

Section 309. Calculation Methodology

A. Stormwater runoff from all Regulated Activity Sites with a drainage area of greater than five (5) 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 (5) acres shall be permitted only upon approval by the Borough 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	US 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 (5) acres, or as approved by the Borough.
Other Methods	Varies	Other computation methodologies approved by the Borough.

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 Ordinance. 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 twenty-four (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. (Refer to Appendix B-3)

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, 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, 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 twenty percent (20%) of the existing Impervious Surface area to be disturbed as "meadow" ground cover.
3. 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 Ordinance.
 - b. Stormwater standards for Redevelopment shall apply to all proposed Regulated Activities that involve only Redevelopment activities as defined in this Ordinance.
 - c. At the discretion of the Borough Engineer, Regulated Activities that involve a combination of both New Development and Redevelopment activities, as defined in this Ordinance, may either:
 - i. Apply the stormwater standards (Redevelopment or New Development) that are associated with the activity that involves the greatest amount of land area;

OR

- ii. 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 B-2 in Appendix B of this Ordinance.
- F. Runoff coefficients (C) for both Predevelopment and proposed (Post-construction) conditions for use in the Rational Method shall be obtained from Table B-1 in Appendix B of this Ordinance.
- 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 utilize the roughness coefficient (Manning “n” values) in accordance with the manufacturer’s specifications or with PennDOT Publication 584, PennDOT Drainage Manual (Appendix B-7).
- 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).

Section 310. Other Requirements

- A. Any BMP intended to hold standing water for four (4) days or longer shall be designed to incorporate biologic controls consistent with the West Nile Guidance found in Appendix F, 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.)
- B. Any stormwater basin required or regulated by this Ordinance 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 (100)-year proposed conditions. The height of embankment shall provide a minimum one (1.0) foot of Freeboard above the maximum pool elevation computed when the facility functions for the one hundred (100)-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 (100)-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 (25)-year storm event. Larger storm events (fifty (50)-year and one hundred (100)-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 100-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.

Section 311. Other Conveyance and System Design Standards

A. General.

1. For all above ground storage facilities the bottom of the excavated basin shall be a minimum of two (2) feet or 24 inches above the seasonal high water table or bedrock. Soil sampling, test pits or auger testing must be completed in the proposed location of the facilities in support of the design.
2. Above ground storage facilities without restricted access shall have impoundment areas with side slopes no greater than five horizontal to one vertical. Basins with side slopes steeper than five horizontal to one vertical shall be protected by fencing that will discourage access.
3. Above ground storage facilities with a facility depth greater than eight (8) feet shall not be permitted in residential areas.
4. Above ground storage facilities with a facility depth greater than 15 feet require a dam permit from DEP.
5. All pipe collars, when required, shall be designed in accordance with Chapter 7 of the DEP E&S Manual. The material shall consist of concrete or otherwise non-degradable material approved by the Borough Engineer around the outfall barrel and shall be watertight.

6. The embankment fill material shall be taken from an appropriate borrow area which shall be free of roots, stumps, wood, rubbish, stones greater than 6 inches, frozen or other objectionable materials.
7. When required, embankments shall be compacted by sheepsfoot or pad roller. The loose lift thickness shall be nine (9) inches or less, depending on roller size, and the maximum particle size is six (6) inches or less (two-thirds of the lift thickness). Five (5) passes of the compaction equipment over the entire surface of each lift is required. Embankment compaction to visible non-movement is also required.
8. The minimum bottom slope of facilities not designed for infiltration shall be one percent (1%). A flatter slope may be used if an equivalent dewatering mechanism is provided.
9. When required, dewatering shall be provided through the use of underdrain, surface device, or alternate approved by the Borough Engineer. If the facility is to be used for infiltration, the dewatering device should be capable of being disconnected and only be made operational if the basin is not dewatering within the required timeframe.
10. When required, pretreatment elements shall consist of forebays, filter strips or alternate approved by the Borough Engineer, to keep silt to a smaller portion of the facility for ease of maintenance.
11. Within basins designed for infiltration, existing native vegetation shall be preserved, if possible. For existing unvegetated areas or for infiltration basins that require excavation, a planting plan shall be prepared in accordance with § 301.N and the BMP Manual which is designed to promote infiltration.
12. For facilities with a depth of two (2) feet or greater, a type D-W endwall or riser box outlet structure shall be provided.
13. For facilities with a depth less than two (2) feet, no outlet structure is required.
14. All discharge control devices with appurtenances shall be made of reinforced concrete and stainless steel. Bolts/fasteners shall be stainless steel.
15. The spillway shall be designed to provide a non-erosive, stable condition when the project is completed.
16. The spillway shall be designed to convey the 100-year peak inflow when required.
17. Freeboard shall be measured from the top of the water surface elevation for emergency use.
18. Atglen Borough may require a breach analysis based on site-specific conditions and concern of threat for downstream property. When required, the breach analysis shall be conducted in accordance with the NRCS methodology, the US Army Corps of Engineers methodology (HEC-1) or other methodologies as approved by the Borough.

