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CHAPTER 26

WATER

Part 1

General Provisions

§100. Long Title. An Ordinance establishing rules, regulations, and standards for regulating land use activities and associated stormwater runoff within Buffalo Township, County of Union, Commonwealth of Pennsylvania; setting forth the powers, duties and procedures to be followed by the Township in administering this Ordinance; and setting forth the penalties for violation thereof.

§101. Short Title. This Ordinance shall be known as and may be referenced and cited as the Consolidated Buffalo Township Stormwater Management Ordinance.

§102. Authority. The Township is empowered to regulate land use activities that affect runoff by the authority of the Act of October 4, 1978, 32 P.S., P.L. 864 (Act 167) Section 680.1 et seq., as amended, the Stormwater Management Act. Stormwater Management is also authorized by the Pennsylvania Municipalities Planning Code, Act 247 of 1968, P.L. 805; P.S. 10101 and by the Second Class Township Code, Act 69 of 1933, P.L. 103; 53 P.S. 65101.

§103. Statement of Findings. The Buffalo Township Board of Supervisors finds that:

(1) 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.

(2) A comprehensive program of stormwater management, including reasonable regulation of development 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.

§104. Purpose. The purpose of this Ordinance is to promote health, safety and welfare within Buffalo Township by minimizing the damages described in Section 103 of this Ordinance though provisions designed to:

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

(2) Promote the utilization and preservation of existing natural drainage systems.

(3) Encourage groundwater recharge where appropriate and prevent degradation of groundwater quality.

(4) Maintain existing natural flows of streams including quantity, peak flows, flow type and quality.

(5) Preserve and restore flood carrying capacity of streams.

(6) Provide for proper maintenance of all permanent stormwater management facilities constructed in the Township.

(7) Provide for the protection of wellhead areas and community water supplies and protection of downstream properties from impacts resulting from increased development.

(8) Provide performance standards and design criteria for watershed wide stormwater management and planning.

§105. Applicability. This Ordinance shall apply in all watersheds within Buffalo Township and shall only apply to permanent stormwater management facilities constructed as part of any regulated activities listed in this Section. This Ordinance contains only the stormwater management performance standards and design criteria that are necessary or desirable from a watershed-wide perspective.

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

(1) Land development.

(2) Subdivision.

(3) Construction of new or additional impervious or semi-pervious surfaces (driveways, parking lots, etc.).

(4) Construction of new buildings or additions to existing buildings.

(5) Diversion or piping of any natural or man-made stream channel.

(6) Installation of stormwater management facilities or appurtenances thereto.

§106. Exemptions.

(1) Any Regulated Activity on parcels generating less than 5,000 square feet of total impervious area may be granted an exemption from the provisions of this Ordinance. This criterion shall apply to the total development even if development is to take place in phases. The date of this 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. Exemptions shall be at discretion of Municipal Engineer upon review of site conditions, topography, soils and other factors as deemed appropriate.

(2) Prior to the granting of an exemption, the Applicant must provide documentation that the increased flows from the site leaves the site in the same manner as the pre-development condition, and that there will be no adverse affects to properties along the path of flow(s), or that the increased flow(s) will reach a natural watercourse or an existing stormwater management structure before adversely affecting any property along the path of the flow(s). This documentation must include a signed statement by the landowner indicating the total impervious area constructed since the date of adoption of this Ordinance.

(3) No exemption shall be provided for Regulated Activities as defined in Section 105.E and 105.F of this Ordinance.

§107. Compatibility with Other Ordinances. Approvals issued pursuant to this Ordinance do not relieve the applicant of the responsibility to secure required permits, or approvals for activities regulated by any other applicable act, code, law, ordinance, plan, policy, rule, regulation, or statute.

§108. Repealer. All previous Township stormwater management ordinances are hereby repealed. All other ordinances or sections thereof and resolutions, which are inconsistent with any of the provisions herein, are hereby repealed to the extent of the inconsistency only. Repeal of said Ordinances or resolutions shall not be construed to affect any suit or proceeding now pending in any court or any rights accrued or liability incurred or any cause or causes of action accrued or existing under any Ordinance repealed hereby; nor shall any right or remedy be lost, impaired, or affected by this Ordinance.

§109. Severability. Should a court of competent jurisdiction declare any section, subsection, or provision of this Ordinance invalid, such decision shall not affect the validity of this Ordinance as a whole, or any other part of the remaining provisions of the Ordinance. The Buffalo Township Supervisors hereby declare that it would have enacted the remainder of this Ordinance even without any such part, provision, or application.

§110. Liability Disclaimer. The granting of approval of a stormwater drainage plan, stormwater management design, or any improvement installed as a condition thereof, shall not constitute a representation, guarantee, or warranty of any kind by Buffalo Township, or

by any official, employee, or appointee thereof, of the practicality or safety of the proposed use or improvement, and shall create no liability upon or cause of action against the Township, its officials, employees, or appointees for any damage that may result pursuant thereto. The applicant is responsible for ensuring that any development and activities regulated by this Ordinance will not cause injury or damage to other persons or property.

§111. References. Specific methods and publications referenced in this Ordinance shall, in all cases, refer to the latest available edition and shall include revisions, amendments, and/or replacements thereto.

§112. Amendments. The Buffalo Township Supervisors may, from time to time, revise, modify, and amend this Ordinance pursuant to the provisions of the Pennsylvania Stormwater Management Act, Act 167 of October 4, 1978 32 P.S., P.L. 864; the Pennsylvania Municipalities Planning Code, Act 247 of 1968, P.L. 805; P.S. 10101 and by the Second Class Township Code, Act 69 of 1933, P.L. 103; 53 P.S. as from time to time reenacted and amended or other applicable law in effect at the time of said amendment.

§113. Effective Date. This Ordinance shall become effective 15 days after being duly enacted and ordained by the Buffalo Township Board of Supervisors.

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 2

Definitions

§200. General. Unless otherwise expressly stated, the following terms and words used herein shall, for the purposes of this Ordinance, have the meaning indicated in this Section.

§201. General Terms. For the purposes of this chapter, certain terms and words used herein shall be interpreted as follows:

(1) 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.

(2) 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.

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

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

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

§202. Specific Terms.

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. Construction of new buildings or impervious area is not considered an agricultural activity.

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

APPLICANT – A landowner or developer who has filed an application for approval to engage in any Regulated Activities as defined in Section 106 of this Ordinance.

BMP (BEST MANAGEMENT PRACTICE) – Stormwater structures, facilities and techniques to control, maintain or improve the quantity and quality of surface runoff.

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

CISTERN – An underground reservoir or tank for storing rainwater.

CONSERVATION DISTRICT – The Union County Conservation District.

CULVERT – Structure with appurtenant works that carries a stream under or through an embankment or fill.

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

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.

DESIGNEE – The agent of Buffalo Township involved with the administration, review or enforcement of any provisions of this Ordinance by contract or memorandum of understanding.

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

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

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

DEVELOPMENT SITE – The specific tract of land for which a Regulated Activity is proposed.

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

DRAINAGE CONVEYANCE FACILITY – A stormwater management facility designed to transmit stormwater runoff and shall include streams, channels, swales, pipes, conduits, culverts, storm sewers, etc.

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

DRAINAGE PERMIT – A permit issued by the municipal governing body after the drainage plan has been approved. Said permit is issued prior to or with the final municipal approval.

DRAINAGE PLAN – The plan and documentation prepared by the developer or his representative indicating how stormwater runoff will be managed and the stormwater management system, if any, to be used for a given development site, the contents of which are established in this Ordinance.

EARTH DISTURBANCE – Any activity including, but not limited to, construction, mining, timber harvesting and grubbing which alters, disturbs, and exposes the existing land surface.

EMERGENCY SPILLWAY – A depression in the embankment of a pond or basin that is used to pass peak discharge greater than the maximum design storm controlled by the pond.

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

EROSION AND SEDIMENT POLLUTION CONTROL PLAN – A plan that is designed to minimize accelerated erosion and sedimentation.

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

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

FLOODPLAIN – Any land area susceptible to inundation by water from any natural source or delineated by applicable Department of Housing and Urban Development, Federal Insurance Administration Flood Hazard Boundary mapped as being a special flood hazard area. Also included are areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania Department of Environmental Protection (PA DEP) Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by PA DEP).

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

FOREST MANAGEMENT/TIMBER OPERATIONS – Planning and activities necessary for the management of forestland. These include timber inventory and preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation and reforestation.

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

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

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

GROUNDWATER RECHARGE – Replenishment of existing natural underground water supplies.

HEC-HMS (Hydrologic Engineering Center Hydrologic Modeling System) – The computer-based hydrologic modeling technique adapted to a particular watershed as part of an official Act 167 Watershed Plan and calibrated to reflect actual recorded flow values by adjoining key model input parameters. Miller Run sub-watershed of Bull Run and West Branch of the Susquehanna have a calibrated HEC-HMS model.

IMPERVIOUS SURFACE – A surface that prevents the percolation of water into the ground. For the purposes of this Ordinance impervious surface may include, but not be limited to, the following: concrete, asphalt, building coverage, water impoundments, gravel and crushed stone areas, highly compacted soil, etc.

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

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

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

KARST – A type of topography that is formed over limestone, dolomite, or gypsum by bedrock solution, and that is characterized by closed depressions or sinkholes, caves and underground drainage (from AGI, Glossary of Geology, 1972.).

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

LAND EARTH DISTURBANCE – Any activity involving grading, tilling, digging, or filling of ground or stripping of vegetation or any other activity that causes an alteration to the natural condition of the land.

LIMESTONE – A rock that is chiefly formed by the accumulation of organic remains, consisting mainly of calcium carbonate.

MAIN STEM (MAIN CHANNEL) – Any stream segment or other runoff conveyance facility used as a reach in any Act 167 Watershed Plan hydrologic model runs.

MANNING EQUATION in (Manning Formula) – A method for calculation of velocity of flow (e.g., feet per second) and flow rate (e.g., cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. “Open channels” may include closed conduits so long as the flow is not under pressure.

MUNICIPALITY – Buffalo Township, Union County, Pennsylvania.

MUNICIPAL ENGINEER – A professional engineer licensed as such in the Commonwealth of Pennsylvania, duly appointed or retained as the engineer for Buffalo Township.

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

NON-STRUCTURAL BMP'S – Stormwater runoff treatment techniques which use natural measures to reduce pollution levels, do not require extensive construction efforts and/or promote pollutant reduction by eliminating the pollutant source. Acceptable non-structural BMPs are identified in Appendix B.

NRCS – Natural Resource Conservation Service (previously SCS).

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

OVERBANK AND EXTREME EVENT FLOOD PROTECTION VOLUME – See Release Rates.

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

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

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

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

PENN STATE RUNOFF MODEL (PSRM) – The computer-based hydrologic modeling technique adapted to a particular watershed as part of an official Act 167 Watershed Plan and calibrated to reflect actual recorded flow values by adjoining key model input parameters. Portions of the Bull Run Watershed not impacted by the Plan update of 2002 and the Buffalo Creek Watershed have calibrated PSRM models.

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

PLANNING COMMISSION – Buffalo Township Planning Commission

PMF – PROBABLE MAXIMUM FLOOD – The flood that may be expected from the most severe combination of critical meteorological and hydrological conditions that is reasonably possible in any area. The PMF is derived from the probable maximum

precipitation (PMP) as determined based on data obtained from the National Oceanographic and Atmospheric Administration (NOAA).

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

RECHARGE VOLUME (RE_v) – The volume of stormwater runoff from a site that must be infiltrated into the soil to promote the maintenance of groundwater recharge rates that existed prior to development.

REGULATED ACTIVITIES – Actions or proposed actions that have an impact on stormwater runoff and that are specified in Section 106 of this Ordinance.

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

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

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

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

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

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

SEDIMENT POLLUTION – The placement, discharge or any other introduction of sediment into the waters of the Commonwealth occurring from the failure to design, construct, implement or maintain control measures and control facilities in accordance with the requirements of this Ordinance.

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

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

SHEET FLOW – Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.

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

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

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 waste.

STORMWATER MANAGEMENT CREDITS – Incentive based non-structural stormwater management applications that can be incorporated into the site design process to promote water quality, groundwater recharge, volume control, and other stormwater objectives. These include conservation of natural areas, disconnection of rooftop runoff, disconnection of non-rooftop runoff, sheet flow to buffers, grass channels and environmentally sensitive or low impact development.

STORMWATER – The total amount of precipitation reaching the ground surface.

STORMWATER HOTSPOT – A land use or activity that generates higher concentrations of hydrocarbons, trace metals, or toxicants than are found in typical stormwater runoff, based on monitoring studies. Typical stormwater hotspots are listed in Section 302 of this Ordinance.

STORMWATER MANAGEMENT FACILITY – Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not

limited to, detention and retention basins, open channels, storm sewers, pipes, and infiltration structures.

STORMWATER MANAGEMENT PLAN – The plans for managing stormwater runoff in designated watersheds adopted by Union County and approved by the PA DEP as required by the Act of October 4, 1978, P.L. 864, (Act 167), the Stormwater Management Act.

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

SUBAREA (SUB-WATERSHED) – The smallest drainage unit of a watershed for which stormwater management criteria have been established in an Act 167 Stormwater Management Plan.

SUBDIVISION – The division or re-division 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 dwellings, shall be exempt.

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

TECHNICAL RELEASE 20 (TR-20) – Project Formulation-Hydrology, Computer Program. NRCS.

TECHNICAL RELEASE 55 (TR-55) – Urban Unit Hydrology for Small Watersheds. NRCS.

TIMBER OPERATIONS – See Forest Management.

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

WATERCOURSE – A stream of water, river, brook, creek, or a channel or ditch for water, whether natural or man-made.

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.

WATER QUALITY VOLUME (WQ_v) – The storage needed to capture and treat the runoff from 90% of the average annual rainfall. For Union County the depth of rain associated with 90% of the total of all rainfall events is 1.2 inches.

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

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 3

Stormwater Management

§300. Stormwater Management Areas. The Buffalo Township Stormwater Management Areas are as follows and appear on a map in Appendix A of this Ordinance.

(1) Buffalo Creek Stormwater Area – Activities within the Buffalo Creek Watershed shall comply with the requirements of this Ordinance and the *Buffalo Creek Act 167 Stormwater Management Plan*, adopted by the County of Union and approved by the Pennsylvania Department of Environmental Protection.

(2) Bull Run (Limestone Run) Stormwater Area – Activities occurring within the Bull Run Watershed shall comply with the requirements of this Ordinance and the original *Bull Run Act 167 Stormwater Management Plan* of 1993 and the Plan Update of 2002, adopted by the County of Union and approved by the Pennsylvania Department of Environmental Protection.

(3) West Branch Susquehanna River Stormwater Area – Activities occurring within the West Branch Susquehanna River Watershed shall comply with the requirements of this Ordinance and the *West Branch Susquehanna River Act 167 Stormwater Management Plan*, adopted by the County of Union and approved by the Pennsylvania Department of Environmental Protection.

(4) Penns Creek Stormwater Area – Activities occurring within the Penns Creek Watershed shall comply with the requirements of this Ordinance and the *Penns Creek Act 167 Stormwater Management Plan*, adopted by the County of Union and approved by the Pennsylvania Department of Environmental Protection.

§301. General Requirements.

(1) The management of stormwater on the site, both during and upon the completion of construction, and the design of any temporary or permanent facilities or structures and the utilization of a natural drainage system shall be in full compliance with this section.

(2) Site designs shall minimize impervious surfaces and shall promote the infiltration of runoff through seepage beds, infiltration trenches, etc. where soil conditions permit to reduce the size or eliminate the need for detention facilities.

(3) Stormwater runoff generated from development discharged directly into a wetland or other waters of the Commonwealth shall be done in accordance with Federal and State regulatory requirements and shall be adequately treated to prevent degradation.

(4) Annual groundwater recharge rates shall be maintained by promoting infiltration. At a minimum annual recharge from the post development site shall mimic the annual recharge from the pre-development site conditions.

(5) Applicants may select runoff control techniques, or a combination of techniques, which are most suitable to control stormwater runoff from the development site. Buffalo Township encourages applicants to consider alternative solutions, including Best Management Practices (BMP's) for stormwater management. Applicants are urged to consult the Pennsylvania Handbook of Best Management Practices for Developing Areas and with the Municipal Engineer and the County Conservation District. All stormwater designs are subject to the approval of the Municipal Engineer. The Township may request specific information on design and/or operating features of the proposed stormwater controls in order to determine their suitability and adequacy in terms of the standards of this Ordinance.

(6) All stormwater management facilities including detention basins, BMP's, sewers, and culverts shall be designed by an individual qualified and/or experienced in their design. These qualifications should be listed on the front cover of the plan narrative.

