

Township of Westtown, PA
Wednesday, June 14, 2017

Chapter 144. Stormwater Management

Article III. Stormwater Management Standards

§ 144-301. General requirements.

- A. Applicants proposing regulated activities in the municipality which are not exempt under § **144-106** shall submit a stormwater management site plan (SWM site plan) to the municipality for review and approval in accordance with Articles **III** and **IV**. SWM site plans approved by the municipality shall be on site throughout the duration of the regulated activity.
- B. The stormwater management and runoff control criteria and standards in this chapter shall apply to the total proposed regulated activity, even if it is to take place in stages. The measurement of impervious surfaces shall include all of the impervious surfaces in the total proposed regulated activity even if the development is to take place in stages.
- C. No regulated activity within the municipality shall commence until:
 - (1) The municipality issues approval of a SWM site plan, which demonstrates compliance with the requirements of this chapter; and
 - (2) The applicant has received a letter of adequacy or approval for the erosion and sediment control plan review by the municipality and the Conservation District (if required), and has received all other local, state and federal permit approvals required for the project involving the regulated activity.
- D. Neither submission of an SWM site plan under the provisions herein nor compliance with the provisions of this chapter shall relieve any person from responsibility for damage to any person or property otherwise imposed by law.
- E. The applicant shall design the site to minimize disturbances to land, site hydrology, and natural resources, and to maintain the natural hydrologic regime, drainage patterns and flow conditions. The applicant shall apply the procedures set forth in § **144-304** for the overall site design and for selection, location and design of features and BMPs to be used to comply with the requirements of this chapter.
- F. To the maximum extent practicable, post-construction stormwater shall be discharged within the drainage area of the same stream or water body receiving the runoff prior to construction of the proposed regulated activity.
- G. For regulated activities with one acre or more of proposed earth disturbance, existing drainage peak rate discharges up to and including the one-hundred-year storm onto or through adjacent property(ies) or down-gradient property(ies), including diffuse drainage discharge, shall not be altered in any manner without written permission from, and, where applicable as determined by the municipality an easement and agreement with, the affected landowner(s) for conveyance of

discharges onto or through their property(ies). Such discharge shall be subject to any applicable discharge criteria specified in this chapter.

- (1) If directed by the Township, regulated activities with one acre or less proposed earth disturbance, the applicant shall provide written notification to the affected landowner(s) describing the proposed regulated activity and proposed discharge(s), unless otherwise required by the municipality.
- H. Areas located outside of the site (i.e., areas outside of the regulated activity) that drain through a proposed site are not subject to water quality and volume control, infiltration, stream channel protection, or peak flow rate control requirements (as presented in §§ 144-305, 144-306, 144-307, and 144-308). Drainage facilities located on the site shall be designed to safely convey flows from outside of the site through the site.
- I. If site conditions preclude capture of runoff from limited portions of the disturbed area for achieving water quality volume control standards, stream channel protection standards, and the five-year and ten-year storm event peak runoff rate reduction standards for new development required by this chapter, the applicant shall propose alternate methods to mitigate the bypass of the BMPs, subject to the approval of the Municipal Engineer. In no case shall resulting peak rate be greater than the predevelopment peak rate for the equivalent design storm.
- J. For all regulated activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated activities (i.e., during construction) as required to meet the purposes and requirements of this chapter, to meet the erosion and sediment control requirements of the municipality, if applicable, and to meet all requirements under Title 25 of the Pa. Code and the Clean Streams Law.^[1]
[1] *Editor's Note: See 35 P.S. § 691.1 et seq.*
- K. For all regulated activities, permanent BMPs and conveyances shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this chapter and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law,^[2] and the Storm Water Management Act.^[3]
[2] *Editor's Note: See 35 P.S. § 691.1 et seq.*
[3] *Editor's Note: See 32 P.S. § 680.1 et seq.*
- L. The design of all BMPs and conveyances shall incorporate sound engineering principles and practices in a manner that does not aggravate existing stormwater problems as identified by the municipality. The municipality reserves the right to disapprove any design that would result in construction in an area affected by existing stormwater problem(s) or continuation of an existing stormwater problem(s).
- M. Existing wetlands, either on the site or on an adjacent property, shall not be used to meet the minimum design requirements for stormwater management or stormwater runoff quality treatment. Stormwater discharges to existing wetlands shall not degrade the quality or hydrologic integrity of the wetland.
- N. Hotspots runoff controls. Specific structural or pollution prevention practices may be required, as determined to be necessary by the Municipal Engineer, to pretreat runoff from hotspots prior to infiltration. Following is a list of examples of hotspots:
 - (1) Vehicle salvage yards and recycling facilities;
 - (2) Vehicle fueling stations;
 - (3) Vehicle service and maintenance facilities;

- (4) Vehicle and equipment cleaning facilities;
 - (5) Fleet storage areas (bus, truck, etc.);
 - (6) Industrial sites based on Standard Industrial Classification Codes;
 - (7) Marinas (service and maintenance areas);
 - (8) Outdoor liquid container storage;
 - (9) Outdoor loading/unloading facilities;
 - (10) Public works storage areas;
 - (11) Facilities that generate or store hazardous materials;
 - (12) Commercial container nursery;
 - (13) Contaminated sites/brownfields;
 - (14) Other land uses and activities as designated by the municipality.
- O. Contaminated and brownfield sites. Where BMPs may contribute to the migration of contaminants in groundwater, the water quality and runoff volume, stream channel protection, and peak rate control standards shall be met; however, at the Municipal Engineer's discretion, the minimum infiltration requirement may be reduced or eliminated commensurate with the contaminated area and the required water quality and runoff control measures may be increased to mitigate the reduced infiltration requirement for the contaminated area.
- P. Additional water quality requirements. The municipality may require additional stormwater control measures for stormwater discharges to special management areas, including, but not limited to:
- (1) Water bodies listed as "impaired" by PADEP.
 - (2) Any water body or watershed with an approved total maximum daily load (TMDL), specifically Goose Creek Watershed.
 - (a) Total phosphorous is the assigned TMDL pollutant to Westtown Township within the Goose Creek Watershed. As such, the Township may require additional phosphorous-reducing measures for regulated activities within the Goose Creek Watershed, including but not limited to:
 - [1] Rain gardens/bioretention.
 - [2] Constructed wetlands.
 - [3] Permanent compost filter sock.
 - [4] Water quality inlet filter.
 - (3) Areas of known existing flooding problems.
 - (4) Critical areas with sensitive resources (e.g., state-designated special protection waters, cold water fisheries, carbonate geology or other groundwater recharge areas that may be highly vulnerable to contamination, drainage areas to water supply reservoirs, etc.).
- Q. Applicants shall utilize the Pennsylvania Stormwater Best Management Practices Manual (PA BMP Manual), as amended, or other sources acceptable to the Municipal Engineer, for testing and design standards for BMPs, and, where there is a conflict with the provisions of this chapter, the most restrictive applies.

- R. For areas underlain by karst or carbonate geology that may be susceptible to the formation of sinkholes and other karst features, the location, type, and design of infiltration BMPs shall be based on a site evaluation conducted by a qualified licensed professional and based on the PA BMP Manual or other design guidance acceptable to the Municipal Engineer.
- S. All regulated activities located within a special flood hazard area designated by the Federal Emergency Management Agency (FEMA) shall comply with the Westtown Township Zoning Ordinance, § 170-401, Floodplain District, and shall be designed to maintain the flood-carrying capacity of the floodway such that the base flood elevations are not increased, either upstream or downstream. The natural conveyance characteristics of the site and the receiving floodplain shall be incorporated into the stormwater management practices proposed for the site.
- T. Disturbance of existing ground cover during construction of the proposed regulated activity is prohibited within fifty (75)^[4] feet of top-of-bank of all perennial and intermittent waterways, water bodies (lakes, ponds, etc.) and wetlands, except for activities otherwise approved by state or local agencies (e.g., stream restoration projects, road crossings, subsurface utility projects, etc.). At the Municipal Engineer's discretion, and with Conservation District and PADEP approval where necessary, the nondisturbance, buffer may be reduced because of setback or other site constraints, but never be less than 10 feet.
- [4] *Editor's Note: So in original.*
- U. Riparian buffer.
- (1) Where a development site is traversed by perennial or intermittent watercourses, riparian buffers shall be provided conforming to the line of such watercourses. The riparian buffer shall be created to extend a minimum of 75 feet to either side of the top of the bank of the channel, unless a wider riparian buffer is required by the provisions of Pennsylvania Code Chapter 102, as amended, in which case the greater of the two shall apply.
 - (2) If the applicable rear or side yard setback is less than 75 feet, the buffer width may be reduced to 25 feet of the setback to a minimum of 10 feet. If an existing buffer is legally prescribed (e.g., deed covenant, easement, etc.) and it exceeds the requirement of this chapter, the existing buffer shall be maintained.
 - (3) The buffer shall be maintained with appropriate native vegetation as defined in the appendices of the Pennsylvania Stormwater Best Management Manual, dated December 30, 2006. Excavating, placing fill, building structures, or making any alterations that may adversely affect the flow of stormwater within any portion of the riparian buffer shall be prohibited unless the proposed work is associated with a regulated wetlands mitigation program.
 - (4) The buffer must be defined through a deed restriction.
 - (5) The riparian buffer shall be built in accordance with § 170-407 of the Westtown Township Zoning Ordinance.

§ 144-302. Permit requirements by other governmental entities.

The following permit or other regulatory requirements may apply to certain regulated activities and shall be met prior to (or as a condition of) final approval by the municipality of the SWM site plan and prior to commencement of any regulated activities, as applicable:

- A.

- B. Second, provide a prioritized listing of these resources and features to identify:
- (1) Those to be incorporated into the site design in a manner that provides protection from any disturbance or impact from the proposed regulated activity;
 - (2) Those to be protected from further disturbance or impact but for which the proposed regulated activity will provide improvement to existing conditions;
 - (3) Those that can be incorporated into and utilized as components of the overall site design in a manner that protects or improves their existing conditions while utilizing their hydrologic function within the limits of their available capacity (i.e., for infiltration, evapotranspiration, or reducing pollutant loads, runoff volume or peak discharge rates, etc.) to reduce the need for or size of constructed BMPs; and
 - (4) Those that may be considered for alteration, disturbance or removal.
- C. Third, develop the site design to achieve the following:
- (1) Recognize and incorporate the priorities identified in § 144-304B as the basis for the proposed site layout, grading, construction, and permanent ground cover design;
 - (2) Minimize earth disturbance (both surface and subsurface);
 - (3) Maximize protection of or improvement to natural resources and special management areas;
 - (4) Minimize the disturbance of natural site hydrology, in particular natural drainage features and patterns, discharge points and flow characteristics, natural infiltration patterns and characteristics, and natural channel and floodplain conveyance capacity;
 - (5) Incorporate natural hydrologic features and functions identified in § 144-304B into the site design to protect and utilize those features and their hydrologic functions to reduce the need for or size of constructed BMPs;
 - (6) Maximize infiltration and the use of natural site infiltration features, patterns and conditions, and evapotranspiration features;
 - (7) Apply selective grading design methods to provide final grading patterns or preserve existing topography in order to evenly distribute runoff and minimize concentrated flows;
 - (8) Minimize the cumulative area to be covered by impervious surfaces and:
 - (a) Minimize the size of individual impervious surfaces;
 - (b) Separate large impervious surfaces into smaller components;
 - (c) Disconnect runoff from one impervious surface to another; and
 - (d) Utilize porous materials in place of impervious wherever practicable;
 - (9) Minimize the volume and peak discharge rates of stormwater generated;
 - (10) Avoid or minimize stormwater runoff pollutant loads and receiving stream channel erosion;
 - (11) Locate infiltration and other BMPs:
 - (a) At or as near to the source of generation as possible; and
 - (b) At depths that are as shallow as possible;
 - (12) Prioritize the selection and design of BMPs as follows:

All regulated activities subject to permit or regulatory requirements by PADEP under regulations at Title 25 Pennsylvania Code Chapter 102, or erosion and sediment control requirements of the municipality.

- B. Work within natural drainageways subject to permit by PADEP under Title 25 Pennsylvania Code Chapter **105**.
- C. Any BMP or conveyance that would be located in or adjacent to surface waters of the commonwealth, including wetlands, subject to permit by PADEP under Title 25 Pennsylvania Code Chapter **105**.
- D. Any BMP or conveyance that would be located on or discharge to a state highway right-of-way, or require access to or from a state highway and be subject to approval by PennDOT.
- E. Culverts, bridges, storm sewers, or any other facilities which must pass or convey flows from the tributary area and any facility which may constitute a dam subject to permit by PADEP under Title 25 Pennsylvania Code Chapter **105**.

§ 144-303. Erosion and sediment control.

- A. No regulated activity within the municipality shall commence until:
 - (1) The municipality receives documentation that the applicant has received:
 - (a) A "letter of adequacy" from the Conservation District or other approval from PADEP in compliance with Title 25 Chapter 102 of the Pennsylvania Code of an erosion and sediment control plan for construction activities, if applicable;
 - (b) A PADEP NPDES Construction Activities Permit as required under Title 25 Pennsylvania Code Chapter 92a, if applicable;
 - (c) Evidence of any other permit(s) or approvals required for the regulated activities; and
 - (2) An erosion and sediment control plan has been approved by the municipality, if required.
- B. A copy of the erosion and sediment control plan and any required permit(s), as required by PADEP regulations, shall be available on the site at all times.
- C. Additional erosion and sediment control measures shall be applied where infiltration BMPs are proposed, at a minimum including those required in § **144-306M**.

§ 144-304. Site design process.

The applicant shall design the site to minimize the disturbances to land, site hydrology, and natural resources, and to maintain the natural hydrologic regime, drainage patterns and flow conditions. For regulated activities with 10,000 or more square feet of proposed earth disturbance or 2,000 or more square feet of proposed impervious surfaces, the applicant shall demonstrate in its SWM site plan (as required in § **144-402C**) that the design sequence, objectives and techniques described below were applied to the maximum extent practicable in the site design of the regulated activity while complying with all other requirements of this chapter. The site design shall:

- A. First, identify and delineate all existing natural resources and natural and man-made hydrologic features listed in § **144-402C(8)** that are located within the site, or receive discharge from, or may be impacted by the proposed regulated activity.

- (a) Nonstructural and vegetation BMPs; then
 - (b) Structural (surface and subsurface) BMPs;
- (13) For flow volumes requiring conveyance from the source of generation to a BMP for management, give preference to open channel conveyance techniques that provide infiltration and water quality benefits, and landscaped-based management in common open space areas, where practicable; and
- (14) Consider additional guidance for incorporating natural hydrology into the site and BMP designs, methods and techniques that support the objectives of § 144-304B and C. Appendix B presents additional discussion of natural hydrology site design and sources of information for "Conservation Design," "Low Impact Design," and "Sustainable Design."^[1]
- [1] *Editor's Note: Said appendix is on file in the Township offices.*
- D. The procedures set forth above shall be utilized to the maximum extent practicable for the overall site design and selection, location and design of features and BMPs to be used to comply with the requirements of §§ 144-305, 144-306, 144-307 and 144-308.

§ 144-305. Water quality and runoff volume requirements.

To control post-construction stormwater impacts from regulated activities and meet state water quality requirements, BMPs shall be provided in the site design that replicate predevelopment stormwater infiltration and runoff conditions, such that post-construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters. The applicant shall comply with the following water quality and runoff volume requirements for all regulated activities, including all new development and redevelopment activities:

- A. The post-construction total runoff volume shall not exceed the predevelopment total runoff volume for all storms equal to or less than the two-year, twenty-four-hour duration precipitation (design storm). The water quality and runoff volume to be managed shall consist of any runoff volume generated by the proposed regulated activity over and above the predevelopment total runoff volume and shall be captured and permanently retained or infiltrated on the site. Permanent retention options may include, but are not limited to, reuse, evaporation, transpiration, and infiltration.
- B. For modeling purposes, the predevelopment ground cover conditions shall be determined using the corresponding ground cover assumptions presented in § 144-309D of this chapter.
- C. The design of the facility outlet shall provide for protection from clogging and unwanted sedimentation.
- D. BMPs that moderate the temperature of stormwater shall be used to protect the temperature of receiving waters.
- E. Water quality improvement shall be achieved in conjunction with achieving the infiltration requirements of § 144-306. The infiltration volume required under § 144-306 may be included as a component of the water quality volume. If the calculated water quality and runoff volume is greater than the volume infiltrated, then the difference between the two volumes shall be managed for water quality and runoff volume control through other techniques or practices but shall not be discharged from the site.
- F. Runoff from the disturbed area shall be treated for water quality prior to entering existing waterways or water bodies. If a stormwater management practice does not provide water quality

treatment, then water quality BMPs shall be utilized to provide pretreatment prior to the runoff entering the stormwater management practice.

- G. The municipality may require additional water quality and runoff control measures for stormwater discharging to special management areas such as those listed in § **144-301P**.
- H. When the regulated activity contains or is divided by multiple drainage areas, the water quality and runoff volume shall be separately addressed for each drainage area.
- I. Weighted averaging of runoff coefficients shall not be used for manual computations or input data for water quality and runoff volume calculations.
- J. Areas located outside of the site (i.e., areas outside of the regulated activity) may be excluded from the calculation of the water quality and runoff volume requirements.
- K. Water quality and volume control practices shall be selected and designed to meet the criteria of § **144-304C** that apply to water quality and volume control.

§ 144-306. Infiltration requirements.

Providing for infiltration consistent with the natural hydrologic regime is required to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created or expanded. The applicant shall achieve the following infiltration requirements:

- A. Wherever possible, infiltration should be designed to accommodate the entire water quality and runoff volume required in § **144-305**.
- B. For regulated activities involving new development, the volume of a minimum of one inch of runoff from all proposed impervious surfaces shall be infiltrated.
- C. For regulated activities involving redevelopment, whichever is less of the following volume options shall be infiltrated:
 - (1) The volume of a minimum of one inch of runoff from all proposed impervious surfaces; or
 - (2) The total water quality and runoff volume required in § **144-305** of this chapter.
- D. If the requirements of § **144-306B** or **C** cannot be physically accomplished, then the applicant shall be responsible for demonstrating with data or calculations to the satisfaction of the Municipal Engineer why this infiltration volume cannot be physically accomplished on the site (i.e., shallow depth to bedrock or limiting zone, open voids, steep slopes, etc.) and what alternative volume can be infiltrated; however, in all cases at least the first 0.5 inch of runoff volume shall be infiltrated.
- E. Only if a minimum of at least 0.5 inch infiltration requirement cannot be physically accomplished on the site, shall a waiver from § **144-306** be considered by the municipality.
- F. If site conditions preclude capture of runoff from portions of the impervious surfaces, the infiltration volume for the remaining area shall be increased an equivalent amount to offset the loss.
- G. When a project contains or is divided by multiple watersheds, the infiltration volume shall be separately addressed for each watershed.
- H. Existing impervious surfaces located in areas outside of the site (i.e., outside of the regulated activity) may be excluded from the calculation of the required infiltration volume.
- I.

A detailed soils evaluation of the site shall be conducted by a qualified professional and at a minimum shall address soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be conducted by a qualified licensed professional and shall be consistent with the PA BMP Manual (as amended) (or other guidance acceptable to the Municipal Engineer) and in general shall:

- (1) Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas where development on fill material is under consideration, conduct geotechnical investigations of subgrade stability; infiltration may not be ruled out without conducting these tests.
 - (2) Provide field tests such as double ring infiltrometer or other hydraulic conductivity tests (at the elevation of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Standard septic/sewage percolation tests are not acceptable for design purposes.
 - (3) Design the infiltration facility for the required retention (infiltration) volume based on field-determined infiltration capacity (and apply safety factor as per applicable design guidelines) at the elevation of the proposed infiltration surface.
 - (4) On-lot infiltration features are encouraged; however, it shall be demonstrated to the Municipal Engineer that the soils are conducive to infiltration on the identified lots.
- J. Infiltration BMPs shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:
- (1) A minimum depth of 24 inches between the bottom of the BMP and the top of the limiting zone. Additional depth may be required in areas underlain by karst or carbonate geology. (See § 144-306N.)
 - (2) An infiltration rate sufficient to accept the additional stormwater volume and drain completely as determined by field tests conducted by the applicant.
 - (3) The infiltration facility shall completely drain the retention (infiltration) volume within three days (72 hours) from the end of the design storm.
- K. All infiltration practices shall:
- (1) Be selected and designed to meet the criteria of § 144-304C that are applicable to infiltration;
 - (2) Be set back at least 100 feet upgradient and 10 feet down gradient from all buildings and features with subgrade elements (e.g., basements, foundation walls, etc.), unless otherwise approved by the Municipal Engineer.
 - (3) For any infiltration practice that collects runoff from shared or multiple features and that is located within 50 feet of a building or feature with subgrade elements (e.g., basements, foundation walls, etc.), the bottom elevation shall be set below the elevation of the subgrade element.
 - (4) Be consistent with the protocols written in the Pennsylvania Stormwater Best Management Practices Manual, December 2006 or latest version thereof.
- L. Infiltration facilities shall, to the maximum extent practicable, be located to avoid introducing contaminants to groundwater:
- (1) When a hotspot is located in the area draining to a proposed infiltration facility, an evaluation of the potential of groundwater contamination from the proposed infiltration facility shall be performed, including a hydrogeologic investigation (if necessary) by a qualified licensed

- professional to determine what, if any, pretreatment or additional design considerations are needed to protect groundwater quality.
- (2) When located within a "wellhead protection area" of a public water supply well, infiltration practices shall be in conformance with the applicable approved source water protection assessment or source water protection plan.
 - (3) The applicant shall provide appropriate safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or spill.
- M. During site construction, all infiltration practice components shall be protected from compaction due to heavy equipment operation or storage of fill or construction material. Infiltration areas shall also be protected from sedimentation. Areas that are accidentally compacted or graded shall be remediated to restore soil composition and porosity. Adequate documentation to this effect shall be submitted to the Municipal Engineer for review. All areas designated for infiltration shall not receive runoff until the contributory drainage area has achieved final stabilization.
- N. Where sediment transport in the stormwater runoff is anticipated to reach the infiltration system, appropriate permanent measures to prevent or collect sediment shall be installed prior to discharge to the infiltration system.
- O. Where roof drains are designed to discharge to infiltration practices, they shall have appropriate measures to prevent clogging by unwanted debris (for example, silt, leaves and vegetation). Such measures shall include but are not limited to leaf traps, gutter guards and cleanouts.
- P. All infiltration practices shall have appropriate positive overflow controls.
- Q. No sand, salt or other particulate matter may be applied to a porous surface material for winter ice conditions.
- R. The following procedures and materials shall be required during the construction of all subsurface facilities:
- (1) Excavation for the infiltration facility shall be performed with equipment that will not compact the bottom of the seepage bed/trench or like facility.
 - (2) The bottom of the bed and/or trench shall be scarified prior to the placement of aggregate.
 - (3) Only clean aggregate with documented porosity, free of fines, shall be allowed.
 - (4) The tops, bottoms and sides of all seepage beds, trenches, or like facilities shall be covered with drainage fabric. Fabric shall be nonwoven fabric acceptable to the Municipal Engineer.
 - (5) Stormwater shall be distributed throughout the entire seepage bed/trench or like facility and provisions for the collection of debris shall be provided in all facilities.

§ 144-307. Stream channel protection requirements.

For regulated activities involving new development with one or more acres of earth disturbance, the applicant shall comply with the following stream channel protection requirements to minimize stream channel erosion and associated water quality impacts to the receiving waters:

- A. The peak flow rate of the post-construction two-year, twenty-four-hour design storm shall be reduced to the predevelopment peak flow rate of the one-year, twenty-four-hour duration precipitation, using the SCS Type II distribution.

- B. To the maximum extent practicable, and unless otherwise approved by the Municipal Engineer, the post-construction one-year, twenty-four-hour storm flow shall be detained for a minimum of 24 hours and a maximum not to exceed 72 hours from a point in time when the maximum volume of water from the one-year twenty-four-hour storm is stored in a proposed BMP (i.e., when the maximum water surface elevation is achieved in the facility). Release of water can begin at the start of the storm (i.e., the invert of the orifice is at the invert of the proposed BMP).
- C. For modeling purposes, the predevelopment ground cover conditions shall be determined using the corresponding ground cover assumptions presented in § 144-309D of this chapter.
- D. The minimum orifice size in the outlet structure to the BMP shall be three inches in diameter unless otherwise approved by the Municipal Engineer, and a trash rack shall be installed to prevent clogging. For sites with small drainage areas contributing to the BMP that do not provide enough runoff volume to allow a twenty-four-hour attenuation with the three-inch orifice, the calculations shall be submitted showing this condition.
- E. When the calculated orifice size is below three inches, gravel filters (or other methods) are recommended to discharge low-flow rates subject to the Municipal Engineer’s satisfaction. When filters are utilized, maintenance provisions shall be provided to ensure filters meet the design function.
- F. All proposed stormwater facilities shall make use of measures to extend the flow path and increase the travel time of flows in the facility.
- G. When a regulated activity contains or is divided by multiple drainage areas, the peak flow rate control shall be separately addressed for each drainage area.

§ 144-308. Stormwater peak rate control requirements.

The applicant shall comply with the following peak flow rate control requirements for all regulated activities including those that involve new development and redevelopment that are not located in the Chester Creek watershed.

- A. Post-construction peak flow rates from any regulated activity shall not exceed the predevelopment peak flow rates as shown for each of the design storms specified in Table 308.1.

Table 308.1

Peak Rate Control Standards

(Peak flow rate of the post-construction design storm shall be reduced to the peak flow rate of the corresponding predevelopment design storm shown in the table.)

Post-Construction Design Storm Frequency (24-Hour Duration)	Predevelopment Design Storm	
	New Development Regulated Activities	Redevelopment Regulated Activities
2-year	1-year	2-year
5-year	5-year	5-year
10-year	10-year	10-year
25-year	25-year	25-year
50-year	50-year	50-year
100-year	100-year	100-year

- B.

For modeling purposes, the predevelopment ground cover conditions shall be determined using the corresponding ground cover assumptions presented in § 144-309D of this chapter.

- C. For regulated activities involving only redevelopment, no peak flow rate controls are required when and only if the total proposed impervious surface area is at least 20% less than the total existing impervious surface area to be disturbed by the regulated activity. In all cases where this requirement is not met, the redevelopment regulated activity shall achieve the peak flow rate controls presented in Table 308.1, using the redevelopment ground cover assumptions presented in § 144-309D.
- D. Only the area of the proposed regulated activity shall be subject to the peak flow rate control standards of this chapter. Undisturbed areas for which the discharge point has not changed are not subject to the peak flow rate control standards.
- E. Areas located outside of the site (i.e., areas outside of the regulated activity) that drain through a proposed site are not subject to peak flow rate control requirements. Drainage facilities located on the site shall be designed to safely convey flows from outside of the site through the site.
- F. When a regulated activity contains or is divided by multiple drainage areas, the peak flow rate controls shall be separately addressed for each drainage area.
- G. The effect of structural and nonstructural stormwater management practices implemented as part of the overall site design may be taken into consideration when calculating total storage volume and peak flow rates.
- H. Regulated activities located within the Chester Creek watershed shall achieve the applicable peak flow release rate control requirements presented in the approved PA Act 167 Plan for that watershed in Table 308.2 below and as presented in the Chester Creek Watershed Release Rate Map in Appendix F^[1] of this chapter.

**Table 308.2
Peak Rate Control Standards for Stormwater Management Districts Within the Chester Creek Watershed**

District	Control Criteria
100%	Post-development peak discharge for all design storms must be no greater than predevelopment peak discharges.
75%	Post-development peak discharge for all design storms must be no greater than 75% of the predevelopment peak discharges.
50%	Post-development peak discharge for all design storms must be no greater than 50% of the predevelopment peak discharges.

[1] *Editor's Note: Said appendix is on file in the Township offices.*

- I. Regulated activities located within the Chester Creek Watershed shall achieve the applicable peak flow release rate control requirements presented in the approved PA Act 167 Plan for that watershed presented in the Chester Creek Watershed Release Rate Map in Appendix F^[2] of this chapter.

[2] *Editor's Note: Said appendix is on file in the Township offices.*

§ 144-309. Calculation methodology.

- A. Stormwater runoff from all regulated activity sites with a drainage area of greater than five acres shall be calculated using a generally accepted calculation technique(s) that is based on the NRCS Soil Cover Complex Method. Table 309.1 summarizes acceptable computation methods. The

method selected for use shall be based on the individual limitations and suitability of each method for a particular site. The use of the Rational Method to estimate peak discharges for drainage areas greater than five acres shall be permitted only upon approval by the Municipal Engineer.

Table 309.1

Acceptable Computation Methodologies for SWM Site Plan

Method	Developed By	Applicability
TR-20 (or commercial computer package based on TR-20)	USDA NRCS	Applicable where use of full hydrology computer model is desirable or necessary
TR-55 (or commercial computer package based on TR-55)	USDA NRCS	Applicable for land development plans where limitations described in TR-55 are met
HEC-1/HEC-HMS	U.S. Army Corps of Engineers	Applicable where use of a full hydrologic computer model is desirable or necessary
Rational Method (or commercial computer package based on Rational Method)	Emil Kuichling (1889)	For sites up to five acres, or as approved by the municipality
Other methods	Varies	Other computation methodologies approved by the municipality

- B. All calculations using the Soil Cover Complex Method shall use the appropriate design rainfall depths for the various return period storms consistent with this chapter. Rainfall depths used shall be obtained from NOAA Atlas 14 values consistent with a partial duration series. When stormwater calculations are performed for routing procedures or infiltration, water quality and runoff volume functions, the duration of rainfall shall be 24 hours.
- C. All calculations using the Rational Method shall use rainfall intensities consistent with appropriate times of concentration (duration) and storm events with rainfall intensities obtained from NOAA Atlas 14 partial duration series estimates, or the latest version of the PennDOT Drainage Manual (PDM Publication 584). Times of concentration shall be calculated based on the methodology recommended in the respective model used. Times of concentration for channel and pipe flow shall be computed using Manning's Equation.
- D. The applicant shall utilize the following ground cover assumptions for all predevelopment water quality and runoff volume, infiltration volume and peak flow rate calculations:
- (1) For regulated activities involving new development, the following ground cover assumptions shall be used:
 - (a) For areas that are woods (as defined in Article II of this chapter), predevelopment calculations shall assume ground cover of "woods in good condition."
 - (b) For all other areas (including all impervious surfaces), predevelopment calculations shall assume ground cover of "meadow."
 - (2) For regulated activities involving redevelopment, the following ground cover assumptions shall be used:
 - (a) For areas that are woods (as defined in Article II of this chapter), predevelopment calculations shall assume ground cover of "woods in good condition."
 - (b)

For areas that are not woods or not impervious surfaces, predevelopment calculations shall assume ground cover of "meadow."

- (c) For areas that are impervious surfaces, predevelopment calculations shall assume at least 20% of the existing impervious surface area to be disturbed as "meadow" ground cover.
- (3) The following additional ground cover assumptions shall apply to regulated activities within the Chester Creek Watershed:
- (a) Redevelopment projects within the Chester Creek Watershed shall meet peak discharge requirements based on the adjusted runoff control number (RCN) or "C" value illustrated by Figure C-1 in Appendix C.^[1]
 - [1] *Editor's Note: Said appendix is on file in the Township offices.*
 - (b) For the purposes of predevelopment flow rate determination, undeveloped land shall be considered as "meadow" good condition, type "B" soils, (RCN=58, Rational "C"=0.12) unless the natural ground cover generates a lower curve number or Rational "C" value (i.e., forest). If a proposed development meets the definition of redevelopment as defined in this chapter, the applicant may adjust the predevelopment RCN or "C" value based on the curves presented in Figure B-3.
 - (c) Runoff characteristics of off-site areas that drain through a proposed regulated activity shall be based on actual existing conditions, and shall be assumed to not have any controls implemented on future development (i.e., no release rate restrictions).
- (4) The applicant shall determine which stormwater standards apply to the proposed regulated activity as follows:
- (a) Stormwater standards for new development shall apply to all proposed regulated activities that involve only new development activities as defined in this chapter.
 - (b) Stormwater standards for redevelopment shall apply to all proposed regulated activities that involve only redevelopment activities as defined in this chapter.
 - (c) At the discretion of the Municipal Engineer, regulated activities that involve a combination of both new development and redevelopment activities, as defined in this chapter, may either:
 - [1] Apply the stormwater standards (redevelopment or new development) that are associated with the activity that involves the greatest amount of land area; or
 - [2] Apply the redevelopment and new development stormwater standards to the corresponding redevelopment and new development portions of the proposed regulated activity.
- E. Runoff curve numbers (CN) for both predevelopment and proposed (post-construction) conditions to be used in the Soil Cover Complex Method shall be obtained from Table C-1 in Appendix C^[2] of this chapter.
- [2] *Editor's Note: Said appendix is on file in the Township offices.*
- F. Runoff coefficients (C) for both predevelopment and proposed (post-construction) conditions for use in the Rational Method shall be obtained from Table C-2 in Appendix C^[3] of this chapter.
- [3] *Editor's Note: Said appendix is on file in the Township offices.*
- G.

Weighted averaging of runoff coefficients shall not be used for manual computations or input data for water quality and runoff volume calculations.

- H. Hydraulic computations to determine the capacity of pipes, culverts, and storm sewers shall be consistent with methods and computations contained in the Federal Highway Administration Hydraulic Design Series Number 5 (Publication No. FHWA-NHI-01-020 HDS No. 5, as amended). Hydraulic computations to determine the capacity of open channels shall be consistent with methods and computations contained in the Federal Highway Administration Hydraulic Engineering Circular Number 15 (Publication No. FHWA-NHI-05-114 HEC 15, as amended). Values for Manning's roughness coefficient (n) shall be consistent with Table C-3 in Appendix C^[4] of the chapter.

[4] *Editor's Note: Said appendix is on file in the Township offices.*

- I. Runoff calculations shall include the following assumptions:
- (1) Average antecedent moisture conditions (for the Soil Cover Complex Method only, for example, TR-55, TR-20).
 - (2) A Type II distribution storm (for the Soil Cover Complex Method only, for example, TR-55, TR-20).

§ 144-310. Other requirements.

- A. Any BMP intended to hold standing water for four days or longer shall be designed to incorporate biologic controls consistent with the West Nile Guidance found in Appendix D,^[1] PADEP document 363-0300-001 "Design Criteria - Wetlands Replacement/Monitoring" (as amended) (or contact the Pennsylvania State Cooperative Wetland Center or the Penn State Cooperative Extension Office for design information).
- [1] *Editor's Note: Said appendix is on file in the Township offices.*
- B. Any stormwater basin required or regulated by this chapter designed to store runoff and requiring a berm or earthen embankment shall be designed to provide an emergency spillway to safely convey flow up to and including the one-hundred-year proposed conditions. The height of embankment shall provide a minimum one foot of freeboard above the maximum pool elevation computed when the facility functions for the one-hundred-year proposed conditions inflow. Should any BMP require a dam safety permit under PA Chapter 105 regulations, the facility shall be designed in accordance with and meet the regulations of PA Chapter 105 concerning dam safety. PA Chapter 105 may require the safe conveyance of storms larger than one-hundred-year event.
- C. Any drainage conveyance facility and/or channel not governed by PA Chapter 105 regulations shall be designed to convey, without damage to the drainage facility or roadway, runoff from the twenty-five-year storm event. Larger storm events (fifty-year and one-hundred-year storms) shall also be safely conveyed in the direction of natural flow without creating additional damage to any drainage facilities, nearby structures, or roadways.
- D. Conveyance facilities to or exiting from stormwater management facilities (i.e., detention basins) shall be designed to convey the design flow to or from the facility.
- E. Roadway crossings or structures located within designated floodplain areas shall be able to convey runoff from a one-hundred-year design storm consistent with Federal Emergency Management Agency National Flood Insurance Program Floodplain Management Requirements.
- F. Any facility located within a PennDOT right-of-way shall comply with PennDOT minimum design standards and permit submission and approval requirements.

- G. Adequate erosion protection and energy dissipation shall be provided along all open channels and at all points of discharge. Design methods shall be consistent with the Federal Highway Administration Hydraulic Engineering Circular Number 11 (Publication No. FHWA-IP-89-016, as amended) and the PADEP Erosion and Sediment Pollution Control Program Manual (Publication No. 363-2134-008, as amended), or other design guidance acceptable to the Municipal Engineer.

§ 144-311. Other conveyance and system design standards.

- A. Design criteria. The criteria behind the design of stormwater management facilities is that "the peak rate of runoff after development shall not exceed the peak rate prior to development." The stormwater system design shall be based on the following methodology:
- (1) Storm sewers shall be designed to carry a storm of twenty-five-year frequency. When determined applicable by the Township Engineer, an overflow system shall be provided to carry flow to the proposed stormwater management basin or system discharge point when the capacity of the storm drain pipe system is exceeded. The overflow system shall have sufficient capacity to carry the difference between the one-hundred-year and the twenty-five-year peak flow rates.
 - (2) Detention and retention basins shall be designed to control the peak flow of storms of two-, five-, ten-, twenty-five-, fifty-, and one-hundred-year frequency and of twenty-four-hour duration.
 - (3) Basins shall be designed to pass a storm of one-hundred-year frequency through the outlet structure without failure of the basin embankment.
 - (4) The entire contributory drainage area shall be taken into account in basin and storm sewer system capacity design.
- B. Storm sewer system.
- (1) Storm sewer design shall meet the requirements of PennDOT Publication 408 Construction Specifications, latest edition and PennDOT Publication 72 Standards for Roadway Construction, latest edition.
 - (2) Storm sewers shall be reinforced concrete when constructed within rights-of-way of streets.
 - (3) All inlets shall be precast concrete, PennDOT type and shall have bicycle-safe-type grate.
 - (4) Inlets shall have a minimum two-inch drop from all inlet pipe invert elevations to most shallow outlet pipe invert elevation.
 - (5) Storm sewer design shall take into account the time of concentration. Time of concentration calculations shall be provided for all drainage areas in which the time of concentration exceeds five minutes.
 - (6) Calculations shall be provided to show the flow in the system, pipe size, allowable flow, actual flow and velocity.
 - (7) Storm sewers shall have a minimum grade of 0.5%.
 - (8) Storm sewers shall have a minimum inside diameter of 15 inches.
 - (9) Storm sewers shall have a minimum cover of 24 inches, unless compliance with PennDOT and manufacturers' specifications can be demonstrated to the satisfaction of the Township Engineer.

- (10) A minimum one foot of freeboard between the hydraulic grade line (HGL) of the design storm and the ground elevation shall be provided throughout all proposed storm sewer conveyance systems.
 - (11) Velocity within the storm sewer system shall be no less than three feet per second and no greater than 11 feet per second for the design storm peak flow.
 - (12) Storm sewer profiles shall be provided for all systems and shall show all applicable design information including, but not limited to, pipe size, material, slope, invert and grate/ground elevations, and cover.
- C. Detention/retention basins. All basins shall be designed and constructed to include, but not be limited to, the following standards:
- (1) Berm constructed of earth of a clay base with no topsoil and a cutoff trench key continuous along the berm base. Construction details and sequence shall indicate that compaction tests shall be performed by the applicant and observed by the Township Engineer, or assigned representative thereof. Trench key shall be of 95% compaction or greater.
 - (2) The top of the berm shall be a minimum of 10 feet. The sides shall have a maximum slope of three horizontal to one vertical (3:1).
 - (3) The bottom of the basin shall have a minimum slope of 2% and any channel shall have a minimum slope of 0.5%.
 - (4) The riser shall be precast concrete, box inlet or equivalent with grate top and shall be built into the berm whenever possible.
 - (5) The barrel shall be concrete pipe with anti-seep collars with a minimum projection of two feet beyond the pipe. Anti-seep collar design calculations shall be provided.
 - (6) Emergency spillway shall be constructed of concrete/grass pavers or riprap protection. Protection shall extend down the basin slopes at the spillway location. Calculations shall be provided to ensure adequate protection is provided.
 - (7) Basin barrel outfall shall have an end wall or flared end section with properly designed riprap or energy dissipators.
 - (8) Surface stormwater storage must be drained complete within 72 hours of the end of the design storm rain event.
- D. Retention basins shall be defined with provisions for draining the permanent pond.
- E. Subsurface retention basin/recharge systems shall be designed in accordance with the Pennsylvania Stormwater Best Management Practices Manual, latest edition, and the following criteria:
- (1) A sump shall be provided between the impervious area and the inground facility to collect and trap sediment and debris before reaching the inground facility.
 - (2) Runoff into the facility shall be evenly distributed through a series of level, perforated PVC or HDPE pipes with Class 2 perforations.
 - (3) The distribution pipe shall be encased in a bed of AASHTO No. 1 coarse aggregate completed envelope (top, sides and bottom) by PennDOT Class 1 geotextile.
 - (4)

The facility shall be designed to completely drain within 72 hours, and infiltration rates used to design the facility shall be determined by field testing conducted in accordance with the Pennsylvania Stormwater Best Management Practices Manual, latest addition.

- (5) The facility shall be provided with an emergency overflow device. An operations and maintenance program shall be developed for the facility and provided to the homeowner for implementation.
- F. Individual berms or in-ground basins may be used where practical. Title plan shall contain a note that facilities are permanent and shall be maintained by the property owner.
- G. Landscaping; drainage channels and retention areas. All storm drainage channels and retention areas whether existing or proposed shall be graded and planted to effectively naturalize areas so as to become an integral and harmonious part of the landscape by contour and type of plant material employed.