19. Embankment construction.

- a. An impervious core/key trench, when required, shall consist of a cutoff trench (below existing grade) and a core trench (above existing grade). A key trench may not be required wherever it can be shown that another design feature, such as the use of an impermeable liner, accomplishes the same purpose.
- b. Materials used for the core shall conform to the Unified Soil Classification GC, SC, CH, or CL and must have at least 30% passing the No. 200 sieve.
- c. The dimensions of the core shall provide a minimum trench depth of two (2) feet below existing grade, minimum width of four (4) feet and side slope of 1H:1V or flatter.
- d. The core should extend up both abutments to the 10 year water surface elevation or six (6) inches below the emergency spillway elevation, whichever is lower.
- e. The core shall extend four (4) feet below any pipe penetrations through the impervious core. The core shall be installed along or parallel to the centerline of the embankment.
- f. Compaction requirements shall be the same as those for the embankment to assure maximum density and minimum permeability.
- g. The core shall be constructed concurrently with the outer shell of the embankment.
- h. The trench shall be dewatered during backfilling and compaction operations.

B. Above ground storage facilities.

Above ground storage facilities consist of all stormwater facilities which store, infiltrate/evaporate/transpire, clean or otherwise affect stormwater runoff and the top of which is exposed to the natural environment. Above ground storage facilities are located above the finished ground elevation. Above ground storage facilities do not include stormwater management facilities designed for conveyance or cisterns.

1. Design Criteria. Refer to Table 311.1.

- a. Above ground storage facility with facility depth of less than two (2) feet
 - 1) The minimum top of embankment width shall be two (2) feet.
 - 2) Maximum interior side slope 2:1
 - 3) Maximum exterior side slope 2:1
 - 4) Minimum outlet pipe diameter shall be six (6) inches.
 - 5) Outlet pipe material: PVC, HDPE or RCP
 - 6) Anti-clogging device is required
 - 7) Watertight joints shall be provided in karst areas
 - 8) The spillway freeboard shall be a minimum three (3) inches
 - 9) The spillway may be used to route the 100-year storm
- b. Above ground storage facility with depth of two (2) to eight (8) feet
 - 1) Embankment minimum top width of five (5) feet