(7) The anticipated peak rate of stormwater runoff from the site during and after full development shall not exceed the peak rate of runoff from the site prior to development activities, measured in accordance with the standards and criteria of this Ordinance.

(8) Roof drains shall not be connected to streets, sanitary or storm sewers or roadside ditches but shall be allowed to drain to the land surface to promote overland flow and infiltration of stormwater.

(9) Existing points of concentrated drainage that discharge onto adjacent property shall not be altered without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this Ordinance.

(10) If existing diffused stormwater flow is proposed to be concentrated the applicant must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other harm will result from concentrated discharge.

(11) Storm sewers, swales, culverts, bridges, and related facilities shall be provided to:

(a) Permit the unimpeded flow of natural watercourses;

(b) Insure the drainage of all points along the line of streets;

(c) Intercept stormwater runoff along streets at reasonable intervals related to the extent and grade of the area drained, and to prevent the flooding of intersections and the undue concentration of storm water; and

(d) Insure unrestricted flow of stormwater under driveways, and at natural watercourses of drainage swales.

Consideration should be given to anticipated up slope development.

(12) All natural streams, channels, swales, drainage systems and/or areas of surface water concentration shall be maintained in their existing conditions unless an alteration is approved by the Township due to topographic conditions.

(13) Easements shall be provided conforming to the line of all natural streams, channels, swales, and drainage systems and other stormwater infrastructure installed to comply with this Ordinance. The terms of such easements shall prohibit excavation, the placement of fill or structures and any other alterations, including the growth of stiff or woody vegetation that may adversely affect the flow of stormwater.

(14) All stream encroachment activities, including work in and adjacent to water of the Commonwealth or wetlands, shall comply with applicable PA DEP requirements.

(15) Any stormwater facility located on a state highway right-of-way shall be subject to the approval of the Pennsylvania Department of Transportation and any facility located on a Township road or street right-of-way shall be subject to the approval of Buffalo Township.

(16) Applicants are encouraged to incorporate designs to take advantage of the stormwater credits presented in Appendix B of this Ordinance.

(17) 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.

(18) 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.

§302. Water Quality Requirements.

(1) For water quality, the objective is to provide adequate storage to capture and treat the runoff from 90% of the average annual rainfall in accordance with the following where P represents the depth of rain associated with 90% of the total rainfall events over 0.11 inches.

(a) The size of the water quality facility shall be based upon the following equation:

$$WQ_v = \frac{(1.2)(R_v)(A)}{12} \qquad P = 1.2 \text{ inches of rainfall}$$

Where: WQ_v = water quality volume (in ac-ft)
R_v = 0.05 + 0.009(I) where I is percent impervious cover
A = area in acres*

*Treatment of the Water Quality Volume (WQ_v) for offsite areas and areas not disturbed is not required.

(b) Treatment of the WQ_v shall be provided at all developments where stormwater management is required. A minimum WQ_v of 0.2 inches per acre shall be met at sites or in drainage areas that have less than 15% impervious cover.

(c) The WQ_v shall be based on the impervious cover for the proposed site. Offsite existing impervious areas may be excluded from the calculation of the water quality volume requirements.

(d) When a project contains or is divided by multiple drainage areas, the WQ_v shall be addressed for each drainage area.

(e) Drainage areas having no impervious cover and no proposed disturbance during development may be excluded from the WQ_v calculations. Designers are encouraged to use these areas as non-structural practices for WQ_v treatment.

(f) Where structural practices for treating the Recharge Volume (Re_v) are employed upstream of a BMP, the Re_v may be subtracted from the WQ_v used for design.

(g) Where non-structural practices are employed in the site design, the WQ_v can be reduced in accordance with the conditions outlined in Appendix B of this Ordinance.

(h) The design of the facility shall consider and minimize the chances of clogging and sedimentation potential. Orifices smaller than three (3) inches diameter are not recommended. However, if the Design Engineer can provide proof that the smaller orifices are protected from clogging by use of trash racks, etc. smaller orifices may be permitted.

(i) When designing flow splitters for off-line practices, consult the small storm hydrology method provided in Appendix M of this Ordinance.

(2) To accomplish adequate water quality treatment the final WQ_v shall be treated by an acceptable BMP from the list presented in Appendix N or an equivalent practice approved by the Municipal Engineer. The applicant may submit original and innovative designs to the Municipal Engineer for review and approval. Such designs may achieve the water quality objectives through a combination of BMPs.

(3) The water quality requirement can be met by providing a 24-hour draw down of a portion of the WQ_v in conjunction with a stormwater pond or wetland system. Referred to as extended detention (ED), this is different than providing the extended detention of the one-year storm for the Channel Protection Volume (Cp_v). The ED portion of the WQ_v may be included when routing the Cp_v.

(4) In selecting the appropriate BMPs or combinations thereof, the applicant shall consider the following:

(a) Total contributing area.
(b) Permeability and infiltration of the site soils.
(c) Slope and topography.
(d) Seasonal high water table.
(e) Depth to bedrock.
(f) Proximity to building foundations and wellheads.
(g) Erodibility of soils.
(h) Subgrade stability and susceptibility to sinkhole formation.
(i) Land availability and configuration of the topography.
(j) Peak discharge and required volume control.
(k) Stream bank erosion.
(l) Efficiency of the BMPs to mitigate potential water quality problems.
(m) The volume of runoff that will be effectively treated.
(n) The nature of pollutants being removed.
(o) Creation and protection of wildlife habitat.
(p) Enhancement of aesthetic and property value.
(q) Maintenance requirements.

(5) Stormwater Hotspots – If a site is designated as a stormwater hotspot as per Table 302-1 it has important implications for how stormwater is managed.

(a) A greater level of stormwater treatment is required at hotspot sites to prevent pollutant wash off after construction.

(b) For areas designated as hotspots a Stormwater Pollution Prevention Plan may be required to be designed and implemented that contains operation practices at the site to reduce the generation of pollutants by preventing contact with rainfall.

(c) Stormwater Pollution Prevention Plans shall follow the requirements of the U.S. EPA NPDES stormwater program.

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

Residential streets and rural highways, residential development, institutional development, commercial and office developments, non-industrial rooftops, pervious areas except for golf courses and nurseries. Large highways and retail gasoline outlet facilities are not designated as hotspots although it is important to ensure that stormwater plans for these facilities adequately protect groundwater.

TABLE 302-1: Stormwater Hotspots

Vehicle Salvage Yards and Recycling Facilities*
Vehicle Service and Maintenance Facilities
Vehicle and Equipment Cleaning Facilities*
Fleet Storage Areas (bus, truck, etc.)*
Industrial Sites
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
Golf Courses
Other land uses and activities as designated.

*Stormwater Pollution Plan implementation may be required for these land uses or activities under the U.S. EPA NPDES stormwater program

§303. Groundwater Recharge Requirements.

(1) Design of the infiltration/recharge stormwater management facilities shall give consideration to providing groundwater recharge to compensate for the reduction in the percolation that occurs when the ground surface is paved and roofed over. These measures are encouraged, particularly in hydrologic soil groups A and B and shall be utilized wherever feasible.

(2) The criteria for maintaining recharge is based on the USDA average annual recharge volume per soil type divided by the annual rainfall in Union County (40 inches per year) and

multiplied by 90%. This keeps the recharge calculation consistent with the WQ_v methodology. Thus, an annual Recharge Volume (Re_v) requirement shall be specified for a site as follows:

(a) Percent Volume Method

$Re_v = [(S)(R_v)(A)]/12$

Where: $R_v = 0.05+0.009(I)$ where I is % impervious cover
A = site area in acres

(b) Percent Area Method

$Re_v = (S)(A_i)$
Where: A_i = the measured impervious cover

Hydrologic Soil Group	Soil Specific Recharge Factor
A	0.40
B	0.27
C	0.14
D	0.07

(c) The recharge volume is considered part of the total WQ_v that must be provided at a site and can be achieved either by a structural practice (e.g., infiltration, bioretention), a non-structural practice (e.g., buffers, disconnection of rooftops), or a combination of both.

(d) Drainage areas having no impervious cover and no proposed disturbance during development may be excluded from the Re_v calculations. Designers are encouraged to use these areas as non-structural practices for Re_v treatment.

(e) The Re_v and WQ_v are inclusive. When treated separately, the Re_v may be subtracted from the WQ_v when sizing the water quality BMP.

(f) Recharge/infiltration facilities may be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.

(3) Basis for Determining Recharge Volume

(a) If more than on Hydrologic Soil Group (HSG) is present at a site, a composite soil specific recharge factor shall be computed based on the proportion of total site area within each HSG. **The recharge volume provided at the site shall be directed to the most permeable HSG available.**

(b) **The "percent volume" method is used to determine the Re treatment requirement when <u>structural practices</u> are used to provide recharge.** These practices must provide seepage into the ground and may include infiltration and exfiltration structures (e.g., infiltration, bioretention, dry swales or sand filters with storage below the under drain). Structures that require impermeable liners, intercept groundwater, or are designed for trapping sediment (e.g., forbays) may not be used. In this method, the volume of runoff treated by structural practices shall meet or exceed the computed recharge volume.

(c) **The "percent area" method is used to determine the Re_v treatment requirements when non-structural practices are used.** Under this method, the recharge requirements are evaluated by mapping the percent of impervious area that is effectively treated by an acceptable non-structural practice and comparing it to the minimum recharge requirements.

(d) Acceptable non-structural practices are those identified in Appendix B and include filter strips that treat rooftop or parking lot runoff, sheet flow discharge to stream buffers, grass channels that treat roadway runoff, and conservation design.

(e) The recharge volume criterion does not apply to any portion of a site designated as a stormwater hotspot or any project considered as redevelopment. In addition, the Municipal Engineer may alter or eliminate the recharge volume requirement if the site is situated on unsuitable soils (e.g., marine clays), karst or in an urban redevelopment area. In this situation, non-structural practices (percent area method) shall be implemented to the maximum extent practicable and the remaining or untreated Re_v included in the WQ_v treatment.

(f) If Re_v is treated by structural or non-structural practices separate and upstream of the WQ_v treatment, the WQ_v is adjusted accordingly.

(4) Soils Evaluation

(a) **A detailed soils evaluation of the project site shall be performed to determine the suitability of recharge facilities.** The evaluation shall be performed by a qualified professional, and at a minimum, address soil permeability, depth to bedrock, susceptibility to sinkhole formation, and subgrade stability. Advanced testing methods such as the double-ring test are encouraged. The municipal engineer reserves the right to require additional soils evaluation when it is believed that test results are not reasonable.

(b) **Extreme caution shall be exercised where infiltration is proposed in geologically susceptible areas such as strip mine or limestone areas.** Extreme caution shall also be exercised where salt or chloride would be a pollutant since soils do little to filter this

pollutant and it may contaminate the groundwater. It is also extremely important that the design professional evaluates the possibility of groundwater contamination from the proposed infiltration/recharge facility and recommends a hydrogeologic justification study be performed if necessary. Whenever a basis will be located in an area underlain by limestone, a geological evaluation of the proposed location may be required to determine susceptibility to sinkhole formations. The design of all facilities over limestone formations shall include measures to prevent ground water contamination and, where necessary, sinkhole formations.

(c) The Township may require the installation of an impermeable liner in detention basins underlain by limestone or in areas of karst topography. The Township may require a detailed hydrogeologic investigation. The developer may also be required to provide safeguards against groundwater contamination for uses that may cause groundwater contamination, should there be an accident or spill.

(5) All recharge/infiltration facilities shall be designed to completely drain within 72 hours of reaching maximum capacity.

§304. Channel Protection Storage Volume (Stream Bank Erosion)

(1) Stream Channel Protection shall be considered in implementing the standards of Section 305 of this Ordinance. If a stormwater storage facility needs to be constructed then, to protect channels from erosion, the outflow structure shall be designed to provide **24 hour extended detention of the one-year; 24-hour storm event.** The method for determining the Cp_v requirement is detailed in Appendix O of this Ordinance.

(2) For discharges to streams having verified naturally reproducing wild trout or that are stocked with trout (based upon the most recent resource classification or other appropriate documentation of the Pennsylvania Fish and Boat Commission or other appropriate agency), only 12 hours of extended detention shall be provided. The rationale for this criterion is that runoff will be stored and released in such a gradual manner that critical erosive velocities during bankfull and near bankfull events will seldom be exceeded in downstream channels.

(3) Basis for Determining Channel Protection Storage Volume

(a) The models HEC-HMS, TR-55 and TR-20 (or an equivalent approved by the Municipal Engineer) shall be used for determining peak discharge rates.

(b) The rainfall depth for the one-year 24-hour storm event in Union County is 2.2 inches.

(c) Off-site areas shall be modeled as present land use in good condition for the one (1) year storm event.

(d) The length of overland flow used in time of concentration (t_c) calculations is limited to no more than 150 feet.

(e) The Cp_v storage volume shall be computed using the detention lag time between hydrograph procedures outlined in Appendix O of this Ordinance. The detention lag time (T) for a one-year (1) storm is defined as the interval between the center of mass of the inflow hydrograph and the center of mass of the outflow hydrograph.

(f) Cp_v is not required at sites where the one-year post development peak discharge (q_i) is less than or equal to 2.0 cfs. A Cp_v orifice diameter (d_i) of less than 3.0 inches is subject to approval by the Municipal Engineer and is not recommended unless an internal control for orifice protection is used.

(g) Cp_v shall be addressed for the entire site. If a site consists of multiple drainage areas, Cp_v may be distributed proportionately to each drainage area.

(h) Extended detention storage provided for the Cp_v does not meet the WQ_v requirement (i.e. Cp_v and WQ_v shall be treated separately).

(i) The stormwater storage needed for the Cp_v may be provided above the WQ_v storage in stormwater ponds and wetlands; thereby meeting all storage criteria except Re_v in a single facility with appropriate hydraulic control structures for each storage requirement.

(j) Infiltration is not recommended for Cp_v control because of large storage requirements.

§305. Overbank and Extreme Event Flood Protection Requirements. For a site located within two or more districts the peak discharge rate from any sub-area shall be the pre-development peak discharge for that sub-area. The calculated peak discharges shall apply regardless of whether the grading plan changes the drainage area by sub-area. Pre-development and post-development runoff for specific sites shall be computed using an approved method as per Table 307-1 for the 2-, 10-, 25-, and 100-year storm.

(1) Bull Run Watershed – The Bull Run Watershed Release Rate Percentage Map in Appendix I of this Ordinance illustrates the release rate subareas and defines the percentage of pre-development Release Rates are also shown in Table 305-1. The Release Rates apply uniformly to all land development or alterations within a subarea. Procedures for applying the Release Rate Percentage are contained in Appendix J.

Table 305-1: Bull Run Watershed Release Rates

Subareas		Release Rate (%)
Bull Run Watershed	1	80
	2	50
	3	100
	4	100
	5	60
	6	60
	7	100
	8	70
	9	50
	10	60
Miller Run	37-40	100
	42-45	100
	46	75
	47	100
	49-51	100

(2) Buffalo Creek Watershed – The Buffalo Creek Watershed Runoff Control Districts Map in Appendix K of this Ordinance illustrates the three (3) major Runoff Control Districts; shown as “A”, “B”, and “C”. Development sites located in the “A”, “B”, and “C” Districts must control post-development runoff rates to pre-development runoff rates as shown in Table 305-2.

Table 305-2: Buffalo Creek Watershed Release Rates

Runoff Control Districts		Subareas	Post-Development Design Storm	Pre-Development Design Storm
	A	1-4	2-Year 10-Year 50-Year	1-Year 10-Year 50-Year
		16		
		28-39		
		58-59		
	B	5-15	2-Year 10-Year 50-Year	1-Year 5-Year 25-Year
		17-27		
		40-55		
		60-65		
		70-75		
	C	79-81	2-Year 10-Year 50-Year	1-Year 10-Year 50-Year
		56-57		
		66-69		
		76-78		
		82-92		

(3) West Branch Susquehanna – The release rate for all areas in Buffalo Township in the West Branch Susquehanna Watershed is 100%. The West Branch Susquehanna Watershed Subareas Map in Appendix L of this Ordinance illustrates the release rate subareas. Procedures for applying the release rates are contained in Appendix J.

(4) Reserved for performance standards to be determined by a Penns Creek Act 167 Plan. Until such time as an Act 167 Plan is duly adopted the post-development rate of runoff shall not exceed the pre-development rate of runoff for the 2-, 10-, 25-, and 100-year storm events.

§306. Design Considerations.

(1) All storm sewers and manmade channels (i.e., swales) shall be able to convey the post-development runoff from a 10-year design storm without surcharging inlets and shall be constructed using Penn DOT Form 408 Specifications, Standard Details unless otherwise directed by the Municipal Engineer.

(2) Stormwater roof drains shall not discharge not any municipal sanitary sewer line or over a sidewalk.

(3) Inlets shall be placed at the curb line where a curbed section is installed. Inlets required for parallel or cross drainage without a curbed section shall be set at the centerline of the ditch.

(4) Structures shall be Penn DOT Type M pre-cast concrete or cast-in-place Class A concrete. Brick or block structures shall not be permitted. Solid concrete block or brick may be incorporated into a structure only for grade adjustment of the casting.

(5) All water obstructions (bridges, culverts, outfalls or stream enclosures) shall have ample waterway opening to carry expected flows, based on a minimum post development peak storm frequency of twenty-five (25) years without damage to the drainage structure or roadway.

(6) Construction of water obstructions shall be in accordance with the Pennsylvania Department of Transportation specifications and shall meet the requirements of the Pennsylvania Department of Environmental Protection (PA DEP). Any work involving wetlands shall be designed in accordance with the specification of the PA DEP and United States Army Corps of Engineers.

(7) Roadway crossings located within designated floodplain areas shall be able to convey runoff from a 100-year design storm.

(8) Whenever the vegetation and topography are to be disturbed, such activity must be in conformance with Chapter 102, Title 25, Rules and Regulations, Part I, Commonwealth of Pennsylvania, Department of Environmental Protection, Subpart C, Protection of Natural Resources, Article II, Water Resources, Chapter 102, “Erosion Control,” and in accordance with the Union County Conservation District.

(9) Any stormwater management facility designed to store runoff and requiring an earthen berm or embankment shall be designed to provide an emergency spillway to handle flow up to and including the 100-year post-development conditions. The height of the embankment must be set as to provide a minimum of one (1) foot of freeboard above the maximum pool elevation computed when the facility functions for the 100-year post-development inflow.

(10) Stormwater management facilities that require a dam safety permit under PA DEP Chapter 105 shall meet the applicable dam safety requirements that may require the facility to pass storms larger than the 100-year event.

(11) Adequate erosion protection shall be provided along all open channels and at all points of discharge.

(12) Additional erosion and sedimentation control design standards and criteria that must be or are recommended to be applied where infiltration BMPs are proposed shall include the following:

(a) Areas proposed for infiltration BMPs shall be protected from sedimentation and compaction during the construction phase, so as to maintain their maximum infiltration capacity.

(b) Constructed infiltration BMPs shall be protected from receiving sediment-laden runoff.

(13) Detention basins for stormwater peak discharge storage shall comply with the following criteria:

(a) Basins shall be installed prior to any earthmoving or land disturbance that they will serve. The phasing of their construction shall be noted in a narrative and on the plan.

(b) Basins located in an area underlain by limestone may require a geologic evaluation of the proposed location to determine susceptibility to sinkhole formations. The design of all facilities over limestone formations shall include measures to prevent ground water contamination and, where necessary, sinkhole formation. The Township may require basins located over limestone to have an impermeable liner.

(c) Soils used for the construction of basins shall have low erodibility factors ("K factors").

(d) Energy dissipators and/or level spreaders shall be installed at points where pipes or drainage ways discharge to or from basins. Discharge from basins shall be into a natural waterway or drainage way.

(e) Exterior slopes of compacted soil shall not exceed one foot (1') vertical per three feet (3') horizontal and may be further reduced in soils of unstable characteristics.

(f) Interior slopes of the basin shall not exceed one foot (1') vertical per three feet (3') horizontal except with the approval of the Municipal Engineer. Where concrete, stone, or brick walls are used for steeper interior slopes, the basin shall be fenced with a permanent wire fence at least forty-two (42") in height and a ramp of durable, non-slip materials for maintenance vehicles shall be provided for basin access.

(g) Outlet structures within basins which will control peak discharge flows and distribute the flows by pipes to discharge areas shall be constructed of concrete, polymer-coated steel or aluminum and shall have childproof, non-clogging trash racks over all design openings exceeding twelve (12") inches in diameter, except those

openings used to carry perennial stream flows. Small outlet structures may be constructed of Schedule 40 PVC.

(h) Where spillways will be used to control peak discharges in excess of the ten (10) year storm, control weirs shall be constructed of concrete of sufficient mass and structural stability to withstand the pressures of impounded waters and outlet velocities.

(i) Concrete outlet aprons shall be designed as level spreaders and shall extend at a minimum to the toe of the basin slope. The incorporation of any large stone found on the site into the concrete apron to provide a more natural appearance is encouraged.

(j) Inlet and outlet structures shall be located at maximum distance from each other. 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.

(k) Temporary and permanent grasses or stabilization measures shall be established on the sides of all earthen basins within fifteen (15) days of initial construction.

§307. Calculation Methodology.

(1) Stormwater calculations to determine runoff, peak flow rates, peak discharge, hydrographs and to design stormwater runoff rate reduction facilities shall use a generally accepted calculation technique that is based on the Natural Resource Conservation Service (NRCS) Soil-Cover Complex method. Table 307-1 summarizes acceptable methods.

(2) It is assumed that all methods will be selected by the design professional 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 200 acres or less; however, the Rational Method shall not be used to generate **pseudo-hydrographs** for drainage areas greater than 10 acres.

(3) For predevelopment flow rate determination it shall be assumed that all undeveloped and pervious land shall be considered as “meadow” in good condition, unless the natural ground cover generates a lower curve number of Rational “C” value (i.e. forest) as listed in Appendix C or Appendix D of this Ordinance.

(4) All calculations using the Soil Cover Complex method shall use the appropriate design rainfall depths for the various return period storms as presented in the table in Appendix E of this Ordinance. If a hydrologic computer model such as PSRM or HEC-HMS is used for stormwater runoff calculations then the duration of rainfall shall be 24 hours. The SCS “S” curve shown in Appendix F of this Ordinance shall be used for the rainfall distribution.

(5) All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration for overland flow and return periods from the Design Storm Curves from PA Department of Transportation Design Rainfall Curves (1986) shown in Appendix G of this Ordinance. 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.

(6) Runoff Curve Numbers (CN) for both existing and proposed conditions to be used in the Soil Cover Complex method shall be obtained from the table in Appendix C of this Ordinance.

(7) Runoff coefficients (c) for both existing and proposed conditions for use in the Rational Method shall be obtained from the table in Appendix D of this Ordinance.

(8) Where uniform flow is anticipated the Manning Equation shall be used for hydraulic computations and to determine the capacity of open channels, pipes, and storm sewers. Manning's Equation should not be used for analysis of pipes under pressure flow or for culvert analysis. Values for Manning's roughness coefficient (n) shall be consistent with Appendix H of this Ordinance.

(9) When existing storm sewers, streets, roadside ditches or drainage swales are accessible; the applicant shall not connect the stormwater drainage system to the existing facilities without the approval of the Municipal Engineer and the facility owner.

(10) Routing of hydrographs through detention/retention facilities for the purposes of designing those facilities shall be accomplished using the Storage Indication method or other recognized routing method subject to approval of the Municipal Engineer. For drainage areas greater than 200 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The Municipal Engineer 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.

(11) Any method approved by the Pennsylvania Department of Transportation or the Pennsylvania Department of Environmental Protection may be used to design the waterway areas of bridges.

Table 307-1: Acceptable Stormwater Management Computation Methodologies

Method	Method Developer	Applicability
TR-20 (or commercial Package based on TR-20)	USDA NRCS	Where use of full hydrologic computer model is desirable or necessary
TR-55 (or commercial Package based on TR-55)	USDA NRCS	For plans within limitations described in TR-55.
HEC-1, HEC-HMS	US Army Corps of Engineers	Where use of full hydrologic computer model is desirable or necessary
PSRM	Penn State University	Where use of full hydrologic computer model is desirable or necessary
Rational Method	Emil Kuichling (1889)	For sites less than 10 acres, or as approved by the Municipal Engineer
Other Methods	Varies	Other computations approved by Municipal Engineer

§308. No Harm Option.

(1) For any proposed development site the developer has the option of using a less restrictive runoff control (including no detention) if the developer can prove that "no harm" would be caused by discharging at a higher runoff rate than that specified by the Plan. The "no harm" option is used when a developer can prove that the post-development conditions will not cause increases in peaks at all points downstream. Proof of "no harm" would have to be shown based upon the following "Downstream Impact Evaluation" which shall include a "downstream hydraulic capacity analysis" consistent with Section 308.B of this Ordinance to determine if adequate hydraulic capacity exists. The land developer shall submit to the Municipality this evaluation of the impacts due to increased downstream stormwater flows in the watershed.

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

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

(c) The peak flow values to be used for downstream areas for the design return period storms (1, 2-, 5-, 10-, 25-, 50-, and 100-year) shall be the values from the

calibrated model used for the analysis and preparation of the particular Act 167 Stormwater Management Plan. These flow values can be obtained from the applicable watershed plan.

(d) Developer-proposed runoff controls that would generate increased peak flow rates at storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no harm," except in conjunction with proposed capacity improvements for the problem areas consistent with Section 308.B

(e) A financial distress shall not constitute grounds for granting a "no harm" exemption.

(f) Capacity improvements may be provided by the developer as necessary to implement the "no harm" option which proposes specific capacity improvements to provide that a less stringent discharge control would not create any harm downstream.

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

(h) Qualification of no harm does not relieve the applicant of the other provisions of this Ordinance, including but not limited to the water quality, groundwater recharge and channel protection volume requirements of Sections 302, 303 and 304 of this Ordinance.

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

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

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

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

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 4

Drainage Plan Requirements

§400. General Requirements. The Drainage Plan shall consist of all applicable calculations, drawings, maps, and plans. The cover sheet of the computations and erosion and sedimentation control plan shall refer to the associated maps by title and date. All Drainage Plan materials shall be submitted to the Township in a format that is clear, concise, legible, neat, and well organized; otherwise, the Drainage Plan shall be disapproved and returned to the Applicant. The following items shall be included in the Drainage Plan:

(1) General

(a) General description of project.

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

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

(d) Drainage Plans shall be prepared by a professional with demonstrated competency in stormwater management and design.

(e) Drainage Plans and related documentation shall contain the seal and signature of the professional that prepared the plans.

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

(a) The location of the project relative to highways, municipalities or other identifiable landmarks.

(b) Existing contours at intervals no greater than two foot. In areas of steep slopes (greater than 15 percent), five-foot contour intervals may be used.

(c) Existing streams, lakes, ponds, field delineated wetlands, or other bodies of water within the project area.

(d) Other physical features including flood hazard boundaries, sinkholes, streams, existing drainage courses, areas of natural vegetation to be preserved, and the total extent of the upstream area draining through the site.

(e) The locations of all existing and proposed utilities, sanitary sewers, and water lines within 50 feet of property lines.

(f) An overlay showing soil names and boundaries.

(g) Proposed changes to the land surface and vegetative cover, including the type and amount of impervious area that would be added.

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

(i) Final contours at intervals of no greater than two foot. In areas of steep slopes (greater than 15 percent), five-foot contour intervals may be used.

(j) 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.

(k) The date of submission.

(l) A graphic and written scale of one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.

(m) A North arrow.

(n) The total tract boundary and size with distances marked to the nearest foot and bearings to the nearest degree.

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

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

(q) Horizontal and vertical profiles of all open channels, including hydraulic capacity.

(r) Overland drainage paths.

(s) A minimum fifteen-foot wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way. The fifteen feet shall extend from the top of the bank of any channel or berm of any basin.

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

(u) A construction detail of any improvements made to sinkholes.

(v) A statement, signed by the landowner, acknowledging the stormwater management system to be a permanent fixture that can be altered or removed only after municipal approval of a revised plan.

(w) The location of all erosion and sedimentation control facilities.

(x) Where pervious pavement is permitted for parking lots, recreational facilities, non-dedicated streets or other areas, pavement construction specifications shall be noted on the plan.

(y) It shall be the applicant's responsibility to verify if the site is underlain by limestone. The following note shall be affixed to all drainage plans and signed and sealed by the engineer, surveyor, landscape architect or geologist:

I, _____, certify that this site and any detention basins located thereon are/are not underlain by limestone.

(2) Supplemental Information

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

(1) The overall stormwater management concept for the project.
(2) Stormwater runoff computations as specified in this Ordinance.
(3) Existing and proposed drainage area maps.
(4) Stormwater management techniques to be applied both during and after development.
(5) Expected project time schedule.

(b) A soil erosion and sedimentation control plan, where applicable, including all reviews and approvals, as required by PA DEP.

(c) A geologic assessment of the effects of runoff on sinkholes as specified in this Ordinance.

(d) 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.

(e) A Declaration of Adequacy and Highway Occupancy Permit from the PENNDOT District Office when utilization of a PENNDOT storm drainage system is proposed.

(3) Stormwater Management Facilities

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

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

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

§401. Plan Submission.

(1) The Drainage Plan shall be submitted by the developer as part of a Preliminary and/or Final Plan application for subdivision and land development activity or separately if the activity regulated by this Ordinance is not being conducted in conjunction with a subdivision or land development.

(2) Four (4) copies of the Drainage Plan and all supplemental materials shall be submitted to the Township.

§402. Drainage Plan Review.

(1) The Municipal Engineer shall review the Drainage Plan for consistency with this Ordinance and applicable Act 167 Stormwater Management Plans. The Township shall require receipt of a complete plan, as specified in this Ordinance.

(2) For activities regulated by this Ordinance, the Municipal Engineer shall notify the Township in writing, whether the Drainage Plan is consistent with this Ordinance. Should the Drainage Plan be determined to be consistent with this Ordinance, the Municipal Engineer will forward an approval letter to the Township Secretary.

(3) Should the Drainage Plan be determined to be inconsistent with this Ordinance the Municipal Engineer will forward a disapproval letter to the Municipal Secretary citing the specific sections of the Ordinance and reason(s) for the disapproval.

(4) The Municipal Secretary shall forward a copy of the Municipal Engineer's review of the Drainage Plan to the applicant and the Township Building Permit Officer, Zoning Officer, and Township Planning Commission.

(5) For Regulated Activities requiring a PA DEP Joint Permit Application, the Municipal Engineer shall notify PA DEP whether the Drainage Plan is or is not consistent with this Ordinance and the Act 167 Stormwater Management Plan and forward a copy of the review letter to the Municipality and the developer. PA DEP may consider the Municipal Engineer's review comments in determining whether to issue a permit.

(6) The Township shall not approve any subdivision or land development for Regulated Activities specified in Section 106 of this Ordinance if the Drainage Plan has been found to be inconsistent with this Ordinance or the Act 167 Stormwater Management Plan, as determined by the Municipal Engineer.

(7) The Municipal Building Permit and Zoning Officers shall not issue building and/or zoning permits for any Regulated Activity specified in this Ordinance if the Drainage Plan has been found to be inconsistent with this Ordinance as determined by the Municipal Engineer.

(8) The applicant shall be responsible for completing record drawings of all stormwater management facilities included in the approved Drainage Plan. The record drawings and an explanation of any discrepancies with the design plans shall be submitted to the Municipal Engineer for final approval. In no case shall the Township approve the record drawings until a copy of an approved Declaration of Adequacy; Highway Occupancy Permit is received from the PENNDOT District Office, and any applicable permits from PA DEP.

(9) The approval of a Drainage Plan shall be valid for a period not to exceed five (5) years. This 5-year time period shall commence on the date that the Township signs the approved Drainage Plan. If stormwater management facilities included in the approved Drainage Plan have not been constructed, or if constructed, and record drawing of these facilities have not been approved within this 5-year time period, then the Township may consider the Drainage Plan disapproved and may revoke any and all approvals and/or permits. Drainage Plans that are considered disapproved by the Township shall be resubmitted in accordance with this Ordinance.

§403. Modification of Plans. A modification to a submitted Drainage Plan for a development site that involves a change in stormwater management facilities or techniques, or that involves the relocation or re-design of stormwater management facilities, or that is necessary because soil or other conditions are not as stated on the Drainage Plan as

determined by the Municipal Engineer, shall require a resubmission of the modified Drainage Plan and a review consistent with this Ordinance.

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

§404. Resubmission of Disapproved Drainage Plans. A disapproved Drainage Plan may be resubmitted, with the revisions addressing the Municipal Engineer's concerns documented in writing, to the Township Secretary in accordance with this Ordinance and distributed accordingly and is subject to review as specified in this Ordinance.

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 5

Fees and Expenses

§500. General. Applicants are responsible for paying all applicable costs incurred by the Township in reviewing Drainage Plans.

§501. Municipality Drainage Plan Review Fee. The Township shall establish a Review Fee Schedule by resolution of the Township Board of Supervisors.

§502. Expenses Covered by Fees. The fees required by this Ordinance shall at a minimum cover:

(1) Administrative costs.

(2) The review of the Drainage Plan by the Municipality and the Municipal Engineer.

(3) The site inspections.

(4) The inspection of stormwater management facilities and drainage improvements during construction.

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

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

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 6

Financial Guarantee & Maintenance Responsibilities

§600. Improvement Guarantee. The applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as required by the approved drainage plan and this Ordinance equal to 110% of the construction cost of the required stormwater controls estimated as of 90 days following the date scheduled for completion by the developer. The improvement guarantee shall follow the procedures and requirements specified for financial guarantees in the Township Subdivision and Land Development Ordinance and the Pennsylvania Municipalities Planning Code, Act 247 of 1968, P.L. 805, 53 P.S. 10101.

§601. Schedule of Inspections.

(1) The Municipal Engineer shall inspect all phases of the installation of the permanent stormwater management facilities as deemed appropriate by the Municipal Engineer.

(2) During any stage of the work, if the Municipal Engineer determines that the permanent stormwater management facilities are not being installed in accordance with the approved Drainage Plan, the Municipality shall revoke any existing approvals and/or permits and issue a cease and desist stop work order until the problem is corrected by the applicant or until a revised Drainage Plan is submitted and approved, as specified in this Ordinance.

(3) At the completion of the project, and as a prerequisite for the release of the improvement guarantee, the owner or his representative shall:

(a) 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.

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

(4) After receipt of the certification by the Township, a final inspection shall be conducted by the Municipal Engineer or designated representative to certify compliance with this Ordinance.

§602. Maintenance Responsibilities.

(1) The Drainage Plan for the development site shall contain an operation and maintenance plan prepared by the developer and approved by the Municipal Engineer. The operation and maintenance plan shall outline required routine maintenance actions and schedules necessary to insure proper operation of the facility(ies).

(2) The Drainage Plan for the development site shall establish responsibilities for the continued operation and maintenance of all proposed stormwater control facilities, consistent with the following principles:

(a) If a development consists of structures or lots which are to be separately owned and in which streets, sewers and other public improvements are to be dedicated to the Township, stormwater control facilities may also be offered for dedication to the Township (the Township is not obligated to accept ownership).

(b) If a development site is to be maintained in a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the ownership and maintenance of stormwater control facilities shall be the responsibility of the owner or private management entity.

(3) The governing body, upon recommendation of the Municipal Engineer, shall make the final determination on the continuing maintenance responsibilities prior to final approval of the drainage plan. The governing body reserves the right to accept or reject the ownership and operating responsibility for any or all of the stormwater management controls.

§603. Maintenance Agreement for Stormwater Facilities.

(1) Prior to final approval of the site's drainage plan, the property owner shall execute a maintenance agreement suitable for recording in the Union County Recorder of Deeds Office, an example of which is contained in Appendix P, covering all stormwater control facilities that are to be privately owned.

(2) Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The maintenance agreement shall be subject to the review and approval of the Township.

§604. Municipal Stormwater Maintenance Fund.

(1) Persons installing stormwater storage facilities shall be required to pay a specific amount to the Municipal Stormwater Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined in accordance with this Section.

(2) If the storage facility is to be privately owned and maintained, the deposit shall cover the cost of periodic inspections performed by the Township for a period of ten (10) years, as estimated by the Municipal Engineer. After that period of time, inspections will be performed at the expense of the Municipality.

(3) If the storage facility is to be owned by and maintained by the Township, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The Municipal Engineer will establish the estimated costs utilizing information submitted by the applicant.

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

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

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 7

Enforcement and Penalties

§700. Right-Of-Entry. 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 condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

§701. 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 approvals issued hereunder, the Township shall provide written notification of the violation. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violation(s). Failure to comply within the time specified shall subject such person to the penalty provisions of this Ordinance. All such penalties shall be deemed cumulative and resort by the Township from pursuing any and all remedies. It shall be the responsibility of the owner of the real property on which any Regulated Activity is proposed to occur, is occurring, or has occurred, to comply with the terms and conditions of this Ordinance.

§702. Enforcement. The Township 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 Municipal Engineer or other qualified persons designated by the Township.

(1) A set of design plans approved by the Township shall be on file at the site throughout the duration of the construction activity. Periodic inspections may be made during construction.

(2) It shall be unlawful for any person, firm or corporation to undertake any Regulated Activity under Section 105 on any property except as provided for in the approved Drainage Plan and pursuant to the requirements of this Ordinance. It shall be unlawful to alter or remove any control structure required by the Drainage Plan pursuant to this Ordinance or to allow the property to remain in a condition that does not conform to the approved Drainage Plan.

(3) Suspension and Revocation of Approvals and/or Permits

(a) Any approval or permit issued under this Ordinance may be suspended or revoked by the governing body for:

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

(2) A violation of any provision of this Ordinance or any other applicable law, ordinance, rule or regulation relating to the project.

(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 approval or permit shall be reinstated by the governing body when:

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

(2) The governing body is satisfied that the violation of the Ordinance, law, or rule and regulation has been corrected.

(3) A permit that has been revoked by the governing body cannot be reinstated. The Applicant may apply for a new permit under the procedures outlined in this Ordinance.

(4) Occupancy Permits. An occupancy permit shall not be issued unless the certification of completion pursuant to Sections 601.C and 601.D has been secured. The occupancy permit shall be required for each lot owner and/or developer for all subdivisions and land development in the Municipality.

§703. Public Nuisance.

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

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

§704. Penalties.

(1) Anyone violating the provisions of this Ordinance shall be guilty of a misdemeanor, and upon conviction shall be subject to a fine of not more than $500.00 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense.

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

§705. Appeals.

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

(2) Any person aggrieved by any decision of the Township Board of Supervisors or the Zoning Hearing Board may appeal to the Union County Court of Common Pleas within thirty (30) days of the municipal decision.

(Ordinance No. 53, adopted February 4, 2008)

CHAPTER 26

WATER

Part 8

The Bull Run (Limestone Run) Stormwater Management Plan

§800. General Provisions.

(1) Purpose. These regulations are adopted and implemented to achieve the following general purposes and objectives:

(a) To manage storm water and runoff resulting from land alteration and disturbance activities in accordance with the watershed storm water management plans adopted pursuant to the Pennsylvania Storm Water Management Act (Act 167 of 1978, as amended).

(b) To utilize and preserve the desirable existing natural drainage system and to preserve the flood-carrying capacity of streams.

(c) To encourage natural infiltration of rainfall to preserve groundwater supplies and stream flows.

(d) To provide for adequate maintenance of all permanent storm water management structures in the municipality.

(2) Applicability. The following activities involving alterations or development of land are deemed to have possible effects upon storm water runoff characteristics and are included within the scope of this Part, depending on the extent of their impact on the land:

(a) Subdivision;

(b) Land developments;

(c) Earth moving involving 1.5 or more acres;

(d) Construction of new buildings or additions to existing buildings;

(e) Construction of new or additional impervious or semi-impervious surfaces (driveways, parking lots, etc.);

(f) Diversion or piping of any natural or man-made stream channel;

(g) Installation, replacement or substantial repair of storm water systems or appurtenances;

(h) Mining operations and oil and gas drilling operations; and

(i) Other activities which may affect or alter existing runoff rates and/or patterns so as to affect downstream persons or properties.

(3) Repealer. This Part shall repeal all other ordinances, or parts thereof, which are contrary to or conflict with the provisions of this Part to the extent necessary to give this Part full force and effect.

(4) Severability. Should any section or provision of this Part be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of this Part as a whole or any other part hereof, the parts or sections remaining shall remain in effect as if the part of the section declared unconstitutional had never been part of this Part.

(5) Liability Disclaimer.

(a) Neither the granting of any approval under the storm water management provisions of this Part, nor the compliance with the provisions of this Part, or with any condition imposed by a municipal officer hereunder, shall relieve any person from any responsibility for damage to persons or property resulting therefrom, or as otherwise imposed by law, nor impose any liability upon the municipality for damage to persons or property.

(b) The granting of a permit which includes any storm water management facilities shall not constitute a representative, guarantee or warranty of any kind by the municipality, or by an official or employee thereof, of the practicability or safety of any structure, use or other plan proposed, and shall create no liability upon or cause of action against such public body, official or employee for any damage that may result pursuant thereto.

§801. Storm Water Management Performance Standards.

(1) Storm Water Management Performance Standards.

(a) For purposes of storm water management, the municipality of Buffalo Township is divided into the following storm water management district: The Bull Run Watershed. This district may be further divided into subareas which have similar hydrological characteristics and drain to a common point.

(b) This location and boundaries of the watershed and subareas are shown on the "Municipal Storm Water Management District Map" which is hereby adopted as part of this section.

(2) General Standards.

(a) The following provisions shall be considered the overriding performance standards against which all proposed storm water control measures shall be evaluated and shall apply throughout the municipality of Buffalo Township.

(1) Any landowner and any person engaged in the alteration or development of land which may affect storm water runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. Such measures shall include such actions as are required:

(a) To assure that the maximum rate of storm water runoff is no greater after development than prior to development activities; or

(b) To manage the quality, velocity and direction of resulting storm water runoff in a manner which otherwise adequately protects health and property from possible injury.

(b) The storm water management plan for the development site must consider all the storm water runoff following over the site.

(c) No discharge of toxic materials shall be permitted into any storm water management system.

(3) Watershed Standards: Designated Bull Run Storm Water Management Watershed.

(a) The storm water performance standards contained in this section are intended to implement the standards and criteria contained in the Bull Run Storm Water Management Plan, adopted and approved in accordance with the Pennsylvania Storm Water Management Act. If there is any discrepancy between the provisions of this section and the standards and criteria of the plan, or if the watershed plan is subsequently amended, then the standards/criteria of the current watershed plan shall govern.

(b) Storm Frequencies. Storm water management facilities on all development sites shall control the peak storm water discharge for the 2-, 10-, 25- and 100-year storm frequencies. The SCS 24 hour, Type II Rainfall Distribution shall be used for analyzing storm water runoff for both pre- and post-development conditions. The 24-hour total rainfall for these storm frequencies in the watershed are:

Rainfall Depth	
Storm Frequency	(inches)
2-year	2.59
10-year	3.72
25-year	4.56
100-year	6.12

(c) Calculation Methods.

(1) Development Sites. For the purpose of computing peak flow rates and runoff hydrographs from development sites, calculations shall be performed using one of the following: SCS publications, Technical Release (TR) 55 or 20, HEC-1, Penn State Runoff Model (PSRM) or Modified Rational Method.

(2) Storm Water Collection/Conveyance Facilities. For the purposes of designing storm sewers, open swales and other storm water runoff collection and conveyance facilities, the Rational Method shall be applied. Rainfall intensities for design should be obtained from the Pennsylvania Department of Transportation rainfall charts.

(3) Predevelopment Conditions. Predevelopment conditions shall be assumed to be those which exist on any site at the time of adoption of the Bull Run Storm Water Management Plan. Hydrologic conditions for all areas with previous cover (i.e., fields, woods, lawn areas, pastures, cropland, etc.) shall be assumed to be in "good" condition, and the lowest recommended SCS runoff curve number (CN) shall be applied for all previous land uses within the respective range for each land use and hydrologic soil group.

(4) Routing of hydrographs through detention/retention facilities for the purpose of designing those facilities shall be accomplished using the Modified-Puls Method or other recognized reservoir routing method subject to approval of the municipality and county.

(d) Release Rate Percentage.

(1) Definition. The release rate percentage defines the percentage of the pre-development peak rate of runoff that can be discharged from an outfall on the site after development. It applies uniformly to all land development or alterations within a subarea. Release rate percentage areas and a listing of the release rate percentage by subarea are displayed on the Bull Run Watershed Release Rate Percentage Map.

(2) Procedure for Use.

(a) Identify the specific subarea in which the development site is located from the watershed map and obtain the subarea release rate percentage from Appendix A and the Bull Run Watershed Release Percentage map.

(b) Compute the pre- and post-development runoff hydrographs for each storm water outfall on the development site using an acceptable calculation method for the 2-, 10-, 25-, and 100-year storms. Apply no on-site detention for storm water management but include any techniques to minimize impervious surfaces increase the time of concentration for storm water runoff flowing from the development site. If the post-development peak runoff rate and the runoff volume area are less than or equal to the pre-development peak runoff rate and volume, then additional storm water control shall not be required at that outfall. If the post-development peak runoff rate and volume are higher, then storm water detention will be required, and the capacity of the detention facility must be calculated in the manner prescribed below.

(c) Multiply the subarea release rate percentage by the pre-development rate of runoff from the development site to determine the maximum allowable release rate from any detention facility for the four prescribed storm events.

(e) No Harm Evaluation.

(1) An applicant may seek to exceed the otherwise applicable subarea release rate percentage by performing the "No Harm Evaluation". This evaluation requires an independent engineering analysis to demonstrate that other reasonable options exist to prevent the occurrence of increased storm water runoff discharge rates and/or velocities or that measures can be provided to prevent increased storm water discharge rates and/or velocities from increasing flood elevations and accelerating erosion at all downstream points in the watershed.

(2) The analysis for the No-Harm Evaluation shall be submitted to the municipal engineer and the Union County Planning Department for review and approval.

(3) A "No Harm Evaluation" will be considered only in instances where the discharge to a stream channel from the development site occurs directly to

the West Branch of the Susquehanna River, an adequately sized storm or combined sewer which discharges directly into the West Branch of the Susquehanna River, or through a properly sized and designed regional storm water detention facility.

(4) The "No Harm Evaluation" shall be prepared by a registered engineer who is experienced in hydrology and hydraulics. The "No Harm Evaluation" analysis shall be completed using the following:

(a) [STEP 1] Develop the runoff hydrograph(s) for the design storm of the site and areas tributary to it using the PSRM for pre-development conditions using the land use characterizations contained in the Bull Run Watershed Storm Water Management Plan.

(b) [STEP 2] Develop the post-development discharge hydrograph from the proposed site using the PSRM. If no management or controls are proposed, this would be equivalent to the runoff hydrograph under the post-development conditions. If some management or controls are proposed, then the runoff hydrograph under post-development conditions should be modified to reflect their effects on the rate, volume and timing of discharges.

(c) [STEP 3] Subtract the runoff hydrograph ordinates under pre-development conditions (STEP 1) from the discharge hydrograph ordinates (STEP 2), maintaining the time scales of both hydrographs for one-to-one correspondence.

(d) [STEP 4] Obtain the PSRM for existing conditions for the Bull Run Watershed from the County.

(e) [STEP 5] Locate the subbasin(s) in which the proposed development is located and into which the discharge hydrograph enters. If more than one subbasin receives this incremental flow, divide the flow accordingly.

(f) [STEP 6] Add the incremental increase computed in STEP 3 to the runoff hydrograph of the subbasin(s) identified in STEP 5.

(g) [STEP 7] Route the adjusted runoff hydrograph through the Bull Run Watershed PSRM and note <u>any</u> increase in peak flows which would occur in downstream subbasins. If no increase is observed in peak flows, the increased potential for erosion and/or sedimentation in downstream channels resulting from any change in the flood hydrograph predicted by the model shall be evaluated. If no increased potential can

be demonstrated by appropriate technical means, then the "No-Harm" exemption may be requested.

(h) [STEP 8] If an increase in peak flow is observed in any of the downstream subbasins or increased potential for erosion and/or sedimentation is indicated, the "No-Harm" exemption shall not be granted.

§802. Design Criteria for Storm Water Management Controls.

(1) General Criteria.

(a) Applicants may select runoff control techniques, or a combination of techniques, which are most suitable to control storm water runoff from the development site. All controls must be subject to approval of the municipal engineer. The municipal engineer may request specific information on design and/or operating features of the proposed storm water controls in order to determine their suitability and adequacy in terms of the standards of this Part.

(b) The applicant should consider the effect of the proposed storm water management techniques on any special soil conditions or geological hazards which may exist on the development site. In the event such conditions are identified on the site, the municipal engineer may require in-depth studies by a competent geotechnical engineer. Not all storm water control methods may be advisable or allowable at a particular development site.

(c) The storm water management practices to be used in developing a storm water management plan for a particular site shall be selected according to the following order of preference:

(1) Infiltration of runoff on-site;

(2) Flow attenuation by use of open vegetated swales and natural depressions; or

(3) Storm water detention/retention structures.

(d) Infiltration practices shall be used to the extent practicable to reduce volume increased and promote groundwater recharge. A combination of successive practices may be used to achieve the applicable minimum control requirements. Justification shall be provided by the applicant for rejecting each of the preferred practices based on actual site conditions.

(e) Sinkholes shall be protected as follows:

(1) Storm water from roadways, parking lots, storm sewers, roof drains or other concentrated runoff paths shall not be discharged directly into sinkholes;

(2) Sinkholes with sufficient capacity to receive appreciable amounts of storm water, as determined by the municipal engineer, shall be designated as such by posting on-site notices clearly visible at the sinkhole prohibiting any disposal of refuse, rubbish, hazardous wastes, organic matter, or soil into the sinkhole. Rock fill may be permitted in the sinkhole for the purpose of preventing dumping of said materials. The discharge of storm water runoff to the subsurface using sinkholes shall be considered as potential pollution and prohibited unless the disposal method is designed so that contaminants in the runoff will be absorbed in the soil mantle and be acted upon by the bacteria naturally present in the mantle before reaching the groundwater. Systems intended to meet this requirement shall be designed by a hydrogeologist.

(3) If increased or concentrated runoff is to be discharged into a sinkhole, including filtered discharge, a geologic assessment of the effects of such runoff on increased land subsidence and groundwater quality shall be prepared and the results submitted with the storm water plan. Such discharge shall be prohibited if the municipal engineer determines that the discharge poses a hazard to life, property, or groundwater resources.

(2) Criteria for Infiltration Systems.

(a) Infiltration systems shall be sized and designed based upon local soil and groundwater conditions.

(b) Infiltration systems greater than three (3) feet deep shall be located at least ten (10) feet from basement walls.

(c) Infiltration systems shall not be used to handle runoff from commercial and industrial working or parking areas. This prohibition does not extend to roof areas which are demonstrated to be suitably protected from the effects of the commercial/industrial activities.

(d) Infiltration systems may not receive runoff until the entire drainage area to the system has received final stabilization.

(e) The storm water infiltration facility design shall provide an overflow system with measures to provide a non-erosive velocity of flow along its length and at the outfall.

(3) Criteria for Flow Attenuation Facilities.

(a) Flow attenuation facilities are employed to assist in the control of peak rates of discharge, their effects must be quantified using the SCS Technical Release (TR) 55 Urban Hydrology for Small Watersheds. The effects of the flow attenuation facilities on travel time should be reflected in the TR-55 calculations as outlined in the TR-55 manuals.

(b) Flow attenuation facilities such as swales and natural depressions should be properly graded to insure positive drainage and avoid prolonged ponding of water.

(c) Swales shall be properly vegetatively stabilized or otherwise lined to prevent erosion.

(d) The design of swales shall be in accordance with the recommendations contained in the Commonwealth of Pennsylvania Erosion and Sediment Pollution Control Program Manual.

(4) Criteria for Storm Water Detention Facilities.

(a) If detention facilities are utilized for the development site, the facility(ies) shall be designed such that post-development peak runoff rates from the developed site are controlled to those rates defined by the subarea release rate percentage for the 2-, 10-, 25-, and 100-year storm frequencies.

(b) All detention facilities are equipped with outlet structures to provide discharge control for the four (4) designated storm frequencies. Provisions shall also be made to safely pass the post-development 100-year storm runoff without damaging (i.e., impairing the continued function of the facilities). Should any storm water management facilities qualify as a dam under PA DER Chapter 105, the facility shall be designed in accordance with Chapter 105 and meet the regulations of Chapter 105 concerning dam safety.

(c) Shared-storage facilities, which provide detention of runoff for more than one development site within a single subarea, may be considered and are encouraged. Such facilities shall meet the criteria contained in this section. In addition, runoff from the development sites involved shall be conveyed to the facility in a manner that avoids adverse impacts (such as flooding or erosion) to channels and properties located between the development site and the shared-storage facilities.

(d) Where detention facilities will be utilized, multiple use facilities, such as wetlands, lakes, ballfields or similar recreational/open space uses are encouraged wherever feasible, subject to the approval of the municipality and Pennsylvania Department of Environmental Resources' Chapter 105 regulations.

(e) Other considerations which should be incorporated into the design of the detention facilities include:

(1) Inflow and outflow structures shall be designed and installed to prevent erosion and bottoms of impoundment type structures should be protected from soil erosion;

(2) Control and removal of debris both in the storage structure and in all inlet or outlet devices shall be a design consideration;

(3) Inflow and outflow structures, pumping stations, and other structures shall be designed and protected to minimize safety hazards;

(4) The water depth at the perimeter to a storage pond should be limited to that which is safe for children. This is especially necessary if bank slopes are steep or if ponds are full and recirculating in dry periods. Restrictions of access (fence, walls, etc.) may be necessary depending on the location of the facility;

(5) Side slope of storage ponds shall not exceed a ratio of two-and-one-half to one (2.5:1) horizontal to vertical dimension;

(6) Landscaping shall be provided for the facility which harmonizes with the surrounding area; and

(7) Facility shall be located to facilitate maintenance, considering the frequency and type of equipment that will be required.

(5) Criteria for Collection/Conveyance Facilities.

(a) All storm water runoff collection or conveyance facilities, whether storm sewers or other open or closed channels, shall be designed in accordance with the following basic standards:

(1) All sites shall be graded to provide drainage away from and around the structure in order to prevent any potential flooding damage;

(2) Lots located on the high side of streets shall extend roof and french drains to the curb line storm sewer (if applicable). Low side lots shall extend roof and french drains to a storm water collection/conveyance/control system or natural watercourse in accordance with the approved storm water management plan for the development site;

(3) Collection/conveyance facilities should not be installed parallel and close to the top or bottom of a major embankment to avoid the possibility of failing or causing the embankment to fail;

(4) All collection/conveyance facilities shall be designed to convey the 25-year storm peak flow rate from the contributing drainage area and to carry it to the nearest outlet such as a storm water control facility, curbed street, storm sewer or natural watercourse; and

(5) Where drainage swales or open channels are used, they shall be suitably lined to prevent erosion and designed to avoid excessive velocities.

(b) Wherever storm sewers are proposed to be utilized, they shall comply with the following criteria:

(1) Where practical, designed to traverse under seeded and planted areas. If constructed within ten (10) feet of road paving, walks or other surfaced areas, drains shall have a narrow trench and maximum compaction to backfill to prevent settlement of the superimposed surface or development;

(2) Preferably installed after excavating and filing in the area to be traversed is completed, unless the drain is installed in the original ground with a minimum of three (3) feet cover and/or adequate protection during the fill construction;

(3) Designed: (1) with cradle when traversing fill areas of indeterminate stability, (2) with anchors when gradient exceed twenty (20%) percent, and (3) with encasement or special backfill requirements when traversing under a paved area;

(4) Designed to adequately handle the anticipated storm water flow and be economical to construct and maintain. The minimum pipe size shall be fifteen (15) inches in diameter;

(5) Drain pipe, trenching, bedding, and backfilling requirements shall conform to the requirements of the municipality and/or applicable PENNDOT Specifications, Form 408;

(6) All corrugated metal pipe shall be polymer coated, and with asbestos bonding and paved inverts where prone to erode. Pipe with a municipal right-of-way shall be reinforced concrete pipe with a minimum diameter of fifteen (15) inches;

(7) Storm inlets and structures shall be designed to be adequate, safe, self-cleaning and unobtrusive and consistent with municipal standards;

(8) Appropriate grates shall be designed for all catch basins, storm water inlets and other entrance appurtenances;

(9) Manholes shall be designed so that the top shall be at finished grade and sloped to conform to the slope of the finished grade. Top casting of structures located in roads or parking areas shall be machined or installed to preclude "rattling";

(10) Where proposed sewer connects with an existing storm sewer system, the applicant shall demonstrate that sufficient capacity exists in the downstream system to handle the additional flow; and

(11) Storm sewer outfalls shall be equipped with energy dissipation devices to prevent erosion and conform with applicable requirements of the Pennsylvania DER for stream encroachments (Chapter 105 of Pennsylvania DER Rules and Regulations).

§803. Erosion and Sedimentation Controls.

(1) Erosion/sedimentation plan shall be provided in accordance with the Pennsylvania Erosion/Sedimentation Regulations (25 PA Code, Chapter 102) and the standards and guidelines of the County Conservation District.

(2) Proposed erosion/sedimentation measures shall be submitted with the storm water management plan as part of the preliminary and final applications.

§804. Maintenance of Storm Water Management Controls.

(1) Maintenance Responsibilities.

(a) The storm water management plan for the development site shall contain an operation and maintenance plan prepared by the developer and approved by the municipal engineer. The operation and maintenance plan shall outline required routine maintenance actions and schedules necessary to insure proper operation of the facility(ies).

(b) The storm water management plan for the development site shall establish responsibilities for the continuing operation and maintenance of all proposed storm water control facilities, consistent with the following principles:

(1) If a development consists of structures or lots which are to be separately owned and in which streets, sewers, and other public improvements are to be dedicated to the municipality, storm water control facilities should also be dedicated to and maintained by the municipality; and

(2) If a development site is to be maintained in single ownership or if sewers and other public improvements are to be privately owned and maintained, then the ownership and maintenance of storm water control facilities should be the responsibility of the owner or private management entity.

(c) The governing body, upon recommendation of the municipal engineer, shall make the final determination on the continuing maintenance responsibilities prior to final approval of the storm water management plan. The governing body reserves the right to accept the ownership and operating responsibility for any or all of the storm water management controls.

(2) Maintenance Agreement for Privately Owned Storm Water Facilities.

(a) Prior to final approval of the site's storm water management plan, the property owner shall sign and record a maintenance agreement covering all storm water control facilities which are to be privately owned. The agreement shall stipulate:

(1) The owner shall maintain all facilities in accordance with the approved maintenance schedule and shall keep the facilities in a safe and attractive manner;

(2) The owner shall convey to the municipality easements and/or rights-of-way to assure access for periodic inspections by the municipality and maintenance, if required;

(3) The owner shall keep on file with the municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information will be submitted to the municipality within ten (10) days of the change; and

(4) If the owner fails to maintain the storm water control facilities following due notice by the municipality to correct the problem(s), the municipality may perform the necessary maintenance work or corrective work and the owner shall reimburse the municipality for all costs.

(b) Other items may be included in the agreement where determined necessary to guarantee the satisfactory maintenance of all facilities. The maintenance agreement shall be subject to the review and approval of the municipal solicitor and governing body.

(3) Municipal Storm Water Maintenance Fund.

(a) Persons installing storm water storage facilities shall be required to pay a specified amount to the Municipal Storm Water Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:

(1) If the storage facility is to be privately owned and maintained, the initial deposit shall cover the cost of the first inspection to be performed by the municipality, as estimated by the municipal engineer. After that initial inspection, all future inspections will be performed at the expense of the owner of the storage facility, payment to be made two weeks in advance of the scheduled inspection, based upon an estimate of the municipal engineer;

(2) If the storage facility is to be owned and maintained by the municipality, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. The municipal engineer will establish the estimated costs utilizing information submitted by the applicant. This paragraph shall in no way be interpreted or construed to require the municipality to accept or assume ownership or dedication of the storm water facility; and

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

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

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

§805. Storm Water Plan Requirements.

(1) General Requirements. No final subdivision/land development plan shall be approved, no permit authorizing construction issued, or any earth moving or land disturbance activity initiated until the final storm water management plan for the development site is approved in accordance with the provisions of this Part.

(2) Exemptions for Small Developments.

(a) At the time of application, the municipality shall determine if the subdivision/land development qualifies as a "small development" and, therefore, is eligible for a simplified storm water plan submission. For the purposes of this Part, a small development is any subdivision or land development which results in (or will result in when fully constructed) the creation of 5,000 or less square feet of impervious surface area. This criteria shall apply to the total development even if development is to take place in phases. This exemption shall not relieve the applicant from providing adequate storm water management to meet the purpose of this Part.

(b) Applications for small developments shall include a plan which describes the type and location of proposed on-site storm water management techniques or the proposed connection to an existing storm sewer system. The plan should show accurately site boundaries, five-foot interval contours, locations of watershed and/or subarea boundaries on the site (if applicable) and any watercourses, floodplains, or existing drainage facilities or structures located on the site. The municipality reserves the right to require that the plan be prepared by a registered professional engineer, surveyor or landscape architect.

(c) The municipal engineer shall review and approve the proposed provisions for storm water management in accordance with the standards and requirements of this Part.

(3) Storm Water Plan Contents.

(a) General Format. The storm water plan shall be drawn to a scale of not less than 1 inch = 200 feet. All sheets shall contain a title block with: name and address of applicant and engineer, scale, north arrow, legend, and date of preparation.

(b) Existing and Proposed Features. The plan shall show the following:

(1) Watershed Location - Provide a key map showing the location of the development site within the watershed(s) and watershed subarea(s). On all site drawings, show the boundaries of the watershed(s) and subarea(s) as they are located on the development site and identify watershed name(s) and subarea number(s);

(2) Floodplain Boundaries – Identify 100-year floodplains on the development site (as appropriate) based on the municipal Flood Insurance Study maps;

(3) Natural Features – Show all bodies of water (natural or artificial), watercourses (permanent and intermittent), swales, wetlands and other natural drainage courses on the development site, or which will be affected by runoff from the development;

(4) Soils – Provide an overlay showing soil types and boundaries within the development site (consult county, SCS and U.S. Geological Survey for information);

(5) Contours – Show existing and final contours at intervals of two (2) feet; in areas with slopes greater than fifteen (15%) percent, five (5) foot contour intervals may be used;

(6) Land Cover – Show existing and final land cover classifications as necessary to support and illustrate and runoff calculations performed;

(7) Drainage Area Delineations – Show the boundaries of the drainage areas employed in the runoff calculations performed;

(8) Storm Water Management Controls – Show any existing storm water management or drainage controls and/or structures, such as sanitary and storm sewers, swales, culverts, etc., which are located on the development site, or which are located offsite but will be affected by runoff from the development.

(c) Professional Certification. The storm water management plan (including all calculations) must be prepared and sealed by a registered professional engineer, surveyor or landscape architect with training and expertise in hydrology and hydraulics. Documentation of qualifications may be required by the municipality.

(d) Runoff Calculations. Calculations for determining pre- and post-development discharge rates and for designing proposed storm water control facilities must be submitted with the storm water management plan. All calculations shall be prepared using the methods and date prescribed by §102 of this Part.

(e) Storm Water Controls. All proposed storm water runoff control measures must be shown on the plan including methods for collecting, conveying, and storing storm water runoff on-site, which are to be used both during and after construction. Erosion and sedimentation controls shall be shown in accordance with applicable municipal and County Conservation District requirements. The plan shall provide information on the exact type, location, sizing, design, and construction of all proposed facilities and relationship to the existing watershed drainage system.

(1) If the development is to be constructed in stages, the applicant must demonstrate that storm water facilities will be installed to manage storm water runoff safely during each stage of development.

(2) A schedule for the installation of all temporary and permanent storm water control measures and devices shall be submitted.

(3) If appropriate, a justification should be submitted as to why any preferred storm water management techniques, as listed in §103, are not proposed for use.

(f) Easements, Rights-Of-Way, Deed Restrictions. All existing and proposed easements and rights-of-way for drainage and/or access to storm water control facilities shall be shown and the proposed owner identified. Show any areas subject to special deed restrictions relative to or affecting storm water management on the development site.

(g) Other Permits/Approvals. A list of any approvals/permits relative to storm water management that will be required from other governmental agencies (Pennsylvania DER Chapter 105 and 106 permits) and anticipated dates of submission/receipt should be included with the storm water plan submission. Copies of permit applications may be requested by the municipality where they may be helpful for plan review.

(h) Maintenance Program. The application shall contain a proposed maintenance plan for all storm water control facilities in accordance with the following:

(1) Identify the proposed ownership entity (e.g., municipality, property owner, private corporation, homeowner's association, or other entity);

(2) Include a maintenance program of all facilities, outlining the type of maintenance activities, probable frequencies, personnel, and equipment requirements and estimated annual maintenance costs;

(3) Identify method of financing continuing operation and maintenance if the facility is to be owned by entity other than the municipality or governmental agency; and

(4) Submit any legal agreements required to implement the maintenance program and copies of the maintenance agreement as required by this Part.

(i) Financial Guarantees. Submit financial guarantees in accordance with the provisions of this Part.

§806. Plan Review Procedures.

(1) Pre-Application Phase.

(a) Before submitting the storm water plan, applicants are urged to consult with the municipality, County Planning Department, and County Conservation District on the requirements for safety managing from the development site in a manner consistent with the municipal ordinances and applicable watershed storm water management plan. These agencies may also be helpful in providing necessary data for the storm water management plan.

(b) Applicants are encouraged to submit a sketch plan with a narrative description of the proposed storm water management controls for general guidance and discussion with the municipality and other agencies.

(c) The pre-application phase in not mandatory; any review comments provided by the municipality or other agencies are advisory only and do not constitute any legally binding action on the part of the municipality or any county agency.

(2) Storm Water Plan Reviews.

(a) Submission of Plans. Storm water plan applications shall be submitted with the preliminary and final subdivision/land development applications.

(b) Notification of Affected Municipalities. The municipality shall notify municipalities upstream and downstream of the development site, which may be affected by the storm water runoff and proposed controls for the site. Copies of the plans will be made available to the municipalities upon request. Comments received from any affected municipality will be considered by the municipal engineer and county agencies in their reviews.

(c) County Planning Review.

(1) A copy of the storm water plan, along with all runoff calculations, shall be forwarded to the Union County Planning Department. A report of the findings will be returned to the municipality within 30 days.

(2) If the Planning Department review identifies that the plan fails to comply with the watershed standards and criteria or that a possibility exists for harmful downstream impacts from the development site, the applicant will be advised so that the necessary modifications can be made to the storm water management controls for the development site. The municipal engineer shall not approve the development site's storm water management plan until

modifications are made and the plan receives a positive review from the County Planning Department.

(d) Municipal Engineer's Review. The municipal engineer shall approve or disapprove the storm water management plan based on the requirements of the municipal ordinances, the standards and criteria of the watershed plan and good engineering practice. The engineer shall submit a written report, along with supporting documentation, stating their reasons for approval or disapproval.

(e) Status of Engineer's Determination. The approval/disapproval of the site's storm water management plan by the municipal engineer shall be considered final. The governing body shall not reverse the storm water management plan or any specific control measure in contradiction to the engineer's action. The governing body may request modifications or alternative approaches to the storm water management controls, provided these are agreed to by the municipal engineer and the applicant's engineer.

(f) Permits Required from Other Governmental Agencies. Where the proposed development requires an obstruction permit from the Pennsylvania DER or an erosion/sedimentation permit from the County Conservation District, then final storm water management plan approval shall be conditional upon receipt of such permits. However, no building permit shall be issued, nor construction started, until the permits are received and copies filed with the municipality.

§807. Status of the Storm Water Plan After Final Approval.

(1) Upon final storm water plan approval and receipt of all necessary permits, the applicant may commence to install or implement the approved storm water management controls.

(2) If site development or building construction does not begin within two years of the date of final approval of the storm water management plan, then before doing so, the applicant shall resubmit the storm water management plan to verify that no condition has changed within the watershed that would affect the feasibility or effectiveness of the previously approved storm water management controls. Further, if for any reason development activities are suspended for two years or more, then the same requirement for resubmitting the storm water management plan shall apply.

§808. Storm Water Plan Modifications.

(1) If the request for a plan modification is initiated **before** construction begins, the storm water plan must be submitted and reviewed according to the procedures contained in §107 above.

(2) If the request for a plan modification is initiated **after** construction is underway, the municipal engineer shall have the authority to approve or disapprove the modification based on the field inspection **provided**: (1) the requested changes in storm water controls do not result in any modifications to other approved municipal land use/development requirements (e.g., building setbacks, yards, etc.) and (2) the performance standards in §102 are met. Notification of the engineer's action shall be sent to the governing body which may issue a stay of the plan modification within five (5) days and require the permittee to resubmit the plan modification for full storm water plan review in accordance with §107 above.

§809. Inspections of Storm Water Management Controls.

(1) The municipal engineer or a designated representative shall inspect the construction of the temporary and permanent storm water management system for the development site. The permittee shall notify the engineer 48 hours in advance of the completion of the following key development phases:

(a) At the completion of preliminary site preparation including stripping of vegetation, stockpiling of topsoil and construction of temporary storm water management and erosion control facilities;

(b) At the completion of rough grading, but prior to placing topsoil, permanent drainage or other site development improvements and ground covers;

(c) During construction of the permanent storm water facilities at such times as specified by the municipal engineer;

(d) Completion of permanent storm water management facilities, including established ground covers; and

(e) Completion of final grading, vegetative control measures or other site restoration work done in accordance with the approved plan and permit.

(2) No work shall commence on any subsequent phase until the preceding one has been inspected and approved. If there are deficiencies in any phase, the municipal engineer shall issue a written description of the required corrections and stipulate the time by which they must be made.

(3) If during construction, the contract or permittee identifies the site condition, such as subsurface soil conditions, alterations in surface or subsurface drainage which could affect the feasibility of the approved storm water facilities, he/she shall notify the municipal engineer within 24 hours of the discovery of such condition and request a field inspection. The municipal engineer shall determine if the condition requires a storm water plan modification.

(4) In cases where storm water facilities are to be installed in areas of landslide-prone soils or where other special site conditions exist, the municipality may require special precautions such as soil tests and core borings, full-time inspectors and/or similar measures. All costs of any such measures shall be borne by the permittee.

§810. Financial Guarantees and Dedications of Public Improvements.

(1) Guarantee of Completion. A completion guarantee in the form of a bond, cash, deposit, certified check or other negotiable securities acceptable to the municipality, shall be filed. The guarantee shall cover all streets, sanitary sewers, storm water management facilities, water systems, fire hydrants, sidewalks, and other required improvements; it shall be in the amount and form prescribed by the Municipalities Planning Code (Section 509).

(2) Release of Completion Guarantee. The completion grantee shall be returned or released upon written certification by the municipal engineer or a designated agent that implements and facilities have been installed and completed in accordance with the approved plan and specifications. The procedures for requesting and obtaining a release of the completion grantee shall be in a manner prescribed by the Municipalities Planning Code (Section 510).

(3) Default of Completion Guarantee. If improvements are not installed in accordance with the approved final plan, the governing body may enforce any corporate bond or other security by appropriate legal and equitable remedies. If proceeds of such bond or other security are insufficient to pay the cost of installing or making repairs or corrections to all the improvements covered by said security, the governing body may at its option install part of such improvements in all or part of the development and may institute appropriate legal or equitable action to recover the monies necessary to complete the remainder of the improvements. All proceeds, whether resulting from the security or from any legal or equitable action brought against the developer, or both, shall be used solely for installation of the improvements covered by such security and not for any other municipal purpose.

(4) Maintenance Guarantee. Prior to acceptance of any improvements or facilities, the applicant shall provide a financial security to secure the structural integrity and functioning of the improvements. The security shall: (1) be in form of a bond, cash, certified check or other negotiable securities acceptable to the municipality, (2) be for a term of 18 months, and (3) be in an amount equal to 15 percent of the actual cost of the improvements and facilities so dedicated.

§811. Fee Schedule. The municipal governing body may adopt by resolution from time to time a reasonable schedule of fees to cover the cost of plan reviews, inspections, and other activities necessary to administer the provisions of this Part. All fees shall be set in accordance with the applicable provisions of the Municipalities Planning Code and any dispute over the fee amount shall be resolved in the manner prescribed by the Planning Code.

§812. Enforcement Procedures and Remedies.

(1) Right of Entry. Upon presentation of proper credentials, duly authorized representatives of the municipality may enter at reasonable times upon any property to investigate or ascertain the condition of the subject property in regard to an aspect regulated by this Part.

(2) Notification. In the event that the applicant, developer owner or his/her agent fails to comply with the requirements of this Part or fails to conform to the requirements of any permit, a written notice of violation shall be issued. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of the violation(s). Upon failure to comply within the time specified, unless otherwise extended by the municipality, the applicant, developer, owner or his/her agent shall be subject to the enforcement remedies of this Part.

(3) Preventative Remedies.

(a) In addition to other remedies, the municipality may institute and maintain appropriate actions by law or in equity to restrain, correct or abate a violation, to prevent unlawful construction, to recover damages, and to prevent illegal occupancy of a building or premises.

(b) In accordance with the Planning Code (Sec. 515.1), the municipality may refuse to issue any permit or grant approval to further improve or develop any property which has been developed in violation of this Part.

(4) Enforcement Remedies.

(a) Any person, who has violated or permitted the violation of the provisions of this Part shall, upon being found liable therefore in a civil enforcement proceeding commenced by the municipality, pay a fine of not less than $50.00 and not more than $500.00 plus court costs, including reasonable attorney's fees incurred by the municipality. No judgment shall commence or be imposed, levied or be payable until the date of the determination of a violation by the district justice.

(b) If the defendant neither pays nor timely appeals the judgement, the municipality may enforce the judgment pursuant to applicable rules of civil procedure.

(c) Each day that a violation continues shall constitute a separate violation unless the district justice further determines that there was a good faith basis for the person violating the ordinance to have believed that there was no such violation. In such case, there shall be deemed to have been only one such violation until the fifth day following the date of the district justice's determination of a violation; thereafter each day that a violation continues shall constitute a separate violation.

(d) All judgments, costs, and reasonable attorney fees collected for the violation of this Part shall be paid over to the municipality.

(e) The Court of Common Pleas, upon petition, may grant an order of stay, upon cause shown, tolling the per diem fine pending a final adjudication of the violation and judgment.

(f) Nothing contained in this section shall be construed or interpreted to grant to any person or entity other than the municipality the right to commence any action for enforcement pursuant to this section.

(5) Additional Remedies. In addition to the above remedies, the municipality may also seek remedies and penalties under applicable Pennsylvania statutes, or regulations adopted pursuant thereto, including but not limited to the Storm Water Management Act (32 P.S. Section 693.1-693.27) and the Erosion and Sedimentation Regulations (25 Pennsylvania Code, Chapter 102). Any activity conducted in violation of this Part or any Pennsylvania approved watershed storm water management plan may be declared a public nuisance by the municipality and abatable as such.

§813. Definitions.

ACT – The Storm Water Management Act (Act of October 4, 1978, P.L. 864 No. 167, 32 P.S. Sections 680.1-680.17, as amended by Act of May 24, 1984, No. 63).

APPLICANT - A landowner or developer who has filed an application for development including his/her heirs, successors and assigns.

CHANNEL – A perceptible natural or artificial waterway which periodically or continuously contains moving water or which forms a connection link between two bodies of water. It has a definite bed and banks which confine the water.

CONSERVATION DISTRICT - The Union County Conservation District.

CULVERT - A closed conduit for the free passage of surface drainage under a highway, railroad, canal, or other embankment.

DESIGN CRITERIA – (1) Engineering guidelines specifying construction details and materials; (2) Objectives, results or limits which must be met by a facility, structure, or process in performance of its intended functions.

DESIGN STORM – See “Storm Frequency”.

DETENTION – The slowing, dampening or attenuating of runoff flows entering the natural drainage pattern or storm drainage system by temporarily holding water on a surface area in a detention basin or within the drainage system.

DETENTION POND – A pond or reservoir, usually small, constructed to impound or retard surface runoff temporarily.

DEVELOPER – The person, persons, or any corporation, partnership, association, or other entity or any responsible person therein or agent therefore that undertakes the activities associated with changes in land use. The term "developer" is intended to include but not necessarily be limited to the term "subdivider", "owner", and "builder" even though the individuals involved in successive stages of a project may vary.

DEVELOPMENT – Any activity, construction, alteration, change in land use or practice that affects storm water runoff characteristics.

DISCHARGE – The flow or rate of flow from a canal, conduit, channel or other hydraulic structure.

DRAINAGE – In general, the removal of surface water from a given area. Commonly applied to surface water and ground water.

DRAINAGE AREA – (1) The area of a drainage basin or watershed, expressed in acres, square miles, or other unit of area. Also called catchment area, watershed, river basin; (2) The area served by a sewer system receiving storm and surface water, or by a watercourse.

ENCROACHMENT – Any structure or activity which in any manner changes, expands or diminishes, the course, current or cross section of any watercourse, floodway or body of water.

EROSION – Wearing away of the lands by running water, glaciers, winds, and waves.

EROSION CONTROL – The application of measures to reduce erosion of land surfaces.

GROUND COVER – Materials covering the ground surface.

GROUND WATER – Subsurface water occupying the saturation zone, from which wells and springs are fed.

GROUND WATER RECHARGE – Replenishment of ground water naturally by precipitation or runoff or artificially by spreading or injecting.

IMPERVIOUS – Not allowing or allowing only with great difficulty the movement of water; impermeable.

INFILTRATION – (1) The flow or movement of water through the interstices or pores of a soil or other porous medium; (2) The absorption of liquid by the soil.

LAND DEVELOPMENT – Any of the following activities:

(1) The improvement of one lot or two or more contiguous lots, tracts or parcels of land of any purpose involving: (a) a group of two or more residential or non-residential buildings, whether proposed initially or cumulatively, or a single non-residential 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, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or features;

(2) A subdivision of land;

(3) Development in accordance with Section 503, subsection 1.1 of the Pennsylvania Municipalities Planning Code (as amended or replaced from time to time); or

(4) Any lot improvements regulated under the Municipal Zoning Regulations.

LAND DISTURBANCE – Any activity involving the changing, grading, transportation, fill and any other activity which causes land to be exposed to the danger of erosion.

MAINTENANCE – The upkeep necessary for efficient operation of physical properties.

MUNICIPALITY – Buffalo Township.

NATURAL STORM WATER RUNOFF REGIME – A watershed where natural surface configurations, runoff characteristics and defined drainage conveyances have attained the conditions of equilibrium.

OUTFALL – (1) The point, location or structure where drainage discharges from a sewer, drain or other conduit; (2) The conduit leading to the ultimate discharge point.

OUTLET CONTROL STRUCTURE – The means of controlling the relationship between the headwater elevation and the discharge, placed at the outlet or downstream end of any structure through which water may flow.

PERFORMANCE STANDARD – A standard which establishes an end result or outcome which is to be achieved but does prescribe specific means for achieving it.

PEAK FLOW – Maximum flow.

PENNSYLVANIA DER – Pennsylvania Department of Environmental Resources.

RELEASE RATE PERCENTAGE – The watershed factor determined by comparing the maximum rate of runoff from a subbasin to the contributing rate of runoff to the watershed peak at specific points of interest.

RETENTION POND – A basin, usually enclosed by artificial dikes, that is used to retain storm water runoff by temporarily storing the runoff and releasing it either through infiltration back into the ground or into the atmosphere by evaporation.

RETURN PERIOD – The average interval in years over which an event of a given magnitude can be expected to occur.

RUNOFF – The part of precipitation which flows over the land.

RUNOFF CHARACTERISTICS – The surface components of any watershed which affect the rate, amount, and direction of storm water runoff. These may include but are not limited to: vegetation, soils, slopes, and man-made landscape alterations.

SCS – U.S. Department of Agriculture Soil Conservation Service.

SEDIMENT – Mineral or organic solid material that is being transported or has been moved from its site of origin by air, water or ice and has come to rest.

SEDIMENTATION – The process by which mineral or organic matter is accumulated or deposited by moving water, wind or gravity.

STORAGE FACILITY – See “Detention Pond” and “Retention Pond”.

STORM FREQUENCY – The average interval in years over which a storm event of a given precipitation volume can be expected to occur.

STORM SEWER – A sewer that carries intercepted surface runoff, street water, and other drainage but excludes domestic sewage and industrial waste.

STORM WASTE COLLECTION SYSTEM – Natural or man-made structures that collect and transport storm water through or from a drainage area to the point of final outlet including, but not limited to, any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, streets, and pumping stations.

STORM WATER MANAGEMENT PLAN – The plan for managing storm water runoff adopted by Union County as required by the Storm Water Management Act.

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

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

WATERSHED – The entire region or area drained by a river or other body of water, whether natural or artificial. A "designated watershed" is an area delineated by the Pennsylvania DER and approved by the Environmental Quality Board for which counties are required to develop watershed storm water management plans.

(Ordinance No. 38, adopted December 5, 1994)

APPENDICES

APPENDIX A – Stormwater Management Areas Map

APPENDIX B – Stormwater Management Credits

APPENDIX C – Runoff Curve Numbers
Source: NRCS (SCS) TR-55

APPENDIX D – Runoff Coefficients for the Rational Method
Source: Rawls, W.J., S.L. Long, and R.H. McCuen, 1981, Comparison of Urban Flood Frequency Procedures. Preliminary Draft Report prepared for the Soil Conservation Service, Beltsville, Maryland.

APPENDIX E – Design Storm Rainfall Amount (Inches)
Source: NRCS (SCS) TR-55

APPENDIX F – NRCS (SCS) Type II Rainfall Distribution

APPENDIX G – Penn DOT Storm Intensity-Duration-Frequency Curve Region 3
Source: "Field Manual of Pennsylvania Department of Transportation" Storm Intensity-Duration-Frequency Charts P D T – I D F" May 1986.

APPENDIX H – Manning Roughness Coefficients
Roughness Coefficients (Manning's "n") For Overland / Sheet Flow (From U.S. Army Corps of Engineers & NRCS TR-55)

APPENDIX I – Bull Run Watershed Release Rate Maps

APPENDIX J – Release Rate Percentage Application Procedures

APPENDIX K – Buffalo Creek Runoff Control Districts Map

APPENDIX L – West Branch Susquehanna Subareas Map

APPENDIX M – Method for Computing Peak Discharge for Water Quality Storm
Adapted from Claytor and Schueler, 1996.

APPENDIX N – Acceptable Stormwater BMP's

APPENDIX O – Cp_v Determination Method

APPENDIX P – Stormwater Facilities Maintenance Agreement

APPENDIX A

Stormwater Areas Map

APPENDIX B

Stormwater Management Credits

APPENDIX B
Stormwater Credits For Effective Site Planning

B.1 Stormwater Credits

In Pennsylvania, there are many programs at both the State and local level that seek to minimize the impact of land development. Critical areas, forest conservation, and local stream buffer requirements are designed to reduce nonpoint source pollution. Non-structural practices can play a significant role in reducing water quality impacts and are increasingly recognized as a critical feature of every stormwater BMP plan, particularly with respect to site design. In most cases, non-structural practices must be combined with structural practices to meet stormwater requirements. The key benefit of non-structural practices is that they can reduce the generation of stormwater from the site; thereby reducing the size and cost of stormwater storage. In addition, they can provide partial removal of many pollutants. Non-structural practices have been classified into six broad groups and are designed to mesh with existing state and local programs (e.g., forest conservation, stream buffers, etc.). To promote greater use, a series of six stormwater credits are provided for designers that use these site planning techniques.

Credit 1. Natural Area Conservation
Credit 2. Disconnection of Rooftop Runoff
Credit 3. Disconnection of Non-Rooftop Runoff
Credit 4. Sheet Flow to Buffers
Credit 5. Grass Channel
Credit 6. Environmentally Sensitive Development.

This Appendix describes each of the credits for the six groups of non-structural practices, specifies minimum criteria to be eligible for the credit, and provides an example of how the credit is calculated. Designers should check with the Municipal Engineer to ensure that the credit is applicable to their jurisdiction.

In general, the stormwater sizing criteria provide a strong incentive to reduce impervious cover at development sites. Storage requirements for all five stormwater sizing criteria are directly related to impervious cover. Thus, significant reductions in impervious cover result in smaller required storage volumes and, consequently, lower BMP construction costs.

These and other site design techniques can help to reduce impervious cover, and consequently, the stormwater treatment volume needed at a site. The techniques presented in this Chapter are considered options to be used by the designer to help reduce the need for stormwater BMP storage capacity. Due to local safety codes, soil conditions, and topography, some of these site design features will be restricted. Designers are encouraged to consult with the Municipal Engineer to determine restrictions on non-structural strategies.

NOTE: In this chapter, *italics* indicate mandatory performance criteria, whereas suggested design criteria are shown in normal typeface.

These credits are an integral part of a project's overall stormwater management plan and BMP storage volume calculation. Therefore, use of these credits shall be documented at the initial (concept) design stage, documented with submission of final grading plans, and verified with "as-built" plans. If a planned credit is not implemented, then BMP volumes shall be increased appropriately to stormwater sizing criteria.

Table B.1 Summary of Stormwater Credits

Stormwater Credit	WQ_v	Re_v	Cp_v or Q_p
Natural Area Conservation	Reduce Site Area	No credit. Use as receiving area w/Percent Area Method.	Forest/meadow CN for natural areas
Disconnection of Rooftop Runoff	Reduced R_v	No credit. Use with Percent Area Method.	Longer tc (increased flow path). CN credit.
Disconnection of Non-Rooftop Runoff	Reduced R_v	No credit. Use with Percent Area Method.	Longer tc (increased flow path) CN credit
Sheet Flow to Buffers	Subtract contributing site area to BMP	Reduced Re_v	CN credit
Open Channel Use	May meet WQ_v	Meets Re_v	Longer tc (increased flow path) No CN credit
Environmentally Sensitive Development	Meets WQ_v	Meets Re_v	No CN credit tc may increase

B.2 Natural Area Conservation Credit

A stormwater credit is given when natural areas are conserved at development sites, thereby retaining pre-development hydrologic and water quality characteristics. A simple WQ_v credit is granted for all **conservation areas permanently protected under conservation easements or other locally acceptable means.** Examples of natural area conservation include;

- forest retention areas
- non-tidal wetlands and associated buffers
- other lands in protective easement (floodplains, open space, steep slopes)
- stream systems

Under the credit, a designer can subtract conservation areas from total site area when computing the water quality volume. **The volumetric runoff coefficient, R_v, is still calculated based on the percent impervious cover for the entire site.**

As an additional incentive, the post development curve number (CN) used to compute the Cp_v or Qp2, and Qp10 for all natural areas protected by conservation easements can be assumed to be woods in good condition when calculating the total site CN.

As an example, the required WQ_v for a ten acre site with three acres of impervious area and three acres of protected conservation area before the credit would be:

$WQ_v = [(P)(R_v)(A)]/12$; where P= 1.2", R_v=0.05=0,009(30%)
$WQ_v = [(1.2")(0.32)(10\ acres)]/12 = 0.320$ ac-ft

Under the credit, three acres of conservation are subtracted from total site area, which yields a smaller storage volume:
$WQ_v = [(P)(R_v)(A)]/12$; where P=1.2", R_v=0.05+0.009(30%)
$WQ_v = [(1.2")(0.32)(10\text{-}3 \text{ acres})]/12 = 0.224$ ac-ft

The recharge requirement (Re_v) is not reduced using this credit.

Criteria for Natural Area Credit

To receive the credit, the proposed conservation area:

- *Shall not be disturbed during project construction (e.g., cleared or graded) except for temporary impacts associated with incidental utility construction or mitigation and afforestation projects.*
- *Shall be protected by having the limits of disturbance clearly shown on all construction drawings and delimited in the field except as provided for above.*
- *Shall be located within an acceptable conservation easement or other enforceable instrument that ensures perpetual protection of the proposed area. The easement must clearly specify how the natural area vegetation shall be managed and boundaries will be marked* [Note: managed turf (e.g., playgrounds, regularly maintained open areas) is not an acceptable form of vegetation management], *and shall be located within the project site.*

B.3 Disconnection of Rooftop Runoff Credit

A credit is given when rooftop runoff is disconnected and then directed to a pervious area where it can either infiltrate into the soil or filter over it. The credit is typically obtained by grading the site to promote overland filtering or by providing bioretention areas on single family residential lots.

If a rooftop is adequately disconnected, the disconnected impervious area may be deducted from total impervious cover (therefore reducing WQ_v). In addition, disconnected rooftops can be used to meet the Re_v requirement as a non-structural practice using the percent area method.

Post development CN's for disconnected rooftop areas used to compute Cp_v and Q_p can be assumed to be woods in good condition.

Criteria for Disconnection of Rooftop Runoff Credit

The credit is subject to the following restrictions:

- *Rooftop cannot be within a designated hotspot.*
- *Disconnection shall cause no basement seepage.*
- *The contributing area of rooftop to each disconnected discharge shall be 500 square feet or less.*
- *The length of the "disconnection" shall be 75 feet or greater, or compensated using Table B.1.*
- *Dry wells, French drains, raingardens, or other similar storage devices may be utilized to compensate for areas with disconnection lengths less than 75 feet. (See Table B.1 and Figure B.1, dry wells are prohibited in "D" soils)*
- *In residential development applications, disconnections will only be credited for lot sizes greater than 6000 sq. ft.*
- *The entire vegetative "disconnection" shall be on an average slope of 5% or less.*
- *The disconnection must drain continuously through a vegetated channel, swale, or through a filter strip to the property line or BMP.*
- *Downspouts must be at least 10 feet away from the nearest impervious surface to discourage "re-connections".*
- *For those rooftops draining directly to a buffer, only the rooftop disconnection credit or the buffer credit may be used, not both.*

B.4 Disconnection of Non-Rooftop Runoff Credit

Credit is given for practices that disconnect surface impervious cover runoff by directing it to pervious areas where it is either infiltrated into the soil or filtered (by overland flow). This credit can be obtained by grading the site to promote overland vegetative filtering or providing bioretention areas on single family residential lots.

These "disconnected" areas can be subtracted from the impervious area when computing WQ_v. In addition, disconnected surface impervious cover can be used to meet the Re_v requirement as a non-structural practice using the percent area method.

Criteria for Disconnection of Non-Rooftop Runoff Credit

The credit is subject to the following restrictions:

- *Runoff cannot come from a designated hotspot.*
- *The maximum contributing impervious flow path length shall be 75 feet.*
- *The disconnection shall drain continuously through a vegetated channel, swale, or filter strip to the property line or BMP.*
- *The length of the "disconnection" must be equal to or greater than the contributing length.*
- *The entire vegetative "disconnection" shall be on an average slope of 5% or less.*
- *The surface impervious area to any one discharge location cannot exceed 1,000 ft^2.*
- *Disconnections are encouraged on relatively permeable soils (HSG's A and B).*
- *If the site cannot meet the required disconnect length, a spreading device, such as a french drain, gravel trench or other storage device may be needed for compensation.*
- *For those areas draining directly to a buffer, only the non rooftop disconnection credit or the stream buffer credit can be used, not both.*

B.5 Sheetflow to Buffers Credit

This credit is given when stormwater runoff is effectively treated by a natural buffer to a stream or forested area. Effective treatment is achieved when pervious and impervious area runoff is discharged to a grass or forested buffer through overland flow. The use of a filter strip is also recommended to treat overland flow in the green space of a development site.

The credits include:

1. The area draining by sheet flow to a buffer is subtracted from the total site area in the WQ_v calculation.
2. The area draining to the buffer contributes to the recharge requirement, Re_v.
3. A *wooded* CN can be used for the contributing area if it drains to a forested buffer.

Criteria for Sheetflow to Buffers Credit

The credit is subject to the following conditions:

- *The minimum buffer width shall be 50 feet as measured from bankfull elevation or centerline of the buffer.*

- *The maximum contributing length shall be 150 feet for pervious surfaces and 75 feet for impervious surfaces.*

- *Runoff shall enter the buffer as sheet flow. Either the average contributing overland slope shall be 5.0% or less, or a concrete level spreading device shall be used where sheet flow can no longer be maintained.*

- *Not applicable if rooftop or non rooftop disconnection is already provided.*

- *Buffers shall remain unmanaged other than routine debris removal.*

- *Shall be located within an acceptable conservation easement or other enforceable instrument that ensures perpetual protection of the proposed area. The easement must clearly specify how the natural area vegetation shall be managed and boundaries will be marked* [NOTE: managed turf (e.g., playgrounds, regularly maintained open areas) is not an acceptable form of vegetation management].

- The Re_v credit for sheet flow to buffer is not applicable in HSG's C and D.

Figure B.2 illustrates how a buffer or filter strip can be used to treat stormwater from adjacent pervious and impervious areas.

B.6 Grass Channel Credit (in lieu of Curb and Gutter)

Credit may be given when open grass channels are used to reduce the volume of runoff and pollutants during smaller storms (e.g., < 1 inch). The schematic of the grass channel is provided in Figure B.3.

Use of a grass channel will automatically meet the Re_v for impervious area draining into the channel. However, Re_v for impervious areas not draining to grass channels must still be addressed. If designed according to the following criteria, the grass channel will meet the WQ_v as well.

CNs for channel protection or peak flow control (Cp_v or Q_p) will not change.

Criteria for the Grass Channel Credit

The WQ_v credit is obtained if a grass channel meets the following criteria:

- *The maximum flow velocity for runoff from the 1.2 inch rainfall shall be less than or equal to 1.0 fps (see Appendix L for methodology to compute flowrate).*
- *The maximum flow velocity for runoff from the 10-year design event shall be non-erosive.*
- *The bottom width shall be 2 feet minimum and 8 feet maximum.*
- *The side slopes shall be 3:1 or flatter.*
- *The channel slope shall be less than or equal to 4.0%.*
- *Not applicable if rooftop disconnection is already provided (see Credit B.2).*
- *Credit for use of grass channels is not applicable in HSG's C and D.*

An example of a grass channel is provided in Figure B.3.

B.7 Environmentally Sensitive Development Credit

Credit is given when a group of environmental site design techniques are applied to low density or residential development. The credit eliminates the need for structural practices to treat both the Re_v and WQ_v and is intended for use on large lots.

Criteria for Environmentally Sensitive Development Credit

These criteria can be met without the use of structural practices in certain low density residential developments when the following conditions are met:

For Single Lot Development:

- *Total site impervious cover is less than 15%.*
- *Lot size shall be at least two acres.*
- *Rooftop runoff is disconnected in accordance with the criteria outline in Section B.3.*
- *Grass channels are used to convey runoff versus curb and gutter.*

For Multiple Lot Development:

- *Total site impervious cover is less than 15%.*
- *Lot size shall be at least two acres if clustering techniques are not used.*
- *If clustering techniques are used, the average lot size shall not be greater than 50% of the minimum lot size as identified in the appropriate local zoning ordinance and shall be at least one half acre.*
- *Rooftop runoff is disconnected in accordance with the criteria outlined in Section B.3.*
- *Grass channels are used to convey runoff versus curb and gutter.*
- *A minimum of 25% of the site is protected in natural conservation areas (by permanent easement or other similar measure).*
- *The design shall address stormwater (Re_v, WQ_v, Cp_v, and extreme events) for all roadway and connected impervious surfaces.*

APPENDIX C

Runoff Curve Numbers

APPENDIX C

Runoff Curve Numbers

Source: NRCS (SCS) TR-55

Runoff Curve Numbers for Urban Areas					
Cover Description		**Curve Numbers for Hydrologic Soil Groups**			
Cover Type and Hydrologic Condition	***Average % Impervious Area***	***A***	***B***	***C***	***D***
Fully Developed Urban Areas (Vegetation Established)					
Open Space (lawns, parks, golf courses, etc.)					
Poor Condition (grass cover < 50%)		68	79	86	89
Fair Condition (grass cover 50% to 75%)		49	69	79	84
Good Condition (grass cover > 75%)		39	61	74	80
Impervious Areas					
Paved Parking Lots, Roofs, Driveways, etc.		98	98	98	98
Streets and Roads					
Paved: Curbed and Storm Sewers		98	98	98	98
Paved: Open Ditches		83	89	92	93
Gravel		76	85	89	91
Dirt		72	82	87	89
Western Desert Urban Areas					
Natural Desert Landscaping (pervious area only)		63	77	85	88
Artificial Desert Landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban Districts					
Commercial and Business	85%	89	92	94	95
Industrial	72%	81	88	91	93
Residential Districts by Average Lot Size					
1/8 Acre	65%	77	85	90	92
1/4 Acre	38%	61	75	83	87
1/3 Acre	30%	57	72	81	86

1/2 Acre	25%	54	70	80	85
1 Acre	20%	51	68	79	84
2 Acres	12%	46	65	77	82

APPENDIX C (Cont'd)

Runoff Curve Numbers

Source: NRCS (SCS) TR-55

Runoff Curve Numbers for Cultivated Agricultural Lands						
Cover Description			**Curve Numbers for Hydrologic Soil Groups**			
Cover Type	***Treatment***	***Hydrologic Condition***	***A***	***B***	***C***	***D***
Fallow	Bare Soil	--	77	86	91	94
	Crop Residue Cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row Crops	Straight Row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & Terraced (C & T)	Poor	66	74	80	82
		Good	62	71	78	81
	C & T + CR	Poor	65	73	79	81
		Good	61	70	77	80
Small Grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C & T	Poor	61	72	79	82
		Good	59	70	78	81
	C & T + CR	Poor	60	71	78	81
		Good	58	69	77	80
Close Seeded or Broadcast Legumes Or Rotation Meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C & T	Poor	63	73	80	83
		Good	51	67	76	80

APPENDIX C (Cont'd)

Runoff Curve Numbers

Source: NRCS (SCS) TR-55

Runoff Curve Numbers for Other Agricultural Lands					
Cover Description		**Curve Numbers for Hydrologic Soil Groups**			
Cover Type	***Hydrologic Condition***	***A***	***B***	***C***	***D***
Pasture, Grassland, or Range – Continuous Forage for Grazing	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow – Continuous Grass, Protected from Grazing and Generally Mowed for Hay	--	30	58	71	78
Brush – Brush, Weed, Grass Mixture with Brush the Major Element	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30	48	65	73
Woods – Grass Combination (Orchard or Tree Farm)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77
Farmsteads – Buildings, Lanes, Driveways, and Surrounding Lots	--	59	74	82	86

APPENDIX C (Cont'd)

Runoff Curve Numbers

Source: NRCS (SCS) TR-55

Runoff Curve Numbers for Cultivated Agricultural Lands					
Cover Description		**Curve Numbers for Hydrologic Soil Groups**			
Cover Type	***Hydrologic Condition***	***A***	***B***	***C***	***D***
Herbaceous – Mixture of Grass, Weeds, and Low-Growing Brush, With Brush the Minor Element	Poor	--	80	87	93
	Fair	--	71	81	89
	Good	--	62	74	85
Oak-Aspen – Mountain Brush Mixture of Oak Brush, Aspen, Mountain Mahogany, Bitter Brush, Maple, and Other Brush	Poor	--	66	74	79
	Fair	--	48	57	63
	Good	--	30	41	48
Pinyon-Juniper – Pinyon, Juniper, or Both; Grass Understory	Poor	--	75	85	89
	Fair	--	58	73	80
	Good	--	41	61	71
Sagebrush With Grass Understory	Poor	--	67	80	85
	Fair	--	51	63	70
	Good	--	35	47	55
Desert Shrub – Major Plants Include Saltbrush, Greasewood, Creosotebush, Blackbrush, Bursage, Palo Verde, Mesquite, and Cactus	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

APPENDIX D

Runoff Coefficients for the Rational Method

APPENDIX D

Runoff Coefficients For The Rational Method

Source: Rawls, W.J., S.L. Long, and R.H. McCuen, 1981. Comparison of Urban Flood Frequency Procedures. Preliminary Draft Report prepared for the Soil Conservation Service, Beltsville, Maryland.

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	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
Land	0.14[b]	0.08	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	0.35	0.30	0.33	0.38	0.33	0.36	0.42
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
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
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
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
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	0.72	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 or	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
Impervious	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

APPENDIX E

Design Storm Rainfall Amount

APPENDIX E

DESIGN STORM RAINFALL AMOUNT (INCHES)

The design storm rainfall amount chosen for design shall be obtained from the PENNDOT Region III Storm Intensity-Duration-Frequency Curve according to Appendix G.

Source: NRCS (SCS) TR-55

Design Storm Frequency (years)	24 Hours Rainfall Amount (inches)
1	2.2
2	2.6
5	3.1
10	3.8
25	4.6
50	5.3
100	6.0

APPENDIX F

NRCS Type II Rainfall Distribution

APPENDIX G

PennDOT Storm Intensity-Duration-Frequency Curve Region III

APPENDIX H

Manning Roughness Coefficients

APPENDIX H

Manning Roughness Coefficients

Roughness Coefficients (Manning's "n") For Overland/Sheet Flow
(From U.S. Army Corps of Engineers & NRCS TR-55)

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
Fallow (no residue)	0.05
Cultivated Soils	
Residue Cover Less Than or = 20%	0.06
Residue Cover Greater Than 20%	0.17
Grass	
Dense Grasses	0.24
Bermuda Grass	0.41
Range (natural)	0.13
Woods (Light Underbrush)	0.40

APPENDIX I

Bull Run Watershed
Release Rate Maps

APPENDIX J

Release Rate Percentage
Application Procedures

APPENDIX J
Release Rate Percentage Procedures

To utilize the Release Rate for a particular site in one of the delineated Release Rate Percentage areas, the applicant shall follow the following general sequence of actions.

1. Compute the pre-development and post-development runoff for the specific site using an approved method for the 2-, 10-, 25-, and 100-year storms, using **no stormwater management techniques.** If the post-development peak rate is less than or equal to the pre-development rate and time of peak of post and pre-development rates are identical, the requirements of Act 167 and the Plan have been met. If the post-development runoff rate exceeds the pre-development rate, proceed to Step 2.

2. Apply on-site stormwater management techniques to increase infiltration and reduce impervious surfaces. Recompute the post-development runoff rate for the 2-, 10-, 25-, and 100-year storms; and if the resulting post-development rate is less than or equal to the pre-development rate multiplied by the applicable release rate, the requirements of the Act 167 Plan have been met. Otherwise, stormwater detention or retention will be required and the applicant should proceed to Step 3.

3. Multiply the assigned release rate percentage for the area times the pre-development peak runoff rate to determine the allowable total peak runoff rate from the development. Design the necessary detention/retention facilities to meet the allowable peak runoff rate standard.

APPENDIX K

Buffalo Creek Runoff Control
Districts Map

APPENDIX L

West Branch Susquehanna
Subareas Map

APPENDIX M

Method for Computing Peak Discharge for Water Quality Storm

APPENDIX M

Method for Computing Peak Discharge for Water Quality Storm

(Adapted from Claytor and Schueler, 1996)

The peak rate of discharge is needed for the sizing of off-line diversion structures and to design grass channels. Conventional SCS methods underestimate the volume and rate of runoff for rainfall events less than 2 inches. This discrepancy in estimating runoff and discharge rates can lead to situations where a significant amount of runoff by-passes the filtering treatment practice due to an inadequately sized diversion structure or leads to the design of undersized grass channels.

The following procedure can be used to estimate peak discharges for small storm events. It relies on the volume of runoff computed using the Small Storm Hydrology Method (Pitt, 1994) and utilizes the NRCS, TR-55 Graphical Peak Discharge Method (USDA, 1986).

Using the WQ_v methodology, a corresponding Curve Number (CN) is computed utilizing the following equation:

$$CN = \frac{1000}{[10+5P+10Q_a - (Q_a^2 + 1.25\ Q_aP)^{1/2}]}$$

Where: P = rainfall, in inches (use 1.2" for the Water Quality Storm)
Q_a = runoff volume, in inches (equal to P x R_v)

Note: The above equation is derived from the SCS Runoff Curve Number method described in detail in NEH-4, Hydrology (SCS 1985) and SCS TR-55 Chapter 2: Estimating Runoff. The CN can also be obtained graphically using Figure 1 of this Appendix from TR-55.

Once a CN is computed the time of concentration (t_c) is computed (based on the methods identified in TR-55, Chapter 3: "Time of Concentration and Travel Time").

Using the computed CN, t_c and drainage area (A), in acres; the peak discharge (Q_p) for the Water Quality Storm is computed (based upon the procedures identified in TR-55, Chapter 4: "Graphical Peak Discharge Method"). Use Rainfall distribution type II.

- Read initial abstraction (I_a), compute I_a/P
- Read the unit peak discharge (q_u) from Exhibit 4-II for appropriate t_c
- Using the runoff volume (Q_a), compute the peak discharge(Q_p);**$Q_p = q_u$ x A x Q_a**

Example Calculation of Peak Discharge for Water Quality Storm

Using a 3.0 acre small shopping center having a 1.0 acre flat roof, 1.6 acres of parking, and 0.4 acres of open space, and using P = 1.2"; the weighted volumetric runoff coefficient (R_v) is:

R_v =0.05+0.009(I); I = 2.6 acres/3.0 acres = 0.867 (86.7%)
=0.05+0.009(86.7%)
=0.83

The runoff volume, Q_a is:

Q_a = P x R_v
= 1.2" x 0.83
= 1.0 watershed inches

And WQ_v is:

$$WQ_v = \frac{[(1.2")(1.0)(3.0 \text{ acres})]}{12} \times \frac{43{,}560 \text{ ft}^2}{\text{acre}} = 13{,}016 \text{ ft}^3$$

Using Q_a = 1.0 watershed inches and P = 1.2"; CN for the water quality storm is:

$$CN = \frac{1000}{[10 + (5)(1.2") + (10)(1.0) - 10((1.0)^2 + 1.25(1.0)(1.2"))^{1/2}]} = 98$$

Using: t_c = 10 minutes (0.17 hour);
I_a = (200/CN)-2=0.041;
I_a/P = (0.041/1.2") = 0.049; (Use I_a/P = 0.10, *Ref: TR-55 Limitations)*
Q_u = 850 csm/in. (from TR-55 Exhibit 4-II); and
A = 3.0 acres x 1/640 mi^2 per acre = 0.0047 mi^2
Q_p = (850 csm/in.)(0.0047 mi^2)(1.0") = 4.0 cfs

For computing runoff volume and peak rate for storms larger than the Water Quality Storm (i.e. 2-, 10-, 25-, and 100-year storms) use the published CN's from TR-55 and follow the prescribed procedure in TR-55.

In some cases the Rational Formula may be used to compute peak discharges associated with Water Quality Storm. The designer must have available reliable intensity, duration, frequency (IDF) tables or curves for the storm and region of interest. This information may not be available for many locations and therefore the TR-55 method described above is recommended.

APPENDIX N

Acceptable Stormwater BMP's

APPENDIX N
Acceptable Stormwater Best Management Practices (BMP's)

BMP Group 1 – Stormwater Ponds

Stormwater Ponds – Practices that have a combination of permanent pool, extended duration or shallow wetland equivalent to the entire WQ_v include:

- Micropool Extended Detention
- Wet Pond
- Wet Extended Detention Pond
- Multiple Pond System
- Pocket Pond

BMP Group 2 – Stormwater Wetlands

Stormwater Wetlands – Practices that include significant shallow wetland areas to treat stormwater runoff but often may also incorporate small permanent pools and/or extended detention storage to achieve the full WQ_v include:

- Shallow Wetland
- Extended Detention Shallow Wetland
- Pond/Wetland System
- Pocket Wetland

BMP Group 3 – Infiltration Practices

Infiltration Practices – Practices that capture and temporarily store the WQ_v before allowing it to infiltrate into the soil over a two-day period include:

- Infiltration Trench
- Infiltration Basin

BMP Group 4 – Filtering Practices

Filtering Practices – Practices that capture and temporarily store the WQ_v and pass it through a filter bed of sand, organic matter, soil or other media are considered to be filtering practices. Filtered runoff may be collected and returned to the conveyance system. Design variants include:

- Surface Sand Filter
- Underground Sand Filter
- Perimeter Sand Filter
- Organic Filter
- Pocket Sand Filter
- Bioretention*

  * May also be used for infiltration

BMP Group 5 – Open Channel Practices

Open Channel Practices – Vegetated open channels that are explicitly designed to capture and treat the full WQ_v within dry or wet cells formed by checkdams or other means include:

- Dry Swale
- Wet Swale

BMP Group 6 – Non-Structural BMP's

Non-structural BMP's – These are increasingly recognized as a critical feature of stormwater BMP plans, particularly with respect to site design. In most cases, non-structural BMP's shall be combined with structural BMP's to meet all stormwater requirements. The key benefit of non-structural BMP's is that they can reduce the generation of stormwater from the site; thereby reducing the size and cost of structural BMP's. In addition, they can provide partial removal of many pollutants. The non-structural BMP's have been classified into seven broad categories. To promote greater use of non-structural BMP's, a series of credits and incentives are provided for developments that use these progressive site-planning techniques in Appendix O of this Ordinance.

- Natural Area Conservation
- Disconnection of Rooftop Runoff
- Disconnection of Non-Rooftop Impervious Area
- Sheet Flow to Buffers
- Grass Channel
- Environmentally Sensitive Development

There are numerous sources of information available related to BMP's. This brief list has been provided for your convenience:

United State Environmental Protection Agency – www.epa.gov
PA Department of Environmental Protection – www.dep.state.pa.us
The Center for Watershed Protection – www.cwp.org
The Pennsylvania Handbook for Best Management Practices for Developing Areas*
2000 Maryland Stormwater Design Manual*
New York Stormwater Management Design Manual*

* - Available for review at the Union County Planning Office

APPENDIX O

Cp_v Determination Method

APPENDIX O
Computation Of The Channel Protection
Storage Volume (Cp_v)

The following procedure shall be used to design the channel protection storage volume (Cp_v). The method is based on the Design Procedures for Stormwater Management Extended Detention Structures (MDE, 1987) and utilizes the NRCS, TR-55 Graphical Peak Discharge Method (USDA, 1986).

- Compute the time of concentration (t_c) and the one-year post-development runoff depth (Q_a) in inches.

  $Q_a = \frac{(2.4 - I_a)^2}{(2.4 - I_a) + S}$ where $S = (1000/CN) - 10$, $I_a = (200/CN)-2$

- Compute the ratio $I_a/2.4$ where 2.4 is the one-year rainfall depth (Source: NRCS (SCS) TR-55.

- With t_c and I_a/P, find the unit peak factor (q_u) from Figure 1 and compute the one year post-development peak discharge $q_i = q_u A Q_a$ where A is the drainage in square miles.

- **If $q_i \leq 2.0$ cfs, Cp_v is not required.** Provide for water quality (WQ_v) and groundwater recharge (Re_v) as necessary.

- With q_u, find the ratio of outflow to inflow (q_o/q_i) for T = 12 or 24 hours from Figure 2.

- Compute the peak outflow discharge $q_o - (q_o/q_i) x q_i$

- With q_o/q_i, compute the ratio of storage to runoff volume (V_s/V_r).

  - $V_s/V_r = 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 0.804(q_o/q_i)^3$

- Compute the extended detention storage volume $V_s = (V_s/V_r) x V_r$ (note: $V_r = Q_a$);

- Convert V_s to acre-feet by $(V_s/12) x A$, where V_s is in inches and A is in acres.

- Compute the required orifice area (A_o) for extended detention design:

  - $A_o = \frac{q_o}{C(2gho)^{0.5}} = \frac{q_o}{4.18(ho)^{0.5}}$

- Where ho is the maximum storage depth associated with V_s.

- Determine the required maximum orifice diameter (do) $do = (4A_o/\pi)^{0.5}$

- A do of less than 3.0 inches is subject to local jurisdictional approval, and is not recommended unless an internal control for orifice protection is used.

APPENDIX P

Stormwater Facilities
Maintenance Agreement

APPENDIX P
Standard Stormwater Facilities Maintenance
And Monitoring Agreement

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

WITNESSETH

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

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

WHEREAS, the Subdivision/Land Development Plan and/or Drainage Plan (hereinafter "Plan") for the _____ Subdivision/Land Development which is expressly made a part hereof, as approved or to be approved by the Township, provides for detention or retention of stormwater within the confines of the Property; and

WHEREAS, the Township and the Landowner, his successors and assigns agree that the health, safety, and welfare of the residents of the Municipality require that on-site stormwater management facilities be constructed and maintained on the Property; and

WHEREAS, the Township requires, through the implementation of the _____ Watershed Stormwater Management Plan, that stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Landowner, his successors and assigns.

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

1. The on-site stormwater management facilities shall be constructed by the Landowner, his successors and assigns, in accordance with the terms, conditions and specifications identified in the Plan.

2. The Landowner, his successors and assigns, shall maintain the stormwater management facilities in good working condition, acceptable to the Township so that they are performing their design functions.

3. The Landowner, his successors and assigns, hereby grants permission to the Township, his authorized agents and employees, upon presentation of proper identification, to enter upon the Property at reasonable times, and to inspect the stormwater management facilities whenever the Township deems necessary. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, pond areas, access roads, etc. When inspections are conducted, the Township shall give the Landowner, his successors and assigns, copies of the inspection report with findings and evaluations. At a minimum, maintenance inspections shall be performed in accordance with the following schedule:

- Annually for the first 5 years after the construction of the stormwater facilities,
- Once every 2 years thereafter, or
- During or immediately upon the cessation of a precipitation even resulting in a depth of six inches or greater in a 24-hour period.

4. All reasonable cost for said inspections shall be borne by the Landowner and payable to the Township.

5. The owner shall convey to the Township easements and/or rights-of-way to assure access for periodic inspections by the Township and maintenance, if required.

6. In the event the Landowner, his successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to the Township, the Township may enter upon the Property and take such necessary and prudent action to maintain said stormwater management facilities and to charge the costs of the maintenance and/or repairs to the Landowner, his successors and assigns. This provision shall not be construed as to allow the Township to erect any structure of a permanent nature on the land of the Landowner, outside of any easement belonging to the Township. 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.

7. The Landowner, his successors and assigns, will perform maintenance in accordance with the maintenance schedule for the stormwater management facilities including sediment removal as outlined on the approved schedule, Subdivision/Land Development Plan and/or Drainage Plan.

8. 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 on account of the Landowner's or his successors' and assigns' failure to perform such work, the Landowner, his successors and assigns, shall reimburse the Township upon demand, within 30 days of receipt of invoice thereof, for all costs incurred by the Township hereunder. If not paid within said 30-day period, the Township may enter a lien against the property in the amount of such costs, or may proceed to recover his costs through proceedings in equity or at law as authorized under the provisions of the _____ Code.

9. The Landowner, his successors and assigns, shall indemnify the Township and his agents and employees against any and all damages, accidents, casualties, occurrences or claims which might arise or be asserted against the Township for the construction, presence, existence or maintenance of the stormwater management facilities by the Landowner, his successors and assigns.

10. In the event a claim is asserted against the Township, his agents or employees, the Township shall promptly notify the Landowner, his successors and assigns, and they shall defend, at their own expense, any suit based on such claim. If any judgment or claims against the Township, his agents or employees shall be

allowed, the Landowner, his successors and assigns shall pay all costs and expenses in connection therewith.

11. In the advent of an emergency or the occurrence of special or unusual circumstances or situations, the Township may enter the Property, if the Landowner is not immediately available, without notification or identification, to inspect and perform necessary maintenance and repairs, if needed, when the health, safety or welfare of the citizens is at jeopardy. However, the Township shall notify the Landowner of any inspection, maintenance, or repair undertaken within 5 days of the activity. The Landowner shall reimburse the Township for his costs.

This Agreement shall be recorded among the land records of Union 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/Borough)
County of Union, Pennsylvania