

Chapter 20

Stormwater Management

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Part 1**General Provisions****§20-101. Statement of Findings.**

The Board of Supervisors of the Township finds that:

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

B. 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.

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

(Ord. 2006-115, 1/3/2006, §101)

§20-102. Purpose.

The purpose of this Chapter is to promote health, safety, and welfare within the Township by minimizing the damages described in §20-101.A of this Chapter through provisions designed to:

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

B. Utilize and preserve the existing natural drainage systems.

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

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

E. Preserve and restore the flood-carrying capacity of streams.

F. Provide proper maintenance of all permanent stormwater management facilities that are constructed in the Township.

G. Provide performance standards and review procedures for watershed-wide stormwater management planning and design.

H. Manage stormwater impacts close as possible to the runoff source with a minimum use of structures and a maximum use of natural processes.

I. Meet legal water quality requirements under State law, including

regulations at 25 Pa.Code, Chapter 93.4a to protect and maintain "existing uses" and maintain the level of water quality to support those uses in all streams and to protect and maintain water quality in "special protection" streams.

J. Prevent, to the extent possible, scour and erosion of streambanks and streambeds.

(Ord. 2006-115, 1/3/2006, §102)

§20-103. Statutory Authority.

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

2. *Secondary Authority.* The Township also is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, the Pennsylvania Municipalities Planning Code, as amended by Act 170 of December 21, 1988, and Act 131 of December 14, 1992.

(Ord. 2006-115, 1/3/2006, §103)

§20-104. Applicability.

1. This Chapter shall apply only to permanent stormwater management facilities constructed as part of any of the regulated activities listed in this Section. Erosion and sedimentation control during construction activities are not regulated specifically by this Chapter, but shall continue to be regulated under existing laws and ordinances. Except for inconsistent ordinances and practices that are repealed by §20-105 of this Chapter, local stormwater management design criteria (e.g., inlet spacing, inlet type, collection system design and details, outlet structure design, etc.) shall continue to be regulated by the applicable municipal ordinances or at the Township's discretion. All standards and specifications of Cumberland Township are hereby incorporated by reference.

2. The following activities are defined as "regulated activities" and shall be regulated by this Chapter:

- A. Land development.
- B. Subdivision.
- C. Construction of new or additional impervious or semi-pervious surfaces (driveways, parking lots, etc.).
- D. Construction of new buildings or additions to existing buildings.
- E. Diversion or piping of any natural or man-made stream channel.
- F. Installation of stormwater management facilities or appurtenances thereto.
- G. Earth disturbance activities.

(Ord. 2006-115, 1/3/2006, §104)

§20-105. Compatibility with Other Ordinance Requirements.

Approvals issued pursuant to this Chapter do not relieve the applicant of the responsibility to comply with or to secure required permits or approvals for activities

regulated by any other applicable code, rule, statute, regulation, or ordinance.
(*Ord. 2006-115, 1/3/2006, §107*)

§20-106. Duty of Persons Engaged in the Development of Land.

Notwithstanding any provision of this Chapter, including exemptions and waivers, any landowner and any person engaged in the alteration or development of land which may affect stormwater runoff characteristics shall implement such measures as are reasonably necessary to prevent injury to health, safety or other property. Such measures also shall include such actions as are required to manage the rate, volume, direction and quality of resulting stormwater runoff in a manner which otherwise adequately protects health, property, and water quality from possible injury.

(*Ord. 2006-115, 1/3/2006, §108*)

Part 2

Definitions

§20-202. Definitions.

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

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

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

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

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

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

Accelerated erosion - the removal of the surface of the land through the combined action of human 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 §20-104 of this Chapter.

BMP (best management practice) - Stormwater structures, facilities and techniques to maintain or improve the water quality of surface runoff.

Channel erosion - the widening, deepening, and headward cutting of small channels and waterways, due to erosion.

Cistern - a reservoir or tank for storing rainwater, commonly underground.

Conservation district - the Adams County Conservation District.

Conservation plan - a plan, as defined in and regulated by 25 Pa.Code, Chapter 102, that identifies conservation practices and includes site specific BMPs that minimize the potential for accelerated erosion and sedimentation from agricultural plowing or tilling activities.

Culvert - a structure with appurtenant works which carries a stream under or through an embankment or fill.

Dam - an artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid, or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or 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 the Township involved with the administration, review or enforcement of any provision of this Chapter 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.

Developer - a person, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, that undertakes any regulated activity of this Chapter.

Development site - the specific tract of land for which a regulated activity is proposed.

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 Township after the drainage plan has been approved. Said permit is issued prior to or with the final municipal approval.

Drainage plan - the documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in Part 4.

Earth disturbance activity - see 25 Pa.Code, Chapter 102, except that this Chapter does not further regulate agricultural plowing or tilling.

Erosion - see 25 Pa.Code, Chapter 102.

Erosion and sediment pollution control plan - a plan which is designed to minimize accelerated erosion and sedimentation pursuant to 25 Pa.Code, Chapter 102.

Existing conditions - the initial condition of a project site prior to the proposed construction. If the initial condition of the site is undeveloped land, the land use shall be considered as "meadow" unless the natural land cover is proven to generate lower curve numbers or Rational "C" 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 (PADEP) *Technical Manual for Sewage Enforcement Officers* (as amended or replaced from time to time by PADEP).

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

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

Freeboard - a vertical distance between the design flow elevation and the top of the settled basin embankment elevation of a dam, levee, tank, basin, or diversion ridge. The space is required as a safety margin in a pond or basin.

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

Grassed waterway - a natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water from cropland.

Groundwater recharge - replenishment of existing natural underground water supplies.

Hydrologic soil group (HSG) - infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSG's (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The Natural Resources Conservation Service (NRCS) of the US Department of Agriculture defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report, that can be obtained from local NRCS offices or Conservation District offices. Soils become less as the HSG varies from A to D.

Impervious surface (impervious area) - a surface that prevents the infiltration of water into the ground. Impervious surfaces (or cover) shall include, but not be limited to, roofs, additional indoor living spaces, decks, patios, garages, storage sheds and similar structures, parking or driveway areas and any new streets or sidewalks. Any area initially designated to be gravel or crushed stone shall be assumed to be an impervious surface.

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 an enclosed drain. A structure at the upstream end of a conduit. The upstream end of any structure through which water may flow.

Karst - a type of topography or landscape characterized by depressions, sinkholes, limestone towers and steep-sided hills, underground drainage and caves. Karst is formed on carbonate rocks, such as limestone or dolomite and sometimes gypsum.

Land development (development) - inclusive of any or all of the following meanings: (a) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving 1) a group of two or more buildings, or 2) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (b) any subdivision of land; (c) development in accordance with §503(1.1) of the Pennsylvania Municipalities Planning Code, 53 P.S. §10101 *et seq.*

Land/earth disturbance - any activity involving removing, 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.

Main stem (main channel) - any stream segment or other runoff conveyance facility used as a reach in the stream.

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.

Nonpoint source pollution - pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances or origin.

NRCS - Natural Resources Conservation Service (previously SCS).

Open channel - a drainage element in which stormwater flows with an open surface. Open channels include, but shall not be limited to, natural and man-made drainage ways, swales, streams, ditches, canals, and pipes flowing partly full (for computational purposes).

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 - the use of impervious parking areas for temporary impoundment of Stormwater with controlled release rates during rainstorms.

Peak discharge - the maximum rate of stormwater runoff from a specific storm event.

Penn State Runoff Model - a computer-based hydrologic modeling technique.

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

Planning Commission - the Planning Commission of Cumberland Township,

Adams County, Pennsylvania.

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

Qualified professional - a professional engineer licensed by the Pennsylvania Department of State, and other persons licensed or otherwise qualified by law to perform the work required by this Chapter.

Rational formula - a rainfall-runoff relation used to estimate peak flow.

Regulated activities - actions or proposed actions that impact upon proper management of stormwater runoff and that are governed by this Chapter as specified in §20-104 of this Chapter.

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 once every 25 years.

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

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.

Runoff capture volume (RCV) - the volume of runoff that is captured (retained) and not released into surface waters of the Commonwealth during or after a storm event.

Sediment basin - a barrier, dam, retention or detention basin designed to retain rock, sand, gravel, silt, or other material transported by water.

Sediment pollution - the placement, discharge or introduction of sediment into the waters of the Commonwealth.

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

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.

Site (development site) - the specific tract of land for which a regulated activity is proposed.

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).

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.

State water quality requirements - the regulatory requirements to protect, maintain, reclaim, and restore water quality under Pennsylvania Code, Title 25, and the Clean Streams Law.

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

Storm frequency - the number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years. See "return period."

Storm sewer - a system of pipes and/or open channels that convey intercepted runoff and Stormwater from other sources, but excludes domestic sewage and industrial wastes.

Stormwater - the total amount of precipitation reaching the ground surface.

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

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

Stormwater management site plan - the plan prepared by the developer or his representative indicating how stormwater runoff will be managed at the development site in accordance with this Chapter.

Stream enclosure - a bridge, culvert, or other structure that encloses a regulated water of this Commonwealth.

Subarea - the smallest unit of watershed breakdown for hydrologic modeling purposes for which the runoff control criteria have been established in the adopted 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, 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 10 acres, not involving any new street or easement of access or any residential dwelling, shall be exempt.

Swale - a low-lying stretch of land that gathers or carries surface water runoff.

Timber operations - See "forest management."

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

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

Township - Cumberland Township, Adams County, Pennsylvania.

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

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

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

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, fens, and similar areas.

(Ord. 2006-115, 1/3/2006, §201)

Part 3**Stormwater Management****§20-301. Exemptions.**

1. A regulated activity that meets the exemption criteria shown in Table 20-1 is exempt from the stormwater peak discharge control requirement and from the drainage plan preparation requirement of this Chapter. A regulated activity that meets the exemption criteria shown in Table 20-1.A is exempt only from the peak discharge control requirement of this Chapter.

2. As of the date of adoption of this Chapter, if a subdivision or land development is submitted that addresses peak rate control and includes a drainage plan, then the impervious exemption is calculated from the date of approval of that subdivision/land development plan, based upon the impervious area shown on the subdivision/land development plan.

3. Any activity that constitutes normal farming or agricultural practices including, but not limited to, land clearing, plowing, planting or harvesting crops, or pasturing of livestock is exempt from the peak rate discharge, water quality, and drainage plan preparation requirements of this Chapter provided that the agriculturist is operating according to an approved conservation plan pursuant to 25 Pa.Code, Chapter 102. The creation of additional impervious cover is subject to the requirements and exemptions of this Chapter.

4. Subdivision plans for three lots or fewer are exempt from the requirement to submit a drainage plan at the time of subdivision; however, development of the individual lots created by the subdivision is subject to all other provisions of this Chapter.

5. In determining if an activity is exempt from various requirements as outlined herein, the Township may, at its discretion, require a plan or exhibit to demonstrate that the specific criteria have been met.

(Ord. 2006-115, 1/3/2006, §301)

**TABLE 20-1: Stormwater Management Planning Impervious Area
Exemptions
Peak Rate Controls and Drainage Plan Preparation
Parcel Sizes less than 3 Acres**

Total Parcel size (acres)	Exemption from Peak Rate Controls and from Drainage Plan Preparation (sq. ft.)
<0.125 acre	1000
0.2	1400
0.3	1900
0.4	2300
0.5	2700
0.6	3100
0.7	3500
0.8	3900
0.9	4200
1.0	4600
1.1	4900
1.2	5200
1.3	5500
1.4	5900
1.5	6200
1.6	6500
1.7	6800
1.8	7100
1.9	7300
2.0	7600
2.1	7900
2.2	8200
2.3	8400
2.4	8700
2.5	9000
2.6	9200
2.7	9500
2.8	9800
2.9	10000

**TABLE 20-1-A: Stormwater Management Impervious Area Exemptions
Peak Rate Controls (Only)
Parcel Sizes 3.0 Acres and Greater**

Total Parcel size (acres)	Exemption from Peak Rate Controls ONLY (sq. ft.)
3	10300
3.1	10500
3.2	10800
3.3	11000
3.4	11300
3.5	11500
3.6	11700
3.7	12000
3.8	12200
3.9	12500
4	12700
4.1	12900
4.2	13200
4.3	13400
4.4	13600
4.5	13800
4.6	14100
4.7	14300
4.8	14500
4.9	14700
5	15000
>5	15000

Notes: Exemption areas are computed using the following approximate equation:

$$\text{Exempt Area (sq. ft.)} = 4575 * A^{0.736}$$

Where A is the parcel size in acres.

§20-302. General Requirements.

1. All regulated activities in the Township shall be subject to the stormwater management requirements of this Chapter.

2. The measurement of impervious area shall include the total proposed development even if development is to take place in stages.

For development taking place in stages, the entire development plan must be used in determining conformance with this Chapter. Additional impervious cover shall include, but not be limited to, additional indoor living spaces, decks, patios, garages, driveways, storage sheds and similar structures, any roof, parking or driveway areas and any new streets and sidewalks constructed as part of or for the proposed regulated activity. Gravel, crushed stone, and porous pavement shall be assumed to be impervious.

3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the stormwater management requirements of this Chapter.

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

5. The existing points of concentrated drainage that discharge onto adjacent property shall not be altered without permission of the adjacent property owner(s) and shall be subject to any applicable discharge criteria specified in this Chapter.

6. Areas of existing sheet flow shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as areas of sheet flow, except as otherwise provided by this Chapter. If sheet flow is proposed to be concentrated and discharged onto adjacent property, the developer must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other harm will result from the concentrated discharge.

7. Where a development site is traversed by watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations that may adversely affect the flow of stormwater within any portion of the easement. Also, maintenance, including mowing of vegetation within the easement shall be required, except as approved by the appropriate governing authority.

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

9. No earth disturbance activities associated with any regulated activities shall commence until approval by the Township of a plan which demonstrates compliance with the requirements of this Chapter.

10. Techniques described in Appendix 20-B (Low Impact Development) of this Chapter are encouraged because they reduce the costs of complying with the requirements of this Chapter and the State water quality requirements.

11. Infiltration for stormwater management is encouraged where soils and geology

permit, consistent with the provisions of this Chapter and, where appropriate, infiltration is encouraged for capturing and treating the water quality volume (as calculated in §20-304), any part of the water quality volume or for otherwise meeting the purposes of this Chapter. The applicant shall demonstrate suitability by completion of soil testing as may be required by the Township.

12. Roof drains shall not connect to streets, sanitary or storm sewers, or roadside ditches, whenever conditions allow. Overland flow is encouraged to promote infiltration and recharge of ground water.

13. Exemption from any provisions of this Chapter shall not relieve the applicant from the responsibility to:

- A. Protect health, safety, and property.
- B. Meet State water quality requirements.
- C. Meet the requirements of §20-303.E of this Chapter.
- D. Secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance.
- E. Meet the water quality goals of this Chapter to:
 - (1) Minimize disturbance to floodplains, wetlands, natural slopes over 15 percent, and existing native vegetation.
 - (2) Maintain or extend riparian buffers adjacent to any stream banks and protect existing forested buffers.
 - (3) Establish and maintain non-erosive flow conditions in natural flow pathways.
 - (4) Preserve and maintain trees and woodlands. Provide trees and woodlands wherever feasible.
 - (5) Minimize soil disturbance and soil compaction. Cover disturbed areas with topsoil having a minimum depth of 4 inches. Use tracked equipment for grading when feasible.
 - (6) Disconnect impervious surfaces by directing runoff to pervious areas.
 - (7) Locate discharge points to avoid causing basement seepage or other damage to adjoining properties.

(Ord. 2006-115, 1/3/2006, §302)

§20-303. General Stormwater Management Requirements.

The following general standards shall be applied to all development within Cumberland Township to control stormwater runoff.

A. Except for the exemptions in §20-301, no regulated activities or regulated earth disturbance activities within the Township shall commence until approval by the Township of a drainage plan / site plan that demonstrates compliance with this Chapter.

B. DEP has determined that this Chapter meets State water quality requirements. Therefore, any approvals under this Chapter would satisfy the post construction stormwater management requirements associated with an NPDES permit for stormwater discharges associated with construction activities.

C. The requirement to submit a drainage plan applies to the total proposed development and for developments that occur in stages the requirement applies to every stage of the development.

D. Impervious surfaces shall include, but not be limited to, any roof, parking or driveway area and any new street or sidewalk. Any area initially designated to be gravel or crushed stone shall be assumed to be an impervious surface.

E. The volume and rate of any net increases in Stormwater runoff from regulated activities must be managed to prevent the physical degradation of receiving waters from such effects as scour and streambank destabilization, to satisfy State water quality requirements.

F. The Township may, after consultation with DEP, approve alternative methods for meeting the State water quality requirements other than those in Part, provided that they meet the minimum requirements of, and do not conflict with, State law including but not limited to the Clean Streams Law.

G. To the maximum extent practical accepted best management practices as outlined in the adopted Act 167 Watershed Stormwater Management Plan(s) for the minimization of generating stormwater runoff, avoiding detrimental effects of stormwater runoff and the protection of environment (low impact development techniques) should be used.

H. Runoff from the site shall not be concentrated, or increased runoff discharged onto adjacent property without the written consent of the adjacent landowners in the form of a drainage easement.

I. The drainage plan for all developments that create impervious surface or change the existing topography, except for exemptions provided in §20-301, shall demonstrate that adequate capacity will be provided to treat the "water quality volume" and contain the "runoff capture volume," as described under §§20-304 and 20-305.

J. Special requirements for areas falling within defined exceptional value and high quality sub-watersheds may include the following: the temperature and quality of water and streams that have been declared as exceptional value and high quality is to be maintained as defined in Chapter 93, Water Quality Standards, Title 25 of Pennsylvania Department of Environmental Protection Rules and Regulations. Temperature control BMP's are to be designed and used with storage pool areas and stormwater conveyance channels. At a minimum, the shoreline on ponds and channels should be shaded or planted with shade trees; however, under no circumstances should trees be planted on either the upstream or downstream slopes of dam embankments, regardless of the steepness of the slopes. A long term maintenance schedule and management plan for the thermal control BMP's is to be established and recorded for all development sites.

(Ord. 2006-115, 1/3/2006, §303)

§20-304. Runoff Capture Volume Requirements.

1. General Requirements.

A. The runoff capture volume (RCV) shall be infiltrated unless the applicant demonstrates that it is infeasible to infiltrate the RCV for reasons of:

- (1) Seasonal high water table.
- (2) Permeability rate.
- (3) Soil depth.
- (4) Isolation distances.
- (5) Or except as provided in §20-303.E.

B. Site investigation shall continue on different areas of the site until a suitable infiltration location is found or the entire site is determined to be infeasible for infiltration.

C. The Township may determine infiltration to be infeasible if there are known existing conditions or problems that may be worsened by the use of infiltration.

D. The following site conditions generally are suitable for infiltration:

(1) Depth to bedrock below the invert of the BMP greater than or equal to 2 feet.

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

(3) Soil permeability greater than or equal to 0.5 inches/hour and less than or equal to 12 inches per hour.

(4) Setback distances or buffers as follows:

(a) 100 feet from water supply wells.

(b) 10 feet down-gradient or 100 feet up-gradient from building foundations.

(c) 50 feet from septic system drain fields.

(d) 50 feet from a geologic contact with carbonate bedrock unless a preliminary site investigation is done in the carbonate bedrock to show the absence of special geologic features within 50 feet of the proposed infiltration area.

(e) 100 feet from the property line unless documentation is provided to show that all setbacks from wells, foundations and drain fields on neighboring properties will be met.

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

2. The post-development runoff capture volume (RCV) for a site shall equal or exceed the pre-development runoff capture volume for the site.

3. Compliance with the runoff capture volume requirement shall be demonstrated using the procedure described below unless the drainage plan demonstrates that the procedure is that an alternative methodology is necessary. Alternative methodologies may be necessary when stormwater runoff at a project site is affected by such basin features as swamps, lakes, wetlands, and karst geology.

A. Calculate the pre-development runoff capture volume using the following

equation.

$$P = \text{Runoff Capture Volume} = \frac{200}{\text{CN}} - 2 \quad \text{Equation 1}$$

Where: P = volume of rainfall captured (inches)

S = potential maximum retention after runoff begins (inches)

CN = predevelopment runoff curve number

An example of this calculation is provided in Example 1, located in Appendix 20-A of this Chapter.

B. Calculate the post-development runoff volume using the following procedure.

Step 1: Determine the percentage of each land use / cover type

In conventional site development, the designer would refer to Table 2.2a in TR-55 (SCS, 1986) to select the CN that represents the proposed land use of the overall development (i.e., residential, commercial) without checking the overall percentages of impervious area, grass areas, semi-pervious areas, etc. Because the BMPs emphasize minimal site disturbance, reduce impervious surfaces below conventional amounts, and employ semi-pervious pavements, the CNs for these types of land uses/land covers are less than those for the conventional developments reflected in the CNs contained in Table 2.2a in TR-55. Therefore, it is appropriate to analyze the BMP site as discrete units to determine the CN that most accurately reflects actual conditions.

Step 2: Calculate the composite BMP CN

The initial composite CN is calculated using a weighted approach based on individual land covers without considering the disconnectivity of the site impervious surfaces. This is done using the following Equation 2:

$$\text{CN}_c = \frac{\text{CN}_1 A_1 + \text{CN}_2 A_2 \dots + \text{CN}_j A_j}{A_1 + A_2 \dots + A_j} \quad \text{Equation 2}$$

Where: CN_c = composite curve number

A_j = area of each land cover

CN_j = curve number for each land cover

Overlays of SCS hydrologic soil group boundaries onto homogeneous land cover areas are used to develop the BMP CN. What is unique about this BMP custom-made CN technique is the way that this overlaid information is analyzed as small discrete units that represent the true hydrologic conditions, rather than the conventional TR-55 approach that is based upon representative national averages that do not incorporate BMP techniques.

Step 3: Calculate the BMP CN based on the connectivity of site impervious area

Disconnected impervious areas are impervious areas without any direct connection to a drainage system or other impervious surface. For example, roof

drains from houses that are directed onto lawn areas where sheet flow occurs, instead of onto a driveway that is drained into a curb, gutter, and storm sewer system are considered to be disconnected. Such direction of runoff from impervious to pervious surfaces increases the opportunity for infiltration. By increasing the ratio of disconnected impervious areas to pervious areas on the site, the CN and calculated resultant runoff can be reduced. When the total impervious area is less than 30 percent of the total area, the percentage of the unconnected impervious areas within the area influences the calculation of the CN. If the total impervious area is equal to or greater than 30 percent, no adjustment to the CN is warranted because the absorptive capacity of the remaining pervious surfaces will not significantly affect runoff (TR-55, SCS, 1986).

The following Equation 3 is used to calculate the CN for areas with less than 30 percent impervious area.

$$CN_c = CN_p + \left(\frac{P_{imp}}{100} \right) X (98 - CN_p) X (1 - 0.5R) \quad \text{Equation 3}$$

Where: R = ratio of unconnected impervious area to total impervious area

CN_c = composite CN (adjusted for disconnected impervious areas)

CN_p = composite pervious CN

P_{imp} = percent of impervious site area

Example 1 in Appendix A illustrates the use of steps 1 through 3 to calculate the runoff curve number using the BMP development technique outlined above for a hypothetical 1-acre residential lot designed to incorporate BMP techniques.

Step 4: Calculate the BMP CN based on the connectivity of site impervious area

Once the runoff CN has been calculated, the NRCS (formerly SCS) Runoff Curve Number Method (TR-55, SCS, 1989) can be used to estimate the runoff volume that will occur during the runoff capture design storm using Equation IV-3 and Equation IV-4. The design storm volume is the volume calculated for the site using Equation 1, presented previously).

$$S = \frac{1000}{CN} - 10 \quad \text{Equation 4}$$

Where: CN = post-development composite runoff curve number calculated as described above

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} \quad \text{Equation 5}$$

Where: Q = runoff (inches)

 P = runoff capture rainfall volume (as calculated in Equation 1,

presented previously)

S = potential maximum retention after runoff begins (inches)

Step 5: Check the Runoff Capture Volume Requirement

If the runoff volume calculated in this manner is negligible (e.g., 0.02"), the runoff capture standard has been met. Otherwise, appropriate additional structural retention storage facilities must be used to provide the additional retention volume required to retain the excess runoff volume. The calculations of the post-development runoff CN and resulting runoff volume during the runoff volume rain event are illustrated in Examples 2 and 3 contained Appendix 20-A.

4. The following BMPs are effective in achieving compliance with the runoff capture volume requirement.

- A. Minimization of disturbed areas.
- B. Minimization of impervious surfaced areas.
- C. Disconnection of impervious surfaces.
- D. Use of permeable paving systems.
- E. Use of infiltration trenches and pits.
- F. Use of bioretention areas.
- G. Use of cisterns and rain barrels.

5. The runoff capture volume provided at the site should be directed to the most permeable hydrologic soil group (HSG) available.

6. The recharge facility should be designed to completely infiltrate required volume recharge water within 48 hours.

7. Drainage plans shall include a detailed soils evaluation of the project site to determine the feasibility 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. The general process for designing an infiltration BMP shall be:

- A. Analyze hydrologic soil groups as well as natural and man-made features within watershed to determine general areas of suitability for infiltration practices.
- B. Provide field test to determine appropriate percolation rate.
- C. Design infiltration structures for required storm volume based on field determined capacity at the level of the proposed infiltration surface.
- D. Caution should be exercised where infiltration is proposed in geologically susceptible areas such as strip mine areas or limestone areas.
- E. Whenever a basin is proposed over an area underlain by limestone, the drainage plan shall include an evaluation of the susceptibility to sinkhole formation.
- F. The design of all facilities over limestone formations shall include measures to prevent ground water contamination and, where necessary, to prevent sinkhole formation. In sensitive areas, use of impermeable liners in detention basins should be considered.
- G. The developer is responsible to provide adequate measures to protect the

quality of water resources.

H. The developer is responsible to determine whether or not the site is underlain by limestone.

I. The following note shall be attached to all drainage plans and signed and sealed by the developer's qualified professional:

I, _____ certify that the proposed detention basin (circle one) is/is not underlain by limestone.

8. Where pervious pavement is proposed for parking lots, recreational facilities, nondedicated streets, or other areas, the pavement construction specifications shall be indicated on the plans.

9. In selecting the appropriate BMPs or combinations thereof, the land developer shall consider the following:

- A. Permeability and infiltration rate of the site soils.
- B. Slope and depth to bedrock.
- C. Seasonal high water table.
- D. Proximity to building foundations and wellheads.
- E. Erodibility of soils.
- F. Land availability and topography.

10. When infiltration structures are used, the area where the structure is to be constructed and associated soils shall be protected from compaction.

11. Permit applications for regulated activities shall be submitted to the Township, except for activities covered by the exemptions provided in §20-301.

(Ord. 2006-115, 1/3/2006, §304)

§20-305. Water Quality Requirements.

1. Developed areas shall provide adequate storage and/or treatment facilities necessary to capture and treat the volume of runoff produced by 2.3 inches of rainfall over a 24-hour period. This runoff volume is the water quality volume (WQ_v).

2. Acceptable best management practices (BMPs) shall be used to treat the water quality volume (WQ_v).

3. The water quality volume should be calculated using the NRCS soil-cover complex based methodology as described under §20-304 using post-development conditions composite runoff curve numbers.

4. The runoff capture volume computed under §20-304 may be a component of the water quality volume (WQ_v). If the runoff capture volume is less than the water quality volume, the remaining water quality volume may be captured and treated by methods other than recharge/infiltration BMP's.

5. The following BMPs are acceptable for achieving compliance with *the runoff water quality volume (WQ_v) treatment requirement*.

- Stormwater ponds.
- Stormwater wetlands.
- Infiltration practices.

- Filtering practices.
- Open channel practices.
- Non-structural practices.

6. WQ_v shall be designed as part of a stormwater management facility which incorporates water quality BMP's as a primary benefit of using that facility, in accordance with design guidance contained in the *Monocacy River Watershed Stormwater Management Plan*, the *Pennsylvania Handbook of Best Management Practices for Developing Areas*, and other references identified in the *Monocacy River Watershed Stormwater Management Plan*.

7. The following factors should be considered when evaluating the suitability of BMPs used to control water quality at a given development site:

- Peak discharge and required volume control.
- Stream bank erosion.
- Efficiency of the BMPs to mitigate water quality problems.
- The volume of runoff that will be effectively treated.
- The nature of the pollutant being removed.
- Maintenance requirements.
- Creation/protection of aquatic and wildlife habitat.
- Recreational value.
- Enhancement of aesthetic and property value.

8. If an extended detention or a permanent pool type facility is selected for the treatment of water quality volume, the outlet should be designed such that the 1-year 24-hour post-development runoff volume is released over a 24-hour period. The release of water begins at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility).

9. To reduce the risk of clogging, orifice diameters smaller than 3 inches should not be used without a debris screen or rack.

(Ord. 2006-115, 1/3/2006)

§20-306. Stormwater Peak Discharge Rate Control Requirements.

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

2. Post-development peak discharge rates shall not exceed the predevelopment discharge rates for the 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour design storms. If it is shown, that the peak rates of discharge indicated by the post-development hydrographs are less than or equal to the peaks of discharge indicated by the predevelopment hydrographs for 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour frequency design storms, then the requirements of this Section have been met. Otherwise, the developer shall provide such additional controls as are necessary to satisfy the peak rate of discharge requirement.

3. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the *Precipitation-Frequency Atlas of the United States*, Atlas

14, Volume 2, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland (2004). NOAA's Atlas 14 can be accessed at Internet address: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.

4. The design storm depths in Table 20-2 also may be used.

Table 20-2: Design Storm and PDT-IDF Rainfall Depths

Return Period	24 Hours Rainfall Depth
2-years	2.8 inches
5-years	3.6 inches
10-years	4.5 inches
25-years	5.5 inches
50-years	6.8 inches
100-years	7.8 inches

5. Peak discharge rate should be calculated using methods based on the NRCS soil-cover complex based methodology as described under §20-304 and should reflect the effects of proposed runoff capture and water quality enhancement measures upon peak discharge rates.

6. Peak discharge rates may be computed using the rational formula when the NRCS soil-cover complex method is not applicable.

7. The following BMPs are effective in achieving compliance with the peak rate of discharge limit requirement.

- A. Stormwater ponds.
- B. Stormwater wetlands.
- C. Swales.
- D. Runoff volume reduction BMPs such as infiltration and re-vegetation.

(Ord. 2006-115, 1/3/2006, §306)

§20-307. Design Criteria for Stormwater Management Facilities.

1. *General Criteria.*

- A. Applicants may select runoff control techniques, or a combination of techniques, which are most suitable to control stormwater runoff from the development site. All controls shall be subject to approval of the Township. 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 Section.

- (1) The applicant should consider the effect of the proposed stormwater management techniques on any special soil conditions or geological hazards that may exist on the development site. In the event such conditions are identified on the site, the Township may require in-depth studies by a qualified professional. Not all stormwater control methods may be advisable or allowable at a particular development site.

(a) In developing stormwater management plans for a particular site, stormwater controls 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.
- 3) Vegetative runoff treatment techniques.
- 4) Structural stormwater infiltration devices.
- 5) Stormwater detention/retention structures.

(b) Infiltration practices shall be used to the extent practicable to reduce volume increases 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.

(c) Open detention/retention facilities shall not be permitted within residential areas as part of an infill project.

1) The applicant may request a waiver from this requirement. All such requests for waiver shall be submitted in writing.

2) It shall be the responsibility of the applicant for a waiver of this part to show that the modification will not create a safety risk and that the modification is consistent with the best management practices and current engineering design standards.

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

3. Any facilities that constitute water obstructions (e.g., culverts, bridges, outfalls, or stream enclosures), and any work involving wetlands as directed in PA DEP Chapter 105 regulations (as amended or replaced from time to time by PA DEP), shall be designed in accordance with Chapter 105 and will require a permit from PA DEP. Any facility that constitutes a dam as defined in PA DEP chapter 105 regulations may require a permit under dam safety regulations.

4. Any facility located within a PADOT right-of-way, or draining toward a PADOT right-of-way, must meet PADOT's minimum design standards and must comply with PADOT's Highway Occupancy Permit requirement (67 Pa.Code, Chapter 441).

5. Any drainage conveyance facility and/or channel that do not fall under Chapter 105 regulations must be able to convey, without damage to the drainage structure or roadway, runoff from the design storm as required by municipal ordinance, standards

specifications, or a directed by the Township Engineer. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from that structure. Roadway crossings located within designated floodplain areas must be able to convey runoff from a 100-year design storm. Any facility located within a PADOT right-of-way must meet PADOT minimum design standards and permit submission requirements.

6. Storm sewers must be able to convey post-development runoff from a design storm as required by Township ordinance, standards specifications, or as directed by the Township Engineer without surcharging inlets, where appropriate.

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

8. The Township shall reserve the right to disapprove any design that would result in the occupancy or continuation of an adverse hydrologic or hydraulic condition within the watershed.

9. Applicants must demonstrate that detention/retention basins will be able to dewater by means of either infiltration or with use of an outlet pipe. Where concern exists regarding anticipated standing water, the applicant may be directed to provide a means of dewatering such a basin.

(Ord. 2006-115, 1/3/2006, §307)

§20-308. Calculation Methodology.

Stormwater runoff from all development sites should be calculated using either the soil-cover complex methodology or the rational formula (method).

A. Any stormwater runoff calculations involving drainage areas greater than 200 acres, including on- and off-site areas, shall use generally accepted calculation techniques that are based on the NRCS soil-cover complex method. Table 20-3 summarizes acceptable computation methods. It is assumed that all methods will be selected by a qualified professional based on the individual limitations and suitability of each method for a particular site.

The Township may approve the use of the rational method to estimate peak discharges from drainage areas that contain less than 200 acres.

Table 20-3: Acceptable Computation Methods for Stormwater Management Plans

Method	Method Developed By	Applicability
TR-20 or commercial package based on TR-20	USDA - NRCS	When use of full model is desirable or necessary
TR-55 or commercial package Based on TR-55	USDA - NRCS	Applicable for plans within the models limitations
HEC-1	U.S. Army Corps of Engineers	When full model is desirable or necessary
Rational Method or commercial package based on Rational Method	Emil Kuiching (1889)	For sites less than 200 acres with the approval of the Township

Method	Method Developed By	Applicability
Other Methods	Various	As approved by the Township

Successors to the above methods also are acceptable. Such successors include HEC-HMS for HEC-1, Win TR-55 for TR-55, and Win TR20 for TR-20.

B. All calculations consistent with this Chapter using the soil-cover complex method should use rainfall depths for the various design storms from NOAA's Atlas 14, Volume 2, or from the Pennsylvania Department of Transportation publication *Design Manual Part 2 Highway Design Publication 13M*, current edition. Calculations should utilize a 24-hour rainfall duration and the NRCS Type II rainfall distribution.

C. For the purposes of predevelopment flow rate determination, undeveloped land shall be considered as "meadow" good condition, unless the natural ground cover generates a lower curve number or rational 'C' value (i.e., forest). In the case of expansion of an existing development, existing ground cover may be used in calculation of the predevelopment runoff coefficient, provided that stormwater management has previously been provided or that the existing development does not presently contribute to an existing drainage problem downstream.

All conveyance piping calculations performed using the rational method should use rainfall intensities consistent with appropriate times of concentration for overland flow and return periods. For undeveloped areas, times of concentration may be computed using the SCS equation for Lag Time (T_{LAG}).

(in minutes)

$$Time\ of\ Concentration = T_C = \frac{T_{LAG}}{0.6} * 60$$

$$T_{lag} = L^{0.8} \frac{(S+1)^{0.7}}{1900\sqrt{Y}}$$

Where: T_{lag} = Lag time in hours

L = Hydraulic length of watershed in feet.

Y = Average overland slope of watershed in percent.

S = Maximum retention in watershed as defined by:

$$S = \frac{1000}{CN} - 10$$

CN = SCS Curve Number for watershed as defined by the SCS Loss Method.

For developed areas, times of concentration for overland flow should 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 (travel time) for channel and pipe flow shall be using flow velocity computed by the Manning's equation. Normally, pipes are assumed to be flowing full.

D. Runoff curve numbers (CN) for both existing and proposed conditions to be used in the soil cover complex method shall be obtained from the publication *Urban Hydrology for Small Watersheds*, NRCS, TR-55, current edition.

E. Runoff coefficient (c) for both existing and proposed conditions for use in the rational method shall be obtained from the Pennsylvania Department of Transportation publication *Design Manual Part 2 Highway Design Publication 13M*, current edition.

F. Where uniform flow is anticipated, the Manning equation shall be used for hydraulic computations, and to determine the capacity of open channels, pipes, and storm sewers. Values for Manning's roughness coefficient (n) shall be consistent with shall be obtained from the Pennsylvania Department of Transportation publication *Design Manual Part 2 Highway Design Publication 13M*, current edition.

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

H. The design of any Stormwater detention facilities intended to meet the performance standards of this Chapter shall be verified by routing the design storm hydrograph through these facilities using the storage-indication method.

I. For drainage areas greater than 20 acres in size, the design storm hydrograph shall be computed using a calculation method that produces a full hydrograph. The Township may approve the use of any generally accepted full hydrograph approximation technique, which shall use a total runoff volume that is consistent with the volume from a method that produces a full hydrograph.

J. The Township may require that computed existing runoff rates be reconciled (calibrated) with field observations and site history. Calibration should be based on detailed data, preferably rainfall and stream gage records, for the particular site in question.

(Ord. 2006-115, 1/3/2006, §308)

§20-309. Erosion and Sedimentation Requirements.

1. 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, Part 2, Water Resources, Chapter 102, "Erosion Control," and in accordance with the Adams County Conservation District and the standards and specifications of the appropriate municipal government.

2. Additional erosion and sedimentation control design standards and criteria that must be or are recommended to be applied where infiltration BMPs are proposed and 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. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has received final stabilization.

(Ord. 2006-115, 1/3/2006, §309)

Part 4**Drainage Plan Requirements****§20-401. General Requirements.**

1. For any of the activities regulated by this Chapter and not eligible for the exemptions provided in §20-301, the final approval of subdivision and/or land development plans, the issuance of any building or occupancy permit, or the commencement of any land disturbance activity may not proceed until the property owner or developer or his/her agent has received written approval of a drainage plan from the Township.

2. The following items shall be included in the drainage plan:

A. *General.*

(1) Name and location address of the project site.

(2) General description of project.

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

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

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

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

(2) Existing contours at intervals of 2 feet. In areas of steep slopes (greater than 15 percent), 5-foot contour intervals may be used.

(3) Existing streams, lakes, ponds, or other bodies of water within the project area.

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

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

(6) An overlay showing soil names and boundaries.

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

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

(9) Final contours at intervals at 2 feet. In areas of steep slopes (greater than 15 percent), 5-foot contour intervals may be used.

(10) The name of the development, the name and address of the owner of

the property, and the name of the individual or firm preparing the plan.

(11) The date of submission.

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

(13) A North arrow.

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

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

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

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

(18) Overland drainage paths.

(19) A 15-foot wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.

(20) 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 Chapter.

(21) A construction detail of any improvements made to sinkholes and the location of all notes to be posted, as specified in this Chapter.

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

(23) The following signature block for the plan preparer:

_____, on this date (date of signature),
has reviewed and hereby certify that the drainage plan meets all
design standards and criteria of the Municipal Ordinance."

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

C. *Supplemental Information.*

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

(a) The overall stormwater management concept for the project.

(b) Stormwater runoff computations as specified in this Chapter.

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

(d) Expected project time schedule.

(2) A soil erosion and sedimentation control plan, where applicable, as prepared for and submitted to the approval authority.

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

(4) The effect of the project (in terms of runoff volumes and peak flows)

on adjacent properties and on any existing municipal stormwater collection system that may receive runoff from the project site.

D. Stormwater Management Facilities.

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

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

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

(Ord. 2006-115, 1/3/2006, §401)

§20-402. Drainage Plan Contents.

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

(Ord. 2006-115, 1/3/2006, §402)

§20-403. Drainage Plan Submission.

For all activities regulated by this Chapter and that require preparation of a drainage plan, the steps below shall be followed for submission of the drainage plan. Permits issued for activities regulated under applicable local, State, or Federal regulations shall become part of the drainage plan.

A. The drainage plan shall be submitted by the developer as part of the preliminary plan submission for the regulated activity.

B. Four copies of the drainage plan shall be submitted.

C. Distribution of the drainage plan will be as follows:

(1) Two copies to the Township accompanied by the requisite Township review fee, as specified in this Chapter.

(2) One copy to the Township.

(3) One copy to the County Planning Commission/Office when in conjunction with a subdivision or land development plan as defined by the Municipalities Planning Code.

(Ord. 2006-115, 1/3/2006, §403)

§20-404. Drainage Plan Review.

1. The Township shall review the drainage plan for consistency with this Chapter. The Township shall require receipt of a complete plan, as specified in this Chapter.

2. The Township shall review the drainage plan for any submission or land

development against the Township Subdivision and Land Development Ordinance [Chapter 22] provisions not superseded by this Chapter.

3. For activities regulated by this Chapter, the Township shall determine within 30 calendar days whether the drainage plan is consistent with this Chapter. Should the drainage plan be determined to be consistent with this Chapter, the Township will forward an approval letter to the developer.

In the case where the drainage plan is submitted in conjunction with a subdivision or land development plan, the time period for such determination shall be concurrent and made part of the subdivision and land development plan review as processed under the Township Subdivision and Land Development Ordinance [Chapter 22].

4. Should the drainage plan be determined to be inconsistent with this Chapter, the Township will forward a disapproval letter to the developer citing the reason(s) for the disapproval. Any disapproved drainage plans may be revised by the developer and resubmitted consistent with this Chapter.

5. For regulated activities requiring a PADEP joint permit application, the Township shall notify PADEP whether the drainage plan is consistent with this Chapter and forward a copy of the review letter to the Township and the developer. PADEP may consider the Township'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 §§20-104.A and 20-104.B of this Chapter if the drainage plan has been found to be inconsistent with this Chapter, as determined by the Township. All required permits from PADEP must be obtained prior to approval.

7. The Township building permit office shall not issue a building permit for any regulated activity specified in §20-104 of this Chapter if the drainage plan has been found to be inconsistent with this Chapter, as determined by the Township, or without considering the comments of the Township. All required permits from PADEP must be obtained prior to issuance of a building permit.

8. The developer shall be responsible for completing an "as-built survey" of all stormwater management facilities included in the approved drainage plan. The as-built survey and an explanation of any discrepancies with the design plans shall be submitted to the Township for final approval. In no case shall the Township approve the as-built survey until the Township receives a copy of an approved declaration of adequacy, highway occupancy permit from the PADOT district office, and any applicable permits from PADEP.

9. The Township's approval of a drainage plan shall be valid for a period not to exceed 2 years. This 2-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 an as-built survey of these facilities has not been approved within this 2-year time period, then the Township may consider the drainage plan disapproved and may revoke any and all permits. drainage plans that are considered disapproved by the Township shall be resubmitted in accordance with §20-407 of this Chapter.

(Ord 2006-115, 1/3/2006, §404)

§20-405. Modification of Plans.

1. 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 Township, shall require a resubmission of the modified drainage plan consistent with §20-404 of this Chapter and be subject to review as specified in §20-405 of this Chapter.

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

(Ord. 2006-115, 1/3/2006, §405)

§20-406. Resubmission of Disapproved Drainage Plans.

A disapproved drainage plan may be resubmitted, with the revisions addressing the Township's concerns documented in writing, to the Township in accordance with §20-404 of this Chapter and be subject to review as specified in §20-405 of this Chapter. The applicable Township review fee must accompany a resubmission of a disapproved drainage plan.

(Ord. 2006-115, 1/3/2006, §406)

Part 5**Inspections****§20-501. Schedule of Inspections.**

1. The Township or the municipal assignee shall inspect all phases of the installation of the permanent stormwater management facilities.

2. During any stage of the work, if the Township determines that the permanent stormwater management facilities are not being installed in accordance with this Chapter, the Township shall revoke any existing permits until a revised drainage plan is submitted and approved, as specified in this Chapter.

(Ord. 2006-115, 1/3/2006, §501)

Part 6**Fees and Expenses****§20-601. General.**

A municipal review fee shall be established by the Township to defray review costs incurred by the Township. The applicant shall pay all fees.

(Ord. 2006-115, 1/3/2006, §601)

§20-602. Township Drainage Plan Review Fee.

The Township shall establish a review fee schedule by resolution of the Township Board of Supervisors based on the size of the regulated activity and based on the Township's costs for reviewing drainage plans. The Township shall periodically update the review fee schedule to ensure that review costs are adequately reimbursed.

(Ord. 2006-115, 1/3/2006, §602)

§20-603. Expenses Covered by Fees.

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

- A. Administrative/clerical costs.
- B. The review of the drainage plan by the Township.
- C. The site inspections including, but not limited to, pre-construction meetings, inspections during construction of stormwater facilities and appurtenances, and final inspection upon completion of the stormwater facilities and drainage improvements.
- D. Any additional work required to monitor and enforce any permit provisions regulated by this Chapter, correct violations, and assure proper completion of stipulated remedial actions.

(Ord. 2006-115, 1/3/2006, §603)

Part 7**Maintenance Responsibilities****§20-701. Performance Guarantee.**

The applicant shall provide a financial guarantee to the Township for the timely installation and proper construction of all stormwater management controls as required by this Chapter. The procedure for submission, review and release of financial surety shall be in accordance with the procedure established in the Cumberland Township Subdivision and Land Development Ordinance [Chapter 22].

(*Ord. 2006-115, 1/3/2006, §701*)

§20-702. 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 Township. 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 continuing operating and maintenance of all proposed stormwater control facilities, consistent with the following principals.

3. 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 dedicated to and maintained by the Township; however, nothing in this Chapter shall require the Township to accept such dedications, and responsibility for maintaining the facilities shall not transfer to the Township unless such a dedication is formally accepted by the Township.

4. If a development site is to be maintained in a single ownership or if sewers and other common 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. For privately owned stormwater management facilities, all operation and maintenance responsibilities, including an identification of the party or parties responsible, must be contained in a written document that is recorded in the Office of the Recorder of Deeds of Adams County, Pennsylvania. Such document shall be indexed so that the responsibilities and duties for such facilities will be found in the course of a title search of any lot, tract, or portion of the property served by the facilities.

5. The Board of Supervisors of the Township shall make the final determination on the continuing maintenance responsibilities prior to final approval of the drainage plan. The Board of Supervisors may require a dedication of such facilities as part of the requirements for approval of the drainage plan. Such a requirement is not an indication that the Township will accept the facilities. The Board of Supervisors reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management controls.

6. Where applicable, a maintenance guarantee shall be provided in accordance with the procedures of the Cumberland Township Subdivision and Land Development

Ordinance [Chapter 22].

(*Ord. 2006-115, 1/3/2006, §702*)

§20-703. Maintenance Agreement for Privately Owned Stormwater Facilities.

1. Prior to final approval of the site's stormwater management plan, the property owner shall sign and record a maintenance agreement covering all stormwater control facilities that are to be privately owned. Said agreement, designated as Appendix 20-C, is attached and made part hereto.

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 Solicitor and Board of Supervisors.

(*Ord. 2006-115, 1/3/2006, §703*)

§20-704. Municipal Stormwater Maintenance Fund.

1. If stormwater facilities are accepted by the Township for dedication, persons installing stormwater storage facilities shall be required to pay a specified amount to the Township stormwater maintenance fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit shall be determined as follows:

A. If the storage facility is to be owned and maintained by the Township, the deposit shall cover the estimated costs for maintenance and inspections for 10-years. The Township will establish the estimated costs utilizing information submitted by the applicant.

B. The amount of the deposit to the fund shall be converted to present worth of the annual series values. The Township shall determine the present worth equivalents, which shall be subject to the approval of the Township Board of Supervisors.

2. 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.

3. 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.

(*Ord. 2006-115, 1/3/2006, §704*)

§20-705. Post-Construction Maintenance Inspections.

1. Basins should be inspected by the land owner/developer or responsible entity (including the Township for dedicated facilities) on the following basis:

A. Annually for the first 5 years.

B. Once every 3 years thereafter.

C. During or immediately after the cessation of a 100-year or greater storm event.

2. The entity conducting the inspection shall be required to submit a report to the Township regarding the condition of the facility and recommending necessary repairs, if needed. The format of the report shall be as required by the Township Engineer.

3. For facilities other than basins, inspections shall be at intervals as provided on the approved maintenance schedule.

(Ord. 2006-115, 1/3/2006, §705)

Part 8**Enforcement and Penalties****§20-801. 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 Chapter.

(Ord. 2006-115, 1/3/2006, §801)

§20-802. Notification.

In the event that a person fails to comply with the requirements of this Chapter, or fails to conform to the requirements of any permit 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 violations(s). Failure to comply within the time specified shall subject such person to the penalty provision of this Chapter. All such penalties shall be deemed cumulative and shall not prevent the Township from pursuing any and all other 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 Chapter.

(Ord. 2006-115, 1/3/2006, §802)

§20-803. Enforcement.

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

A. 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 by the Township or designee during construction.

B. *Adherence to Approved Plan.* It shall be unlawful for any person, firm or corporation to undertake any regulated activity under §20-104 on any property except as provided for in the approved drainage plan and pursuant to the requirements of this Chapter. It shall be unlawful to alter or remove any control structure required by the drainage plan pursuant to this Chapter or to allow the property to remain in a condition which does not conform to the approved drainage plan.

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

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

revisions thereto.

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

D. After receipt of the certification by the Township, a final inspection shall be conducted by the Board of Supervisors or its designee to certify compliance with this Chapter.

E. *Suspension and Revocation of Permits.*

(1) Any permit issued under this Chapter may be suspended or revoked by the Board of Supervisors for:

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

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

c) The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution or which endangers the life or property of others, or as outlined in Part 9 of this Chapter.

(2) A suspended permit shall be reinstated by the Board of Supervisors when:

a) The Township 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.

b) The Board of Supervisors is satisfied that the violation of this Chapter, law, or rule and regulation has been corrected.

c) A permit, which has been revoked by the Board of Supervisors, cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Chapter.

F. *Occupancy Permit.* An occupancy permit shall not be issued unless the certification of compliance has been secured. The occupancy permit shall be required for each lot owner and/or developer for all subdivisions and land development in the Township.

(Ord. 2006-115, 1/3/2006, §803)

§20-804. Public Nuisance.

1. The violation of any provision of this Chapter is hereby deemed a public nuisance.

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

(Ord. 2006-115, 1/3/2006, §804)

§20-805. Penalties.

((Municipalities should ask their solicitors to provide appropriate wording for this Section.))

1. Anyone violating the provisions of this Chapter shall be guilty of a summary offense, and upon conviction shall be subject to a fine of not more than \$500 for each

violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.

OR

A violation of this Chapter may be punished as provided by the Second Class Township Code of the Commonwealth of Pennsylvania as a violation of a building, housing, property maintenance, health, water pollution, or public safety code ordinance.

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 Chapter. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.

(Ord. 2006-115, 1/3/2006, §805)

§20-806. Appeals.

1. Any person aggrieved by any action of the Township or its designee, relevant to the provisions of this Chapter, may appeal to the Township within 30 days of that action.

2. Any person aggrieved by any decision of the Township, relevant to the provisions of this Chapter, may appeal to the County Court of Common Pleas in the county where the activity has taken place within 30 days of the Township's decision.

(Ord. 2006-115, 1/3/2006, §806)

Appendix 20-A

Example Volume Control Standard Calculations

Example 1

Example Calculation of Runoff Capture Volume Requirement

Given:

BMP CN: CN for individual land covers based on Table 2.2a (TR-55, SCS, 1986).
Hydrologic Soil Group = B

Procedure:

Step 1: For the pre-development condition, determine percentage of each land cover occurring on the site and the CN associated with each land cover.

Land Cover	HSG	CN	% of Site	Land Coverage (ft ²)
Open space (good condition)	B	61	55	32.670
Woods (fair condition)	B	55	45	10.890

Step 2: Calculate the pre-development composite CN using a weighted average technique.

$$CN = \frac{61 * 32,670 + 55 * 10,890}{32,670 + 10,890}$$
$$CN = 59.5$$

Step 3: Calculate the required Runoff Capture Volume.

$$P = \text{Runoff Capture Volume} = \frac{200}{CN} - 2$$

$$P = \text{Runoff Capture Volume} = \frac{200}{59.5} - 2$$

$P = \text{Runoff Capture Volume} = 1.36$ inches For this hypothetical site, 1.36 inches of rainfall must be retained/infiltrated on the site.

Example 2

BMP CN Calculation

Given:

BMP CN: CN for individual land covers based on Table 2.2a (TR-55, SCS, 1986).
Hydrologic Soil Group = B

Procedure:

Step 1: Determine percentage of each land cover occurring on the site and the CN associated with each land cover.

Land Cover	HSG	CN	% of Site	Land Coverage (ft ²)
Impervious (directly connected)	B	98	5	2,178
Impervious (unconnected)	B	98	10	4,356
Pervious pavement	B	70	5	2,000
Open space (good condition)	B	61	55	24,136
Woods (fair condition)	B	55	25	10,890

Step 2: Calculate the composite custom CN.

$$CN_c = \frac{CN_1 A_1 + CN_2 A_2 \dots + CN_j A_j}{A_1 + A_2 \dots + A_j}$$

$$CN = \frac{98 \times 2,178 + 98 \times 4,356 + 71 \times 2,000 + 61 \times 24,136 + 55 \times 10,890}{2,178 + 4,356 + 2,000 + 24,136 + 10,890}$$

$$CN_c = 65.4$$

Step 2: Calculate the BMP development CN based on the connectivity of site imperviousness.

$$CN_p = \frac{70 \times 2,000 + 61 \times 24,136 + 55 \times 10,890}{2,000 + 24,136 + 10,890} \quad \left| \quad R = \frac{10}{15}$$

$$CN_p = 59.7$$

$$R = 0.67$$

$$CN_c = CN_p + \left(\frac{P_{imp}}{100} \right) \times (98 - CN_p) \times (1 - 0.5R)$$

$$CN_c = 59.7 + \left(\frac{15}{100} \right) \times (98 - 59.7) \times (1 - 0.5 \times 0.67)$$

$$CN_c = 63.5$$

Example 3

Runoff Volume Calculation

Given: Runoff Control Volume Requirement (Example 1) = 1.38 inches.

Post development composite runoff curve number = 63.5 (Example 2)

Development area = 43,560 square feet (Example 3)

$$S = \frac{1000}{CN} - 10$$

$$S = \frac{1000}{63.5} - 10$$

$$S = 5.7$$

$$Q(\text{inches}) = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

$$Q(\text{inches}) = \frac{(1.36 - 0.2 \times 5.7)^2}{(1.36 + 0.8 \times 5.7)}$$

$$Q(\text{inches}) = 0.01 \text{ inches}$$

$$Q(\text{cubic feet}) = Q(\text{inches}) \times \frac{1 \text{ foot}}{12 \text{ inches}} \times \text{Area}$$

$$Q(\text{cubic feet}) = 0.01 \times \frac{1 \text{ foot}}{12 \text{ inches}} \times 43,560 \text{ square feet}$$

$$Q(\text{cubic feet}) = 36 \text{ cubic feet}$$

P = Required Runoff Control Precipitation Volume

For this hypothetical case, P = 1.36 inches (Example 1)

CN = post-development runoff curve number

For this hypothetical case, CN = 63.5 (Example 2)

Area = Development site area (square feet)

For this hypothetical case, Area = 43,560 (Example 2)

Q = "excess" runoff volume to be controlled by supplementary runoff volume control BMPs

Therefore: Approximately 36 cubic feet of runoff volume must be controlled using supplemental structural runoff volume control BMPs.

APPENDIX 20-B

LOW IMPACT DEVELOPMENT PRACTICES

ALTERNATIVE APPROACH FOR MANAGING STORMWATER RUNOFF

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

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

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

- ***Preserving Natural Drainage Features.** Protecting natural drainage features, particularly vegetated drainage swales and channels, is desirable because of their ability to infiltrate and attenuate flows and to filter pollutants. However, this objective is often not accomplished in land development. In fact, commonly held drainage philosophy encourages just the opposite pattern. Streets and adjacent storm sewers typically are located in the natural headwater valleys and swales, thereby replacing natural drainage functions with a completely impervious system. As a result, runoff and pollutants generated from impervious surfaces flow directly into storm sewers with no opportunity for attenuation, infiltration, or filtration. Developments designed to fit site topography also minimizes the amount of grading on site.
- **Protecting Natural Depression Storage Areas.** Depressional storage areas have no surface outlet, or drain very slowly following a storm event. They can be commonly seen as ponded areas in farm fields during the wet season or after large runoff events. Traditional development practices eliminate these depressions by filling or draining, thereby obliterating their ability to reduce surface runoff volumes and trap pollutants. The volume and release-rate characteristics of depressions should be protected in the design of the development site. The

depressions can be protected by simply avoiding the depression or by incorporating its storage as additional capacity in required detention facilities.

- **Avoiding introduction of impervious areas.** Careful site planning should consider reducing impervious coverage to the maximum extent possible. Building footprints, sidewalks, driveways and other features producing impervious surfaces should be evaluated to minimize impacts on runoff.
- **Reducing the Hydraulic Connectivity of Impervious Surfaces.** Impervious surfaces are significantly less of a problem if they are not directly connected to an impervious conveyance system (such as storm sewer). Two basic ways to reduce hydraulic connectivity are routing of roof runoff over lawns and reducing the use of storm sewers. Site grading should promote increasing travel time of stormwater runoff, and should help reduce concentration of runoff to a single point in the development.
- **Routing Roof Runoff Over Lawns.** Roof runoff can be easily routed over lawns in most site designs. The practice discourages direct connections of downspouts to storm sewers or parking lots. The practice also discourages sloping driveways and parking lots to the street. By routing roof drains and crowning the driveway to run off to the lawn, the lawn is essentially used as a filter strip.
- **Reducing the Use of Storm Sewers.** By reducing use of storm sewers for draining streets, parking lots, and back yards, the potential for accelerating runoff from the development can be greatly reduced. The practice requires greater use of swales and may not be practical for some development sites, especially if there are concerns for areas that do not drain in a "reasonable" time. The practice requires educating local citizens and public works officials, who expect runoff to disappear shortly after a rainfall event.
- **Reducing Street Widths.** Street widths can be reduced by either eliminating on-street parking or by reducing roadway widths. Municipal planners and traffic designers should encourage narrower neighborhood streets which ultimately could lower maintenance.
- **Limiting Sidewalks to One Side of the Street.** A sidewalk on one side of the street may suffice in low-traffic neighborhoods. The lost sidewalk could be replaced with bicycle/recreational trails that follow back-of-lot lines. Where appropriate, backyard trails should be constructed using pervious materials.
- **Using Permeable Paving Materials.** These materials include permeable interlocking concrete paving blocks or porous bituminous concrete. Such materials should be considered as alternatives to conventional pavement surfaces, especially for low use surfaces such as driveways, overflow parking lots, and emergency access roads.
- **Reducing Building Setbacks.** Reducing building setbacks reduces driveway and entry walks and is most readily accomplished along low-traffic streets where traffic noise is not a problem.

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

APPENDIX 20- C
DRAINAGE PLAN APPLICATION

DRAINAGE PLAN APPLICATION

Application is hereby made for review of the Stormwater Management and Erosion and Sedimentation Control Plan and related data as submitted herewith in accordance with the Cumberland Township Stormwater Management Ordinance.

Final plan Preliminary plan Sketch plan

Date of submission _____ Submission no. _____

1. Name of subdivision or development _____

2. Name of applicant _____ telephone no. _____
(if corporation, list the corporation's name and the names of two officers of the corporation)

Address _____
_____ zip _____

Applicants interest in subdivision or development _____
(if other than property owner give owners name and address)

3. Name of property owner _____ telephone no. _____

Address _____
_____ zip _____

4. Name of engineer or surveyor _____ telephone no. _____

Address _____
_____ zip _____

5. Type of subdivision or development proposed:

- single-family lots townhouses commercial
(multi-lot)
- two family lots garden apartments commercial
(one-lot)
- multi-family mobile-home park industrial
(multi-lot)
- cluster type lots campground industrial (one-lot)
- planned residential other development

6. Lineal feet of new road proposed? _____ l.f.

7. Area of proposed and existing impervious area on entire tract.

- a. Total area of entire parcel _____ square feet (s.f.)
- b. Existing (to remain) _____ s.f. _____ % of property
- c. Proposed _____ s.f. _____ % of property

8. Stormwater

- a. Describe the proposed runoff control measures (use additional sheets).
- b. Does this plan meet the requirements of Part 3 of the Stormwater Ordinance?

- if not, what variances/waivers are requested?

- reasons for requesting the
variances/waivers _____

- c. What hydrologic method was used in the stormwater computations?

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

- e. Is a construction schedule or staging attached? _____
- f. Is a recommended maintenance program attached? _____

9. Erosion and sediment pollution control (E&S)

- a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the Adams County Conservation District?

- b. Total area of earth disturbance _____ s.f. for all phases of construction.

10. Filing

- a. Has the required fee been submitted? ___ Amount submitted _____
- b. Has the proposed schedule of construction inspection to be performed by the applicant's engineer been submitted? _____
- c. Name of individual making the inspections _____

d. Has the Stormwater Management Practices, Facilities, and Systems Maintenance and Monitoring Agreement been submitted?

e. General comments about stormwater management at development

SUBMITTED BY

DATE

ACCEPTED BY

DATE

HAS APPLICABLE FEE BEEN PAID

YES NO

APPENDIX 20-D
CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF
APPLICATION

**CERTIFICATE OF OWNERSHIP
AND ACKNOWLEDGMENT OF APPLICATION**

COUNTY OF ADAMS, COMMONWEALTH OF PENNSYLVANIA

On this the _____ day of _____, 19____, before me, the undersigned officer, personally appeared

Who being duly sworn, according to law, deposes and says that the person(s) listed below are the Owners of the property described in this application and that the application was made with prior knowledge and/or direction and does hereby agree with the said application and to the submission of the same.

Property Owner(s)

_____ Notary Public

My Commission Expires _____, 20__

THE UNDERSIGNED HEREBY CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF THE INFORMATION AND STATEMENTS GIVEN ABOVE ARE TRUE AND CORRECT.

SIGNATURE OF APPLICANT _____



(Information Below This Line To Be Completed By Cumberland Township)

Cumberland Township official submission receipt

Date complete application received _____ plan number _____

Fees _____ date fees paid _____ received by _____

Official submission receipt date _____

received by _____

APPENDIX 20-E

**STANDARD BEST MANAGEMENT PRACTICES MAINTENANCE AND
MONITORING AGREEMENT**

**STANDARD BEST MANAGEMENT PRACTICES MAINTENANCE AND
MONITORING AGREEMENT**

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

WITNESSETH

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

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

WHEREAS, the Subdivision/Land Management Plan (hereinafter "Plan") for the property identified herein, which is expressly made a part hereof, as approved or to be approved by Cumberland Township, provides for management of stormwater within the confines of the Property through the use of Best Management Practices (BMP's); and

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

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

BMP - Best Management Practice. Stormwater practices, structures, facilities, and techniques to maintain or improve water quality, runoff capture volume, and/or peak discharge rate of surface runoff.

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

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

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

Stormwater Structures and Facilities - Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores and/or otherwise affects stormwater runoff. Such facilities include, but are not limited to, detention and retention basins, open channels, storm sewers, pipes, infiltration structures, and BMP'S.

WHEREAS, Cumberland Township requires, through the implementation of the _____ Subdivision and Land Development Plan, that stormwater management BMP's as required by said Plan and the Municipal Ordinance be constructed and adequately maintained by the Landowner, his successors and assigns. The Plan shall include, but not be limited to, the BMP site location, plan view and cross sectional drawings as appropriate, design calculations, material specifications, and any maintenance requirements imposed by Cumberland Township or its Designated Representatives, and

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 onsite BMP facility shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.
2. The Landowner shall maintain the BMP(s) as shown on the Plan in good working order acceptable to Cumberland Township and in accordance with the specific maintenance requirements noted on the Plan which is attached hereto as Appendix A and made part hereof.
3. The Landowner hereby grants permission to Cumberland Township, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper identification, to inspect the BMP(s) whenever it deems necessary. Whenever possible, Cumberland Township shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to maintain the BMP(s) as shown on the Plan in good working order acceptable to Cumberland Township, Cumberland Township may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow Cumberland Township to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that Cumberland 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 Cumberland Township.
5. In the event Cumberland Township, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse Cumberland Township for all expenses incurred within 10 days of receipt of invoice from Cumberland Township.
6. The intent and purpose of this Agreement is to insure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by nonpoint source pollution runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall indemnify Cumberland Township's employees and designated representatives against all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Township. In the event that a claim is asserted against Cumberland Township, its designated representatives or employees, Cumberland Township shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against Cumberland Township's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.
8. Cumberland Township may inspect the BMP(s) to ensure their continued functioning.
9. The owner shall, as may be required by Cumberland Township, procure the services of a professional engineer to conduct an inspection of designated stormwater management structures at a frequency required by the Township. A report shall be prepared which shall outline any deficiencies or defects and shall provide recommendations for correcting such deficiencies. A copy of the report shall be filed with the Township.
10. This Agreement shall be recorded among the land records of Adams 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:

For Cumberland Township:

(SEAL)

For the Landowner:

(SEAL)

ATTEST:

Cumberland Township

County of Adams, Pennsylvania

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

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

NOTARY PUBLIC

(SEAL)

**APPENDIX 20-F
EXCEPTIONAL VALUE / HIGH QUALITY STREAM SEGMENTS IN
ADAMS COUNTY**

Adams County High Quality / Exceptional Value Stream Segments

Stream	Zone	Water Uses Protected
Susquehanna River Basin:		
Mountain Creek	Basin, Source to Toland	High Quality Cold Water Fishery
West Conewago Creek	Basin, Source to Pleasant Dale Creek	High Quality Cold Water Fishery
Potomac River Basin:		
Birch Run	Basin	High Quality Cold Water Fishery
Stillhouse Run	Basin	High Quality Cold Water Fishery
Hosack Run	Basin	High Quality Cold Water Fishery
Carbaugh Run	Basin, Source to first upstream pipeline crossing (near US Rt. 30)	Exceptional Value
Carbaugh Run	Basin, First upstream pipeline crossing to mouth	High Quality Cold Water Fishery
Toms Creek	Basin, Source to LR 01053 (SR 3021) Bridge	High Quality Cold Water Fishery
Middle Creek	Basin, Source to PA 116 Bridge (near Fairfield)	High Quality Cold Water Fishery

Source: Pennsylvania Code Title 25, Environmental Protection, Chapter 9