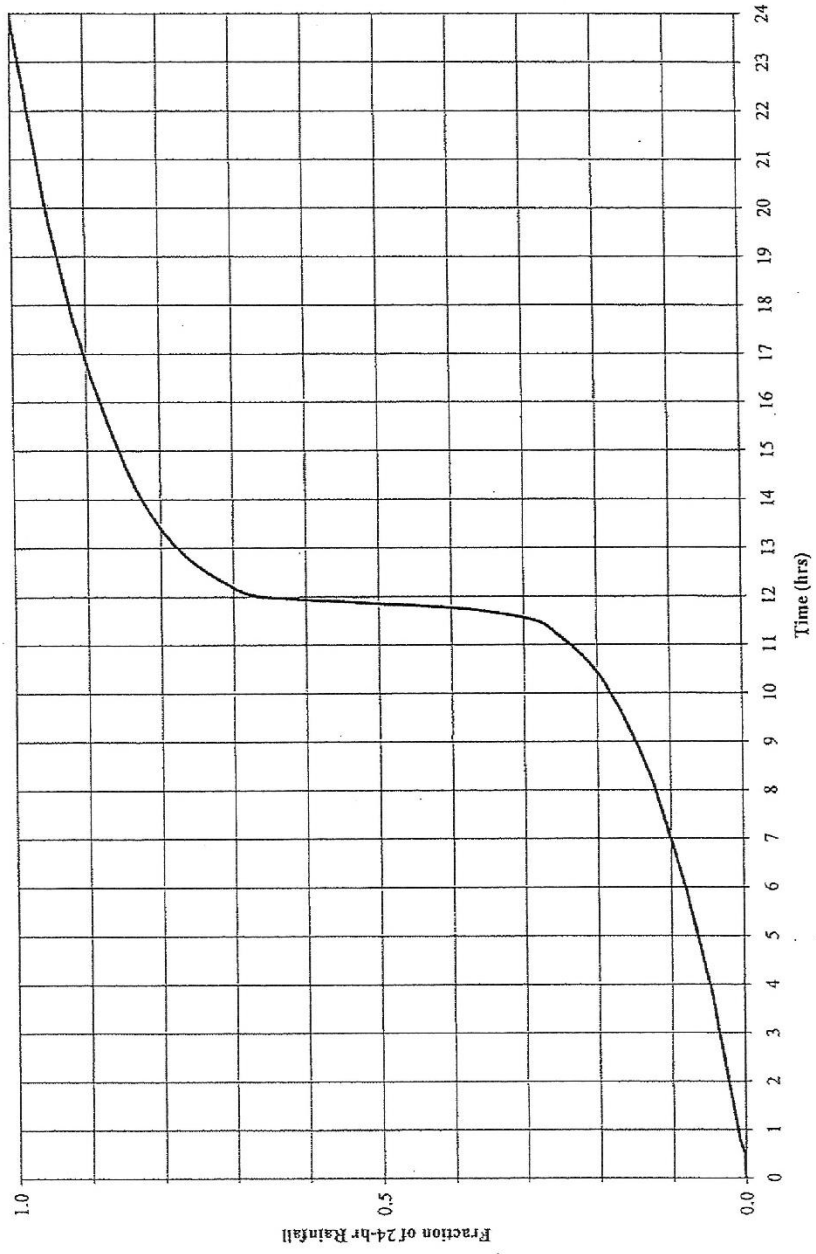
TABLE B-2
RUNOFF CURVE NUMBERS
Source: NRCS (SCS) TR-55

TABLE B-3
RATIONAL RUNOFF COEFFICIENTS

TABLE B-4
MANNING ROUGHNESS COEFFICIENTS

TABLE B-5
INFILTRATION REQUIREMENTS IN CARBONATE AREAS

FIGURE B-1
NRCS (SCS) TYPE II RAINFALL DISTRIBUTION - S CURVE



STORMWATER MANAGEMENT

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

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Open Space	44	65	77	82
Meadow / Orchard	30	58	71	78
Agricultural	59	71	79	83
Forest	36	60	73	79
Commercial (85% Impervious)	89	92	94	95
Industrial (72% Impervious)	81	88	91	93
Institutional (50% Impervious)	71	82	88	90
Residential				
Average Lot Size	% impervious			
1/8 acre or less*	65	77	85	90
1/8 - 1/3 acre	34	59	74	82
1/3 - 1 acre	23	53	69	80
1 - 4 acres	12	46	66	78
Farmstead	59	74	82	86
Smooth Surfaces (Concrete, Asphalt, Gravel or Bare Compacted Soil)	98	98	98	98
Water	98	98	98	98
Mining/Newly Graded Areas (Pervious Areas Only)	77	86	91	94

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

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

TABLE B-3
RATIONAL RUNOFF COEFFICIENTS
 By Hydrologic Soils Group and Overland Slope (%)

Land Use	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated Land	0.08 ^a	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14 ^b	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential	0.25	0.28	0.31	0.27	0.30	0.25	0.30	0.33	0.38	0.33	0.36	0.42
Lot Size 1/8 Acre	0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Lot Size 1/4 Acre	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
Lot Size 1/3 Acre	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
Lot Size 1/2 Acre	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
	0.25	0.29	0.32	0.28	0.32	0.36	0.31	0.35	0.42	0.34	0.38	0.48
Lot Size 1 Acre	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
Streets	0.70	0.71	0.71	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
Open Space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

^a Runoff coefficients for storm recurrence intervals less than 25 years.

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

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

TABLE B-4

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

Surface Description	n	
Dense Growth	0.4	0.5
Pasture	0.3	0.4
Lawns	0.2	0.3
Bluegrass Sod	0.2	0.5
Short Grass Prairie	0.1	0.2
Sparse Vegetation	0.05	0.13
Bare Clay-Loam Soil (eroded)	0.01	0.03
Concrete/Asphalt - very shallow depths (less than 1/4 inch)	0.10	0.15
- small depths (1/4 inch to several inches)	0.05	0.10

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

Reach Description	n
Natural stream, clean, straight, no rifts or pools	0.03
Natural stream, clean, winding, some pools or shoals	0.04
Natural stream, winding, pools, shoals, stony with some weeds	0.05
Natural stream, sluggish deep pools and weeds	0.07
Natural stream or swale, very weedy or with timber underbrush	0.10
Concrete pipe, culvert or channel	0.012
Corrugated metal pipe	0.012-0.027 ⁽¹⁾
High Density Polyethylene (HDPE) Pipe	
Corrugated	0.021-0.029 ⁽²⁾
Smooth Lined	0.012-0.020 ⁽²⁾

(1) Depending upon type, coating and diameter

(2) Values recommended by the American Concrete Pipe Association, check Manufacturer's recommended value.