- 2) Maximum interior side slope 5:1.
 - 3) Maximum exterior side slope 3:1.
 - 4) A key trench and anti-seep collar shall be provided.
 - 5) Compaction density of the embankment is required.
 - 6) A dewatering feature is required.
 - 7) Pretreatment filtering of runoff is required.
 - 8) Minimum outlet pipe diameter of 12 inches
 - 9) Outlet pipe material: HDPE or RCP
 - 10) An anti-clogging device is required.
 - 11) An antivortex design is required.
 - 12) Watertight joints shall be provided.
 - 13) The spillway freeboard shall be a minimum six (6) inches
 - 14) The minimum spillway width is 10 feet.
 - 15) The maximum spillway width is 50 feet
 - 16) The downstream channel into which the spillway discharges shall be checked for adequate capacity and stability.
 - 17) The spillway shall not be considered to function as part of the primary outlet structure and shall be only for emergency situations.
- c. Above ground storage facility with depth greater than eight (8) feet
- 1) Embankment minimum top width of eight (8) feet
 - 2) Maximum interior side slope 5:1.
 - 3) Maximum exterior side slope 3:1.
 - 4) A key trench and anti-seep collar shall be provided.
 - 5) Compaction density of the embankment is required.
 - 6) A dewatering feature is required.
 - 7) Pretreatment filtering of runoff is required.
 - 8) Minimum outlet pipe diameter of 15 inches
 - 9) Outlet pipe material: RCP
 - 10) An anti-clogging device is required.
 - 11) An antivortex design is required.
 - 12) Watertight joints shall be provided.
 - 13) The spillway freeboard shall be a minimum 12 inches.
 - 14) The minimum spillway width is 20 feet.
 - 15) The maximum spillway width is 50 feet.
 - 16) The downstream channel into which the spillway discharges shall be checked for adequate capacity and stability.
 - 17) The spillway shall not be considered to function as part of the primary outlet structure and shall be only for emergency situations.
- d. General Requirements for above ground storage facilities:
- 1) Where practical, the spillway shall be constructed in undisturbed ground.
 - 2) The effect on the downstream areas if the facility embankment fails shall be considered in the design of all facilities. Where possible the facility shall be designed to minimize the potential damage caused by such failure of the embankment.
 - 3) For all above ground facilities that do not rely on infiltration to dewater the runoff, a flow path length to width ratio of 2:1 shall be provided to maximize the treatment time between the inflow point and the outlet structure.

Table 311.1. Above ground storage facility design criteria.

Above-ground storage facility design criteria			
	Facility Depth		
	Less than 2 feet	2 feet to 8 feet	Greater than 8 feet
Embankment Geometry			
Top width (minimum)	2 feet	5 feet	8 feet
Interior side slope (maximum)	2 : 1	5 : 1	5 : 1
Exterior side slope (maximum)	2 : 1	3 : 1	3 : 1
Embankment construction			
Key trench	Not required	Required	Required
Pipe collar	Not required	Required	Required
Compaction density	Not required	Required	Required
Internal Construction			
Dewatering feature	N/A	Required	Required
Pretreatment elements	Not required	Required	Required
Outlet Structure			
Pipe size (minimum)	6 inches	12 inches	15 inches
Pipe material	HDPE, PVC, RCP	HDPE, RCP	RCP
Anticlogging devices	Required	Required	Required
Antivortex design	Not required	Required	Required
Watertight joints in piping	No**	Yes	Yes
Spillway Requirements			
Spillway freeboard (minimum)	3 inches	6 inches	12 inches
Width (minimum)	Not required	10 feet	20 feet
Width (maximum)	Not required	50 feet	50 feet
Spillway channel design	Not required	Required	Required
Routing of 100 year storm	Permitted	Not Permitted	Not Permitted

**Watertight joints shall be provided in all areas of karst geology.

C. Subsurface storage facilities.

Subsurface storage facilities consist of all stormwater facilities which store, infiltrate/evaporate/transpire, clean or otherwise affect stormwater runoff and the top of which is not exposed to the natural environment. Subsurface facilities are located below the finished ground elevation. Subsurface facilities do not include stormwater management facilities designed for conveyance.

1. General

- a. The stone used for infiltration beds shall be clean washed, uniformly graded coarse aggregate (AASHTO No. 3 or equivalent approved by the Borough of Denver). The void ratio for design shall be assumed to be 0.4.
- b. Material consistency and placement depths for backfill shall be (at a minimum) per all applicable pipe manufacturer's recommendations, further providing it should be free of large (not exceeding 6 inches in any dimension) objectionable or detritus material. Select non-aggregate material should be indigenous to the surrounding soil material for non-vehicular areas. Backfill within vehicular areas shall comply with this section unless otherwise specified in governing municipal road/street or subdivision and land development ordinances. Furthermore, if the design concept includes the migration of runoff through the backfill to reach the infiltration facility, the material shall be well drained, free of excess clay or clay like materials and generally uniform in gradation.
- c. Non-woven geotextiles shall be placed on the sides and top of subsurface infiltration facilities. No geotextiles shall be placed on the bottom of subsurface infiltration facilities.
- d. When located under pavement, the top of the subsurface facility shall be a minimum of three (3) inches below the bottom of pavement subbase. Where located under vegetative cover, the top of the subsurface facility shall be a minimum of 12 inches below the surface elevation or as required to establish vegetation.
- e. Subsurface facilities shall be designed to safely convey and/or bypass flows from storms exceeding the design storm.
- f. Infiltration systems shall be located a minimum of 10 feet away from the foundation wall of any building.
- g. Infiltration rates shall not be used in computing the storage volume of the infiltration system.