Table B-5

Recommendation Chart for Infiltration Stormwater Management BMPs in Carbonate Bedrock*

Geology Type		CARBONATE BEDROCK													
		Less than 2 Feet			2 to 4 Feet			Over 4 Feet to 8 Feet			Over 8 Feet				
SITE RISK FACTORS	Effective Soil Thickness	Low/High Buffer	Low Buffer	Medium Buffer	High Buffer	Low Buffer	Medium Buffer	High Buffer	Low Buffer	Medium Buffer	High Buffer	Low Buffer	Medium Buffer	High Buffer	
	Special Geologic Features**	(Unacceptable)	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary	Preliminary
DESIGN FACTORS	Infiltration Loading Rates (% Increase)***	0-100%	100-300%	300-500%	500-100%	100-300%	300-500%	500-100%	100-300%	300-500%	500-100%	100-300%	300-500%	500-100%	100-300%
	PROGRAM SUMMARY GUIDANCE****														
		RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
		NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED

 **RECOMMENDED**

 **NOT RECOMMENDED**

* Source: Developed by Cahill Associates based on information in "Technical Best Management Practice Manual & Infiltration Feasibility Report", November 2002 and input from the LVPC, 2003.

** 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

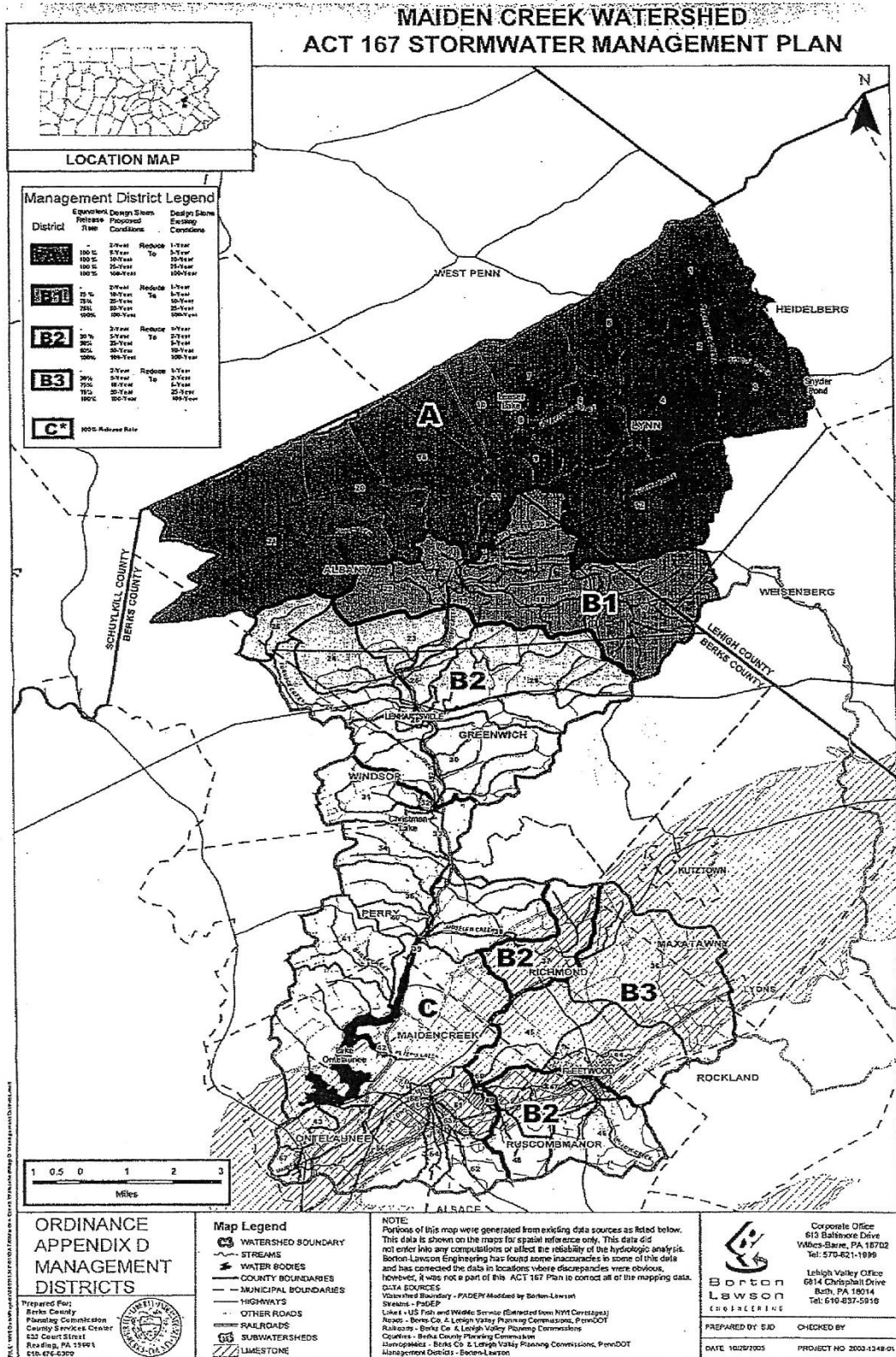
*** Rates greater than 500% not recommended.

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

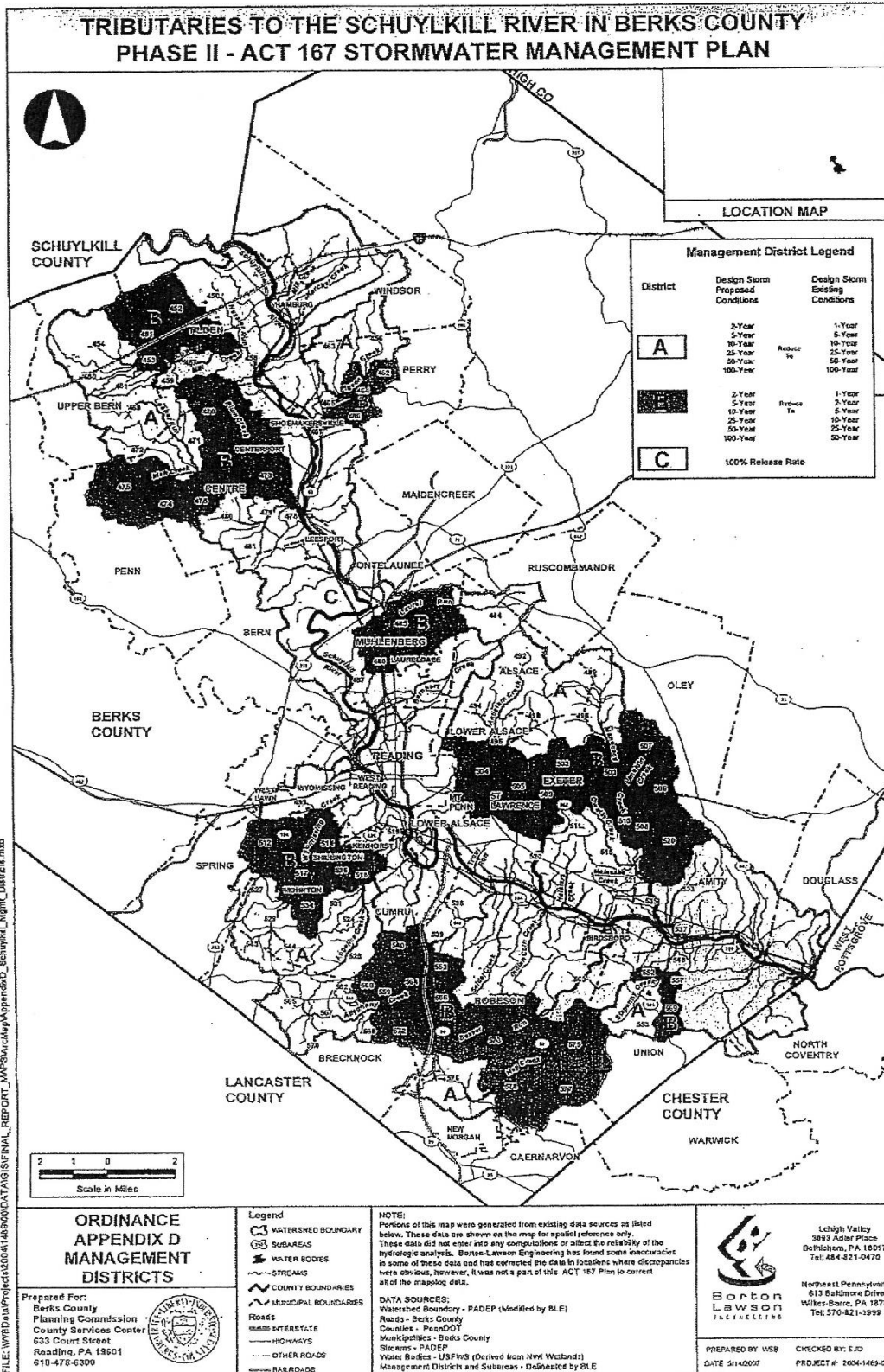
- 1 Infiltration systems may be allowed at the determination of the Engineer and/or Geologist, provided that a Detailed Site Investigation is undertaken which confirms nature of rock, location of Special Geologic Features, and adequacy of the buffer between the SGF and the proposed stormwater system(s).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

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**ORDINANCE APPENDIX C
STORMWATER MANAGEMENT DISTRICT
WATERSHED MAPS**



STORMWATER MANAGEMENT



**ORDINANCE APPENDIX D
REFERENCES**

BMP Manuals

California

California Stormwater BMP Handbook: New Development and Redevelopment
(January 2003) - separate file available at

<http://www.cabmphandbooks.org/Development.asp> Georgia

Georgia Stormwater Management Manual Volume 2: Technical Handbook (August
2001) separate file (<http://www.georgiastormwater.com/>)

Maryland

2000 Maryland Stormwater Design Manual -

[http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/storm
water design/index.asp](http://www.mde.state.md.us/Programs/Waterprograms/SedimentandStormwater/stormwater%20design/index.asp)

Massachusetts

Stormwater Management, Volume Two: Stormwater Technical Handbook

(Massachusetts, 1997)-separate file available at

<http://www.state.ma.us/dep/brp/stormwtr/stormpub.htm>

Minnesota

Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices
for Cold Climates (July 2001) -

<http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm>

New Jersey

Revised Manual for New Jersey: Best Management Practices for Control of Non-point
Source Pollution from Stormwater (Fifth Draft May 2000) -

<http://www.state.nj.us/dep/watershedmgt/bmpmanual.htm>

New York

New York State Stormwater Management Design Manual (2001) -

<http://www.dec.state.ny.us/website/dow/swmanual/swmanual.html> Pennsylvania

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

Washington

Stormwater Management Manual for Western Washington (August 2001) -

<http://www.ecy.wa.gov/prograrns/wq/stormwater/manual.html>

Federal

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

USEPA Infiltration Trench Fact Sheet (September 1999) -

<http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfrn>

Riparian Buffer References

Alliance for the Chesapeake Bay, Pennsylvania Department of Environmental
Protection, September 2000. Forest Buffer Toolkit, Stream ReLeaf Program.

Penn State College of Agricultural Sciences, 1996. *Establishing Vegetative Buffer Strips
Along Streams to Improve Water Quality*. Publication # AGRS-67.

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

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Pennsylvania Conservancy, and Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania Association of Conservation Districts, Inc., Keystone Chapter, Soil and Water Conservation Society, Pennsylvania Department of Environmental Protection, Natural Resources Conservation Service, 1998. *Pennsylvania Handbook of Best Management Practices for Developing Areas*. Prepared by CH2MHill.

Palone, R. S. and A. H. Todd (eds), 1997. *Chesapeake Bay Riparian Handbook: A Guide for Establishing and Maintaining Riparian Forest Buffers*. Chesapeake Bay Program and Northeastern Area State and Private Forestry. Natural Resources Conservation Service Cooperative State Research Education and Extension Services.

The Federal Interagency Stream Restoration Working Group (FISRWG, 10/1998). Stream Corridor Restoration Principles, Processes, and Practices. GPO Item No. 0120-A; SuDocs No. A57.6/2:EN3/PT.653. JSBN-0-934213-59-3. Published October 1998. Revised August 2000.

ORDINANCE APPENDIX E
West Nile Virus Guidance

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

Monroe County Conservation District Guidance:
Stormwater Management and West Nile Virus
Source: Brodhead McMichaels Creeks Watershed Act 167 Stormwater Management Ordinance Final Draft 2/23/04

The Monroe County Conservation District recognizes the need to address the problem of non-point source pollution impacts caused by runoff from impervious surfaces. The new stormwater policy being integrated into Act 167 Stormwater Management regulations by the PA Department of Environmental Protection (DEP) will make non-point pollution controls an important component of all future plans and updates to existing plans. In addition, to meet post-construction anti-degradation standards under the state National Pollution Discharge Elimination System (NPDES) permitting program, applicants will be required to employ Best Management Practices (BMPs) to address non-point pollution concerns.

Studies conducted throughout the United States have shown that wet basins and in particular constructed wetlands are effective in traditional stormwater management areas such as channel stability and flood control, and are one of the most effective ways to remove stormwater pollutants (United States Environmental Protection Agency 1991, Center for Watershed Protection 2000). From Maryland to Oregon, studies have shown that as urbanization and impervious surface increase in a watershed, the streams in those watersheds become degraded (CWP 2000). Although there is debate over the threshold of impervious cover when degradation becomes apparent (some studies show as little as 6% while others show closer to 20%), there is agreement that impervious surfaces cause non-point pollution in urban and urbanizing watersheds, and that degradation is ensured if stormwater BMPs are not implemented.

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

Mosquitoes

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

STORMWATER MANAGEMENT

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

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

Stormwater Facilities

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

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

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

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

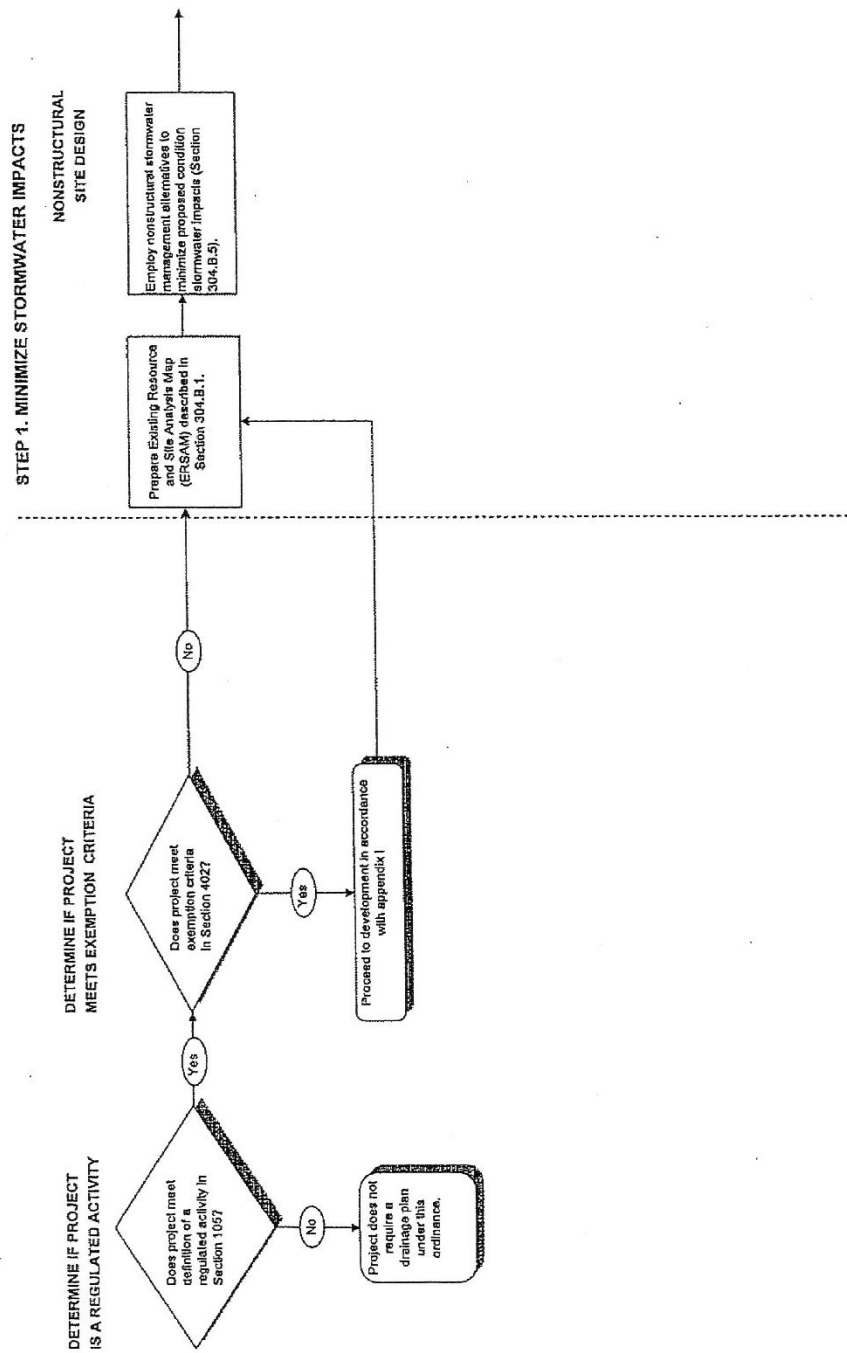
Conclusion

The Conservation District understands the pressure faced by municipalities when dealing with multifaceted issues such as stormwater management and encourages the incorporation of water quality management techniques into stormwater designs. As Monroe County continues to grow, conservation design, groundwater recharge and constructed wetlands and ponds should be among the preferred design options to reduce the impacts of increases in impervious surfaces. When designed and constructed

appropriately, the runoff mitigation benefits to the community from these design options will far outweigh their potential to become breeding grounds for mosquitoes.

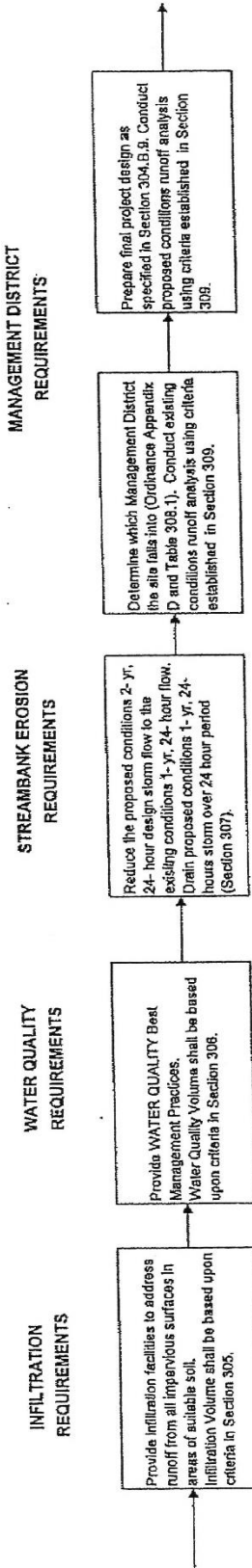
**ORDINANCE APPENDIX F
IMPLEMENTATION FLOW CHARTS**

**MAIDEN CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan Preparation Procedure
Applicant Flow Chart**



**MAIDEN CREEK WATERSHED
 STORMWATER MANAGEMENT
 Water Quality and Quantity Control Drainage Plan Preparation Procedure
 Applicant Flow Chart**

STEP 1. MINIMIZE STORMWATER IMPACTS



Provide infiltration facilities to address runoff from all impervious surfaces in areas of suitable soil. Infiltration Volume shall be based upon criteria in Section 305.

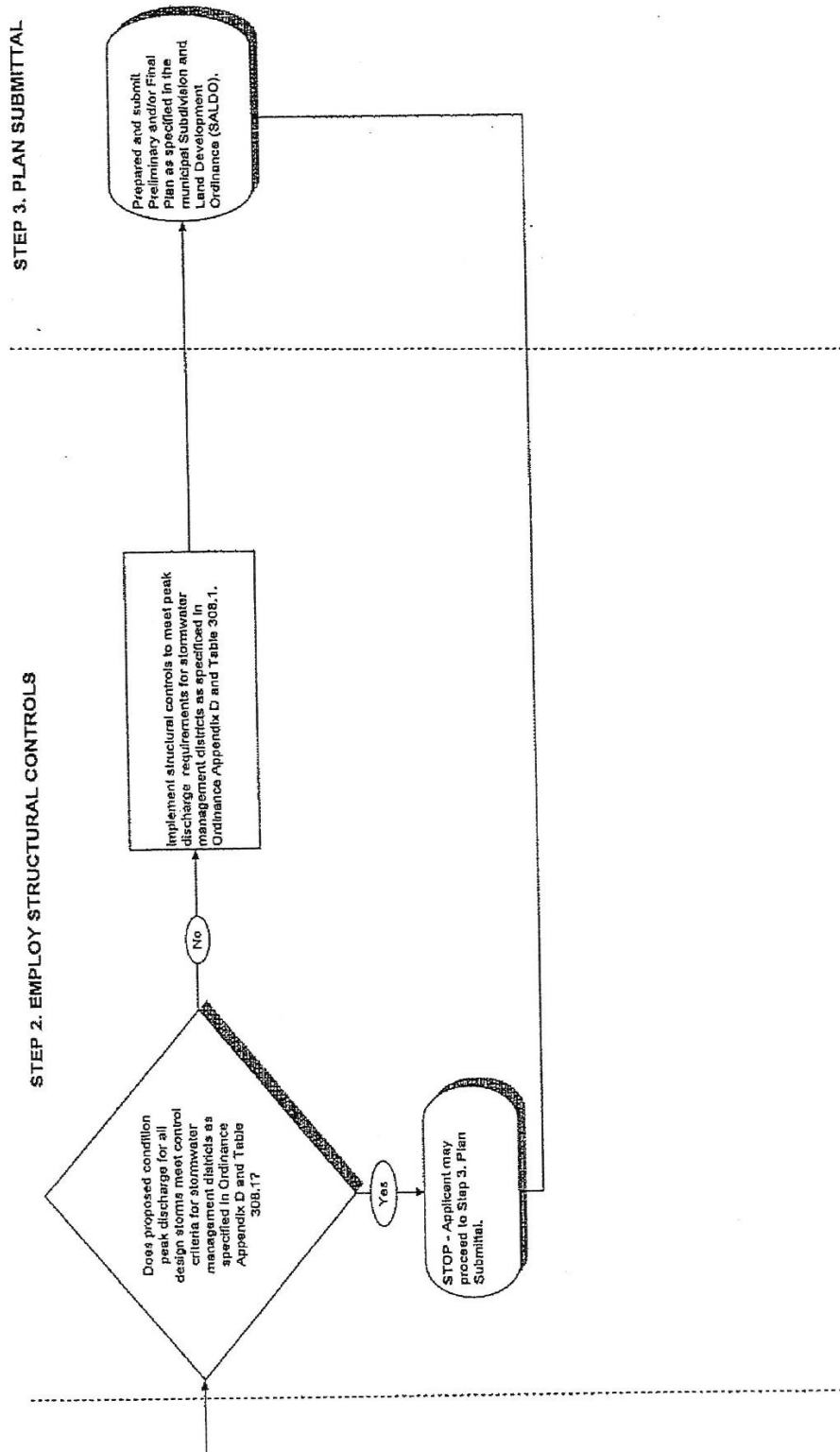
Provide WATER QUALITY Best Management Practices. Water Quality Volume shall be based upon criteria in Section 306.

Reduce the proposed conditions 2-yr, 24-hour design storm flow to the existing conditions 1-yr, 24-hour flow. Drain proposed conditions 1-yr, 24-hour storm over 24 hour period (Section 307).

Determine which Management District the site falls into (Ordinance Appendix D and Table 308.1). Conduct existing conditions runoff analysis using criteria established in Section 309.

Prepare final project design as specified in Section 304.B.i. Conduct proposed conditions runoff analysis using criteria established in Section 309.

**MAIDEN CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan Preparation Procedure
Applicant Flow Chart**

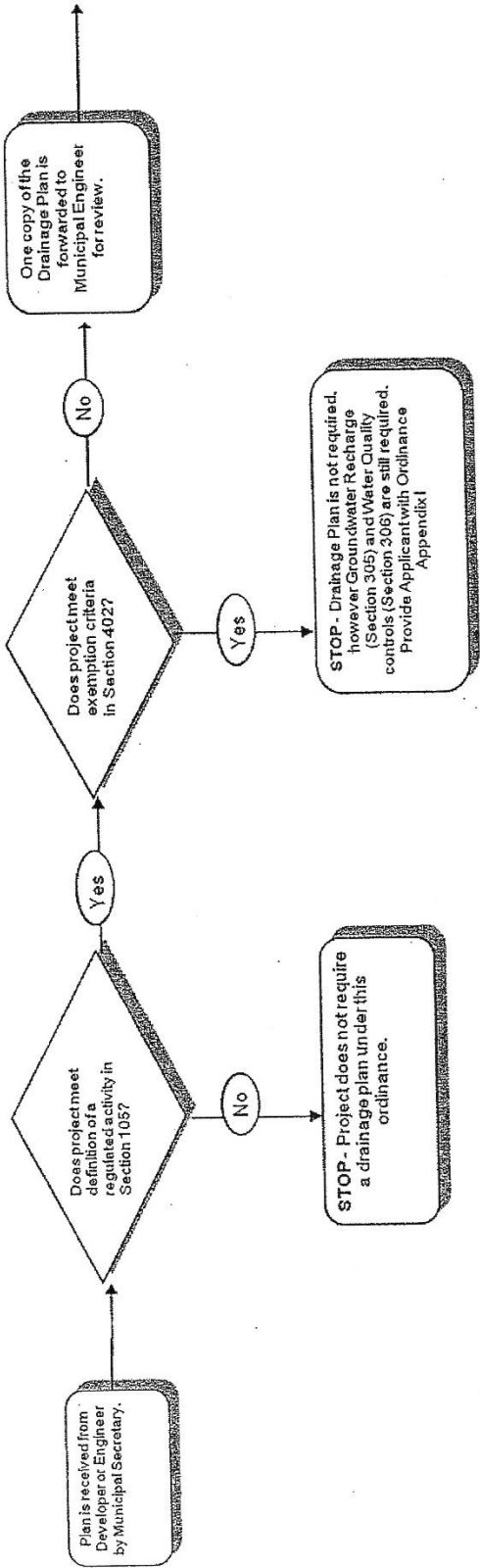


MAIDEN CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Municipal Review Flow Chart

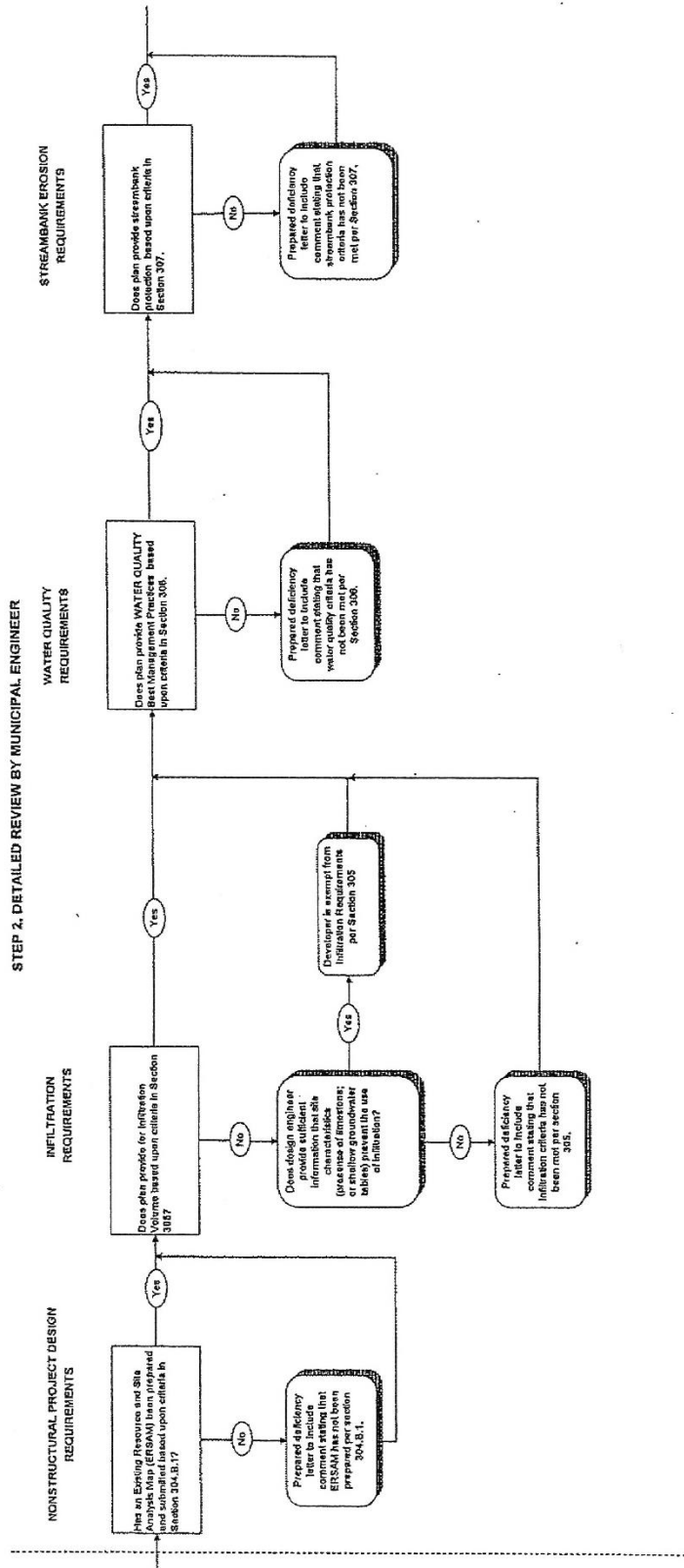
STEP 1. PRELIMINARY REVIEW BY ZONING OFFICER

DETERMINE IF PROJECT
MEETS EXEMPTION CRITERIA

DETERMINE IF PROJECT
IS A REGULATED ACTIVITY

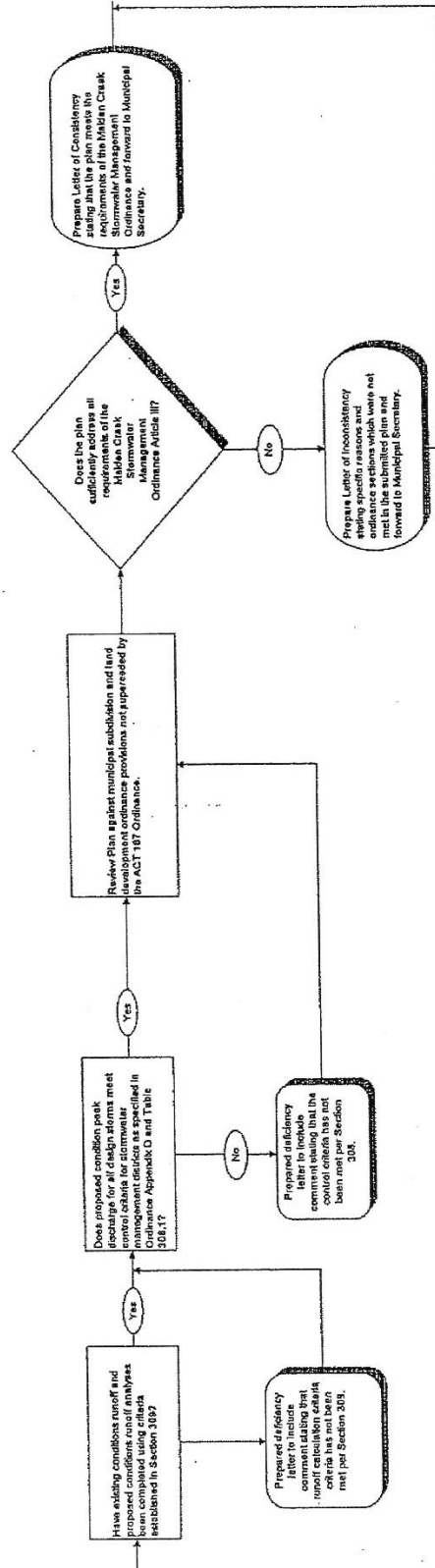


MAIDEN CREEK WATERSHED
 STORMWATER MANAGEMENT
 Water Quality and Quantity Control Drainage Plan
 Municipal Review Flow Chart

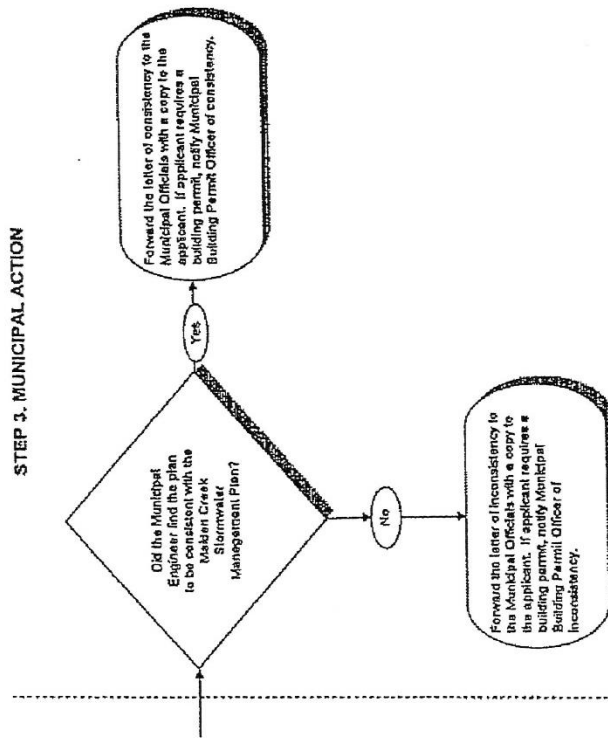


**MAIDEN CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Municipal Review Flow Chart**

STEP 2. DETAILED REVIEW BY MUNICIPAL ENGINEER



MAIDEN CREEK WATERSHED
STORMWATER MANAGEMENT
Water Quality and Quantity Control Drainage Plan
Municipal Review Flow Chart



ORDINANCE APPENDIX G
Stormwater Management Practices for projects which are exempt
under Section 402 of this Ordinance

STORMWATER MANAGEMENT

STORMWATER MANAGEMENT PROCEDURES FOR PROJECTS MEETING THE IMPERVIOUS AREA EXEMPTION CRITERIA

What are the Act 167 Stormwater Management Requirements?

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

Who is affected by these requirements?

The Act 167 Stormwater Management Requirements affect all NEW development in the Maiden Creek and Schuylkill River watersheds. Individual home construction projects on single family lots which are exempt under Section 402 of this Ordinance, are not required to submit formal Drainage Plans to the Township or County; however, they are still required to address Water Quality and Groundwater Recharge criteria specified in the Ontelaunee Township Stormwater Management Ordinance (Ord. Sections 305 and 306).

Do I require professional services to meet these requirements?

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

What do I need to Send to the Township?

Even though a formal Drainage Plan is not required for individual lot owners, a brief description of the proposed infiltration facilities, including types of material to be used, total impervious areas and volume calculations as shown above, and a simple sketch plan showing the following information shall be submitted to the Township Code Enforcement Officer as part of a building permit application, prior to construction:

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

Determination of Recharge Volume

The amount of recharge volume that should be provided can be determined by following the simple steps below. Impervious area calculations should include all areas on the individual lots that are covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including sidewalks, driveways or parking areas. Sidewalks, driveways or patios that are constructed with gravel or turf pavers and will not be blacktopped in the future, need not be included in this calculation.

Example Recharge Volume:

STEP 1 - Determine Total Impervious Surfaces:

House Roof (Front)	12 ft. x 48 ft.	=	576 sq. ft.
House Roof (Rear)	12 ft. x 48 ft.	=	576 sq. ft.
Driveway	12 ft. x 50 ft.	=	600 sq. ft.
Parking Pad	12 ft. x 12 ft.	=	144 sq. ft.
Walkway	6 ft. x 20 ft.	=	120 SQ. ft.

			2,016 sq. ft.

STEP 2 -Determine Require Infiltration Volume (R_v) Using the Following Equation

$$R_v = \frac{0.46 \text{ inches} \times (\text{total impervious area in square feet})}{12} = \text{_____ cubic feet of recharge}$$

$$R_v = \frac{0.46 \text{ in.} \times 2,016 \text{ sq. ft.}}{12} = 77.3 \text{ cu. ft.}$$

STEP 3 - Sizing of Select Infiltration Method

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

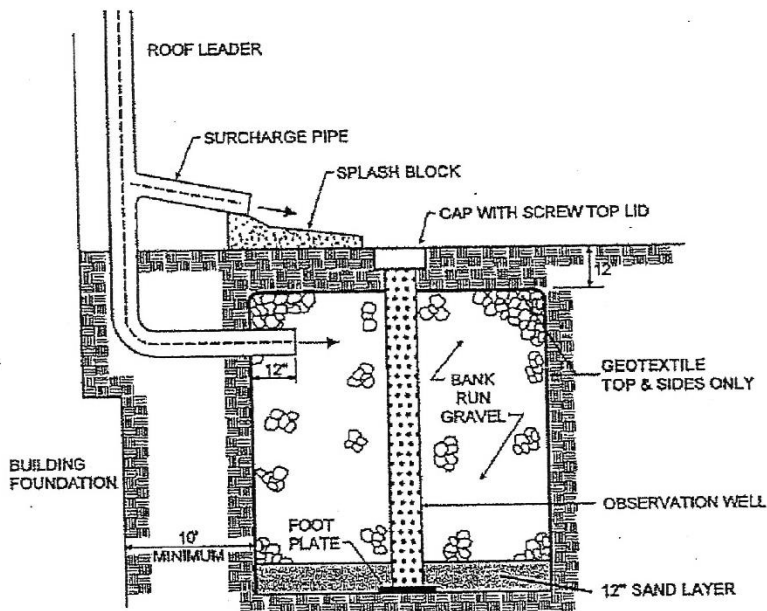
Dry Wells

Dry wells are effective methods of infiltrating runoff from roof leaders. These facilities should be located a minimum of 10 feet from the building foundation to avoid seepage problems. A dry well can be either a structural prefabricated chamber or an excavated pit filled with aggregate. Construction of a dry well should be performed after all other areas of the site are stabilized, to avoid clogging. During construction, compaction of the subgrade soil should be avoided and construction should be performed with only light machinery. Depth of dry wells in excess of 3 ½, feet should be avoided. Gravel fill should be an average 1.5 - 3.0 inches in diameter. Dry wells should be inspected at least four times annually as well as after large storm events.

STORMWATER MANAGEMENT

FIGURE G-1

TYPICAL DRY WELL CONFIGURATION



Source: Maryland Stormwater Design Manual, 2000

Example Sizing:

STEP 1- Determine Total Impervious Surfaces

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

STEP 2 -Determine Require Infiltration Volume using Equation

$$\frac{0.46 \text{ in.} \times 576 \text{ sq. ft.}}{12} = 22.1 \text{ cu. ft.}$$

$$\frac{22.1 \text{ cu. ft.}}{0.4^*} = 55.3 \text{ cu. ft. (* assume 40\% void ratio in gravel bed)}$$

STEP 3 - Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

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

$$55.3 \text{ cu. ft.} = 3.5 \text{ ft.} \times L \times L; L = 4.0 \text{ ft.}$$

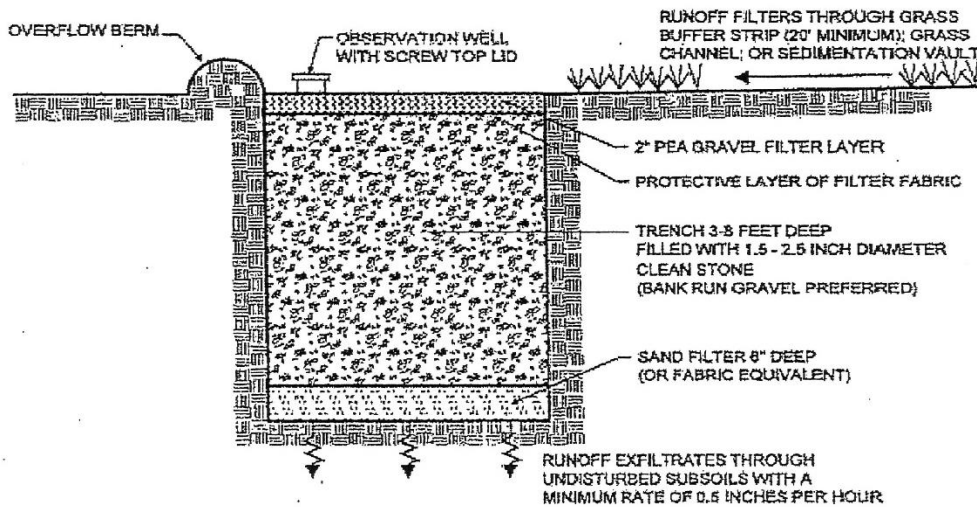
Final Facility Dimensions: 3.5 ft. (D) x 4.0 ft. (W) x 4.0 ft. (L)

Infiltration Trenches

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

FIGURE G-2

TYPICAL INFILTRATION TRENCH CONFIGURATION



Source: Maryland Stormwater Design Manual, 2000

Example Sizing:

STEP 1-Determine Total Impervious Surfaces

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

			864 sq. ft.

STEP 2 - Determine Require Infiltration Volume using Equation

$0.46 \text{ in.} \times 864 \text{ sq. ft.} = 33.1 \text{ cu. ft.}$

STORMWATER MANAGEMENT

$$\frac{33.1 \text{ cu. ft.}}{0.4} = 82.8 \text{ cu. ft. (* assume 40\% void ratio in gravel bed)}$$

STEP 3 - Sizing of Select Infiltration Method

Volume of facility = Depth x Width x Length

Set D = 3 ft.; Determine Required Surface Area of Trench

$$82.8 \text{ cu. ft.} / 3 \text{ ft.} = 27.6 \text{ sq. ft.}$$

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

Determine trench length: $L = 27.6 \text{ sq. ft.} / 6 \text{ ft} = 4.6 \text{ ft.}$

Final Trench Dimensions: 3 ft. (D) x 6 ft. (W) x 4.6 ft. (L)

FIGURE G-3

SAMPLE SITE SKETCH PLAN