2. Design Criteria. Refer to Table 311.2.

- a. Infiltration and Storage Facility
 - 1) Maximum Depth from Surface: 2 feet less than limiting zone
 - 2) Loading Ratio: Loading Ratio: Per December 2006 BMP Manual, as amended. The maximum impervious loading ratio of 5:1 relating impervious drainage area to infiltration area. The maximum total loading ratio of 8:1 relating to total drainage area to infiltration area. In areas of Karst Geology, the maximum impervious drainage area to infiltration area is 3:1.
 - 3) Minimum distribution pipe size shall be four (4) inches. Distribution system piping may be PVC or HDPE.
 - 4) Pretreatment of runoff to the facility is required to provide a method to eliminate solids, sediment, and other debris from entering the subsurface facility.

- 5) Observation/access ports shall be provided in the facility. For facilities with the bottom less than five (5) feet below the average grade of the ground surface, a clean-out shall be an acceptable observation port. For facilities with the bottom five (5) feet or more below the average grade of the ground surface, a manhole or other means acceptable to the Borough of Denver shall be provided for access to and monitoring of the facility. The number of access points shall be sufficient to flush or otherwise clean out the system.
- 6) The facility shall be designed to provide a means of evenly balancing the flow across the surface of the facility to be used for infiltration.

b. Storage without Infiltration Facility

- 1) Minimum distribution pipe size shall be four (4) inches. Distribution system piping may be PVC, HDPE, or RCP.
- 2) Pretreatment of runoff to the facility is required to provide a method to eliminate solids, sediment, and other debris from entering the subsurface facility.
- 3) Observation/access ports shall be provided in the facility. For facilities with the bottom less than five (5) feet below the average grade of the ground surface, a clean-out shall be an acceptable observation port. For facilities with the bottom five (5) feet or more below the average grade of the ground surface, a manhole or other means acceptable to the Borough of Denver shall be provided for access to and monitoring of the facility. The number of access points shall be sufficient to flush or otherwise clean out the system.

Table 311.2. Subsurface storage facility design criteria:

Subsurface storage facility design criteria		
	Facility Type	
	Infiltration and Storage	Storage without Infiltration
Facility Geometry		
Depth from surface (maximum)	2 feet less than limiting zone	N/A
Loading ratio (maximum)	Per BMP Manual*	N/A
Distribution System Requirements		
Pipe size (minimum)	4 inches	4 inches
Pretreatment	Required	Required
Loading/balancing	Required	Not required
Observation/access ports	Required	Required

*Unless otherwise determined by professional geologic evaluation.

D. Conveyance Facilities.

Conveyance facilities consist of all stormwater facilities which carry flow, which may be located either above or below the finished grade. Conveyance facilities do not include stormwater management facilities which store, infiltrate/evaporate/transpire, or clean stormwater runoff.

1. General.

- a. Conveyance pipes, culverts, manholes, inlets and endwalls within the public street right-of-way or proposed for dedication shall conform to the requirements of PennDOT Standards for Roadway Construction, Publication No. 72M.
- b. Conveyance pipes, culverts, manholes, inlets and endwalls which are otherwise subject to vehicular loading shall be designed for the HS-25 loading condition.
- c. Backfill material. Material consistency and placement depths for backfill shall be (at a minimum) per all applicable pipe manufacturer's recommendations, further providing it should be free of large (not exceeding 6 inches in any dimension) objectionable or detritus material. Select non-aggregate material should be indigenous to the surrounding soil material for non-vehicular areas. Backfill within vehicular areas shall comply with this section unless otherwise specified in governing municipal road/street or subdivision and land development ordinances.
- d. Inlets or manholes shall be placed at all points of changes in the horizontal or vertical directions of conveyance pipes. Curved pipe sections are prohibited.
- e. Access/maintenance ports. An access/maintenance port is required may either be an inlet or manhole.
- f. Watertight joints shall be provided where pipe sections are joined, except for perforated pipe installed as pavement base drain. The watertight joints shall be of a type approved by the Borough Engineer. This requirement shall be noted and/or detailed on the plans.
- g. The street crossing angle shall be measured between the pipe centerline and the street centerline.
- h. Elliptical pipe of an equivalent cross-sectional area may be substituted in lieu of circular pipe where cover or utility conflict conditions exist.
- i. All pipes must enter inlets completely through one of the sides. No corner entry of pipes is permitted.
- j. Within the public street right-of-way, the gutter spread based on the 25-year storm shall be no greater than one half of the travel lane and have a maximum depth of three inches (3 inches) at the curb line. A parking lane shall not be considered as part of the travel lane. In the absence of pavement markings separating a travel lane from the parking lane, the parking lane shall be assumed to be seven feet (7 feet) wide if parking is permitted on the street.
- k. Flow depth within intersections. Within intersections of streets, the maximum depth of flow shall be one and one-half inches (1 ½ inches) based on the 25-year storm.
- l. Inlets in streets shall be located along the curb line.

- m. Top units shall be PennDOT Type "C". The hood shall be aligned with the adjacent curb height.
- n. All inlets placed in paved areas shall have heavy duty bicycle-safe grating consistent with PennDOT Publication 72M, latest edition. A note to this effect shall be added to the SWM Site Plan or inlet details therein.
- o. Inlets, junction boxes, or manholes greater than five feet (5 feet) in depth shall be equipped with ladder rungs and shall be detailed on the SWM Site Plan.
- p. A swale shall be considered as any man-made ditch designed to convey stormwater directly to another stormwater management facility or surface waters.
- q. Inlets within swales shall have PennDOT Type "M" top units or equivalent approved by the Borough engineer.
- r. Swale capacities and velocities shall be computed using the Manning equation using the following design parameters:
 - 1. Vegetated swales.
 - (a) The first condition shall consider swale stability based upon a low degree of retardance ("n" = 0.03);
 - (b) The second condition shall consider swale capacity based upon a higher degree of retardance ("n" = 0.05); and
 - (c) All vegetated swales shall have a minimum slope of 1% unless otherwise approved by the Borough Engineer.
 - (d) The "n" factors to be used for paved or riprap swales or gutters shall be based upon accepted engineering design practices, as approved by the Borough Engineer.
- s. Where the connecting pipe has a diameter 18 inches or greater, headwalls and endwalls shall be provided with a protective barrier device to prevent entry of the storm sewer pipe by unauthorized persons. Such protection devices shall be designed to be removable for cleaning.
- t. Headwalls and endwalls shall be constructed of concrete.
- u. Flared end sections shall be of the same material as the connecting pipe and be designed for the size of the connecting pipe.
- v. Level spreaders:
 - 1. Shall discharge at existing grade onto undisturbed vegetation.
 - 2. Discharge at a depth not exceeding 3.0 inches for a 50-year, 24-hour design storm.
- w. Energy dissipaters shall be designed in accordance with the requirements in the DEP E&S Manual.

- x. SWM Facilities which qualify as a dam per DEP regulations or facilities deemed a potential threat to the life; safety or welfare of the general public shall be subject to the following requirements.
 - 1. Facilities which qualify as a dam per DEP regulation shall obtain the required permit through DEP and design the facility in accordance with DEP standards.
 - 2. Additional requirements and analysis may be required by the Borough to prove that the proposed facility has been designed to limit the potential risk to the life, safety or welfare of the general public.
 - y. In addition to the material requirements in this section, culverts designed to convey Waters of the Commonwealth may be constructed with either a corrugated metal arch or a precast concrete culvert.
 - z. Trash racks shall be provided on all endwalls and storm sewer discharge points for pipe diameters of 18 inches or greater. The proposed trash rack shall be subject to review and approval by the Borough.
2. Design criteria. Refer to Table 311.3.
- a. Within public street right-of-way.
 - 1) Conveyance system material shall consist of HDPE or RCP pipe.
 - 2) The minimum pipe slope shall be 0.5%.
 - 3) A minimum 1 foot of cover to the stone subgrade shall be provided over the conveyance pipes.
 - 4) The minimum pipe diameter shall be 15 inches.
 - 5) The minimum street crossing angle for the conveyance system shall be 75° to 90°.
 - 6) Maximum spacing between access or maintenance ports shall be 400 feet.
 - 7) Inlets and manholes shall be concrete.
 - 8) Inlets shall be depressed a minimum of two (2) inches below the surface grade to provide positive flow.
 - 9) Swales shall be provided with a minimum freeboard of six (6) inches.
 - 10) The maximum swale velocity shall be determined based on the stability of the channel.
 - 11) The minimum swale slope shall be one percent (1 %).
 - 12) Side slopes in residential areas shall be a maximum of 4:1. Side slopes in non-residential areas shall be a maximum of 4:1.
 - 13) The bottom width to flow depth ration shall be 12:1.
 - 14) Pipe entrances/discharges in public street right-of-ways shall be provided with a headwall/endwall treatment.
 - 15) The pipe discharge locations shall be provided with an energy dissipater designed to handle the anticipated flow conditions.
 - b. Outside public street right-of-way: vehicular loading
 - 1) Conveyance system material shall consist of PVC, HDPE or RCP pipe.

- 2) The minimum pipe slope shall be 0.5%.
 - 3) A minimum 1 foot of cover to the stone subgrade shall be provided over the conveyance pipes.
 - 4) The minimum pipe diameter shall be 15 inches.
 - 5) Maximum spacing between access or maintenance ports shall be 400 feet.
 - 6) Inlets and manholes shall be concrete.
 - 7) Inlets shall be depressed a minimum of two (2) inches below the surface grade to provide positive flow.
- c. Outside public street right-of-way: non-vehicular loading
- 1) Conveyance system material shall consist of PVC, HDPE or RCP pipe.
 - 2) The minimum pipe slope shall be 0.5%.
 - 3) A minimum 1 foot of cover to the surface shall be provided over the conveyance pipes.
 - 4) The minimum pipe diameter shall be eight (8) inches.
 - 5) Maximum spacing between access or maintenance ports shall be 600 feet.
 - 6) Manholes shall be concrete.
 - 7) Inlets shall be depressed a minimum of one (1) inches below the surface grade to provide positive flow.
 - 8) Swales shall be provided with a minimum freeboard of six (6) inches.
 - 9) The maximum swale velocity shall be determined based on the stability of the channel.
 - 10) The minimum swale slope shall be one percent (1 %).
 - 11) Side slopes in residential areas shall be a maximum of 4:1. Side slopes in non-residential areas shall be a maximum of 3:1.
 - 12) The bottom width to flow depth ration shall be 12:1.
 - 13) Pipe entrances/discharges in public street right-of-ways shall be provided with a headwall/endwall or flared end section treatment.
 - 14) The pipe discharge locations shall be provided with an energy dissipater designed to handle the anticipated flow conditions.

Table 311.3. Conveyance facility design criteria:

Conveyance facility design criteria			
Location	Within public street right-of-way	Outside public street right-of-way	
Loading	All	Vehicular loading	Non-vehicular Loading
Pipe design			
Material	HDPE, RCP	PVC, HDPE, RCP	PVC, HDPE, RCP
Slope (minimum)	0.5%	0.5%	0.5%
Cover	1 foot to stone subgrade	1 foot to stone subgrade	1 foot to surface
Diameter (minimum)	15 inches	15 inches	8 inches
Street crossing angle	75° to 90°	N/A	N/A
Access/maintenance port frequency (maximum)	400 feet	400 feet	400 feet
Inlet design			
Material	Concrete	Concrete	N/A
Grate depression	2 inches	2 inches	1 inch minimum
Manhole design			
Material	Concrete	Concrete	Concrete
Swale design			
Freeboard (minimum)	6 inches	N/A	6 inches
Velocity (maximum)	Stability check	N/A	Stability check
Slope (minimum)	1%	N/A	1%
Side slopes (residential area)	4 : 1 max	N/A	4 : 1 max
Side slopes (non-residential area)	4 : 1 max	N/A	3 : 1 max
Bottom width to flow depth ratio	12 : 1	N/A	12 : 1
Outlet design			
End treatment	Headwall/endwall	N/A	Headwall/ endwall or flared end section
Energy dissipater	Required	N/A	Required

E. Capture and Reuse Facilities.

1. Design Requirements:

- a. Calculation of water usage to insure adequate capacity is available for storage of follow-up rainfall events. The property will draw from the cistern on a daily basis; the cistern shall be dewatered in seventy-two (72) hours to maintain the capacity of the storage facility.
- b. Verification of conveyance pipe capacity in the roof leader design.

- c. The water storage container(s) shall be protected from direct sunlight to minimize algae growth
- d. An alternative supply of water shall be available for the property use during dry periods.
- e. Water storage containers should be watertight with smooth interior surfaces.
- f. The cover (or lid) should have a tight fit to keep out surface water, children, animals, dust and light. The cover or lid opening should be a minimum 24 inches in order to access the facility for maintenance and repair.
- g. Cisterns shall be designed to store the runoff volume of a 100-year storm event for the area served by the water storage facility.
- h. Every water storage facility (cistern, rain barrel, etc.) shall be provided with an overflow or an emergency spillway. The overflow shall be designed to discharge away from buildings and other structures and towards existing natural or manmade channels, stormwater facilities or vegetated slopes.
 - i. The plans proposing a water storage facility shall include the following:
 - ii. All calculations and assumptions used in the design.
 - iii. Sufficient detail showing the proposed method of dewatering (i.e. pump).
 - iv. Structural details.
- i. Maintenance responsibilities for water storage and reuse facilities shall include flushing the storage units to remove any accumulated sediment, the inside surfaces shall be brushed and thoroughly disinfected.
- j. The water shall not be allowed to freeze in the devices.

Section 312. Riparian Buffers

- A. In order to protect the existing environmentally sensitive areas within the Borough, protect the natural resources and aid in the improvement of water quality riparian buffer easements shall be created as part of any subdivision or land development or SWM Plan (except exemptions and Small Project applications).

For any site located immediately adjacent to or encompassing a watercourse (i.e. stream, creek or other natural body of water), a “Riparian Buffer Easement” measuring 35 feet in width from the centerline (on each side) of the watercourse shall be provided and maintained. The Riparian Buffer Easement shall not be designated along industrial ponds, sewerage treatment lagoons, man-made irrigation ditches, stormwater management basins and other artificial features with similar water quality or storage facility. The purpose of the Riparian Buffer Easement shall be to protect and preserve the existing natural features and environmental resources subject to the following requirements:

1. Preservation of Existing Buffer Plantings: Within the Riparian Buffer Easement the existing natural trees and vegetation shall be preserved.
2. Required Buffer Plantings: To create a Riparian Forested Buffer, the required easement area shall be planted with additional native trees, shrubs and other plant material as determined necessary (depending on site conditions) in order to create a suitable "Riparian Buffer".
3. The Riparian Buffer Easement shall be incorporated into the deed for the property or lot(s) and shall limit the use of the property located therein. The easement shall allow for the continued private ownership and count toward the minimum lot area as required by the Atglen Borough Zoning Ordinance, but restrict land uses to the current use or to other non-damaging activities such as:
 - a. Regulated activities permitted by the Commonwealth of Pennsylvania (i.e. permitted stream or wetland crossing). Maximum area disturbance permitted for this use shall be five (5) percent of the designated riparian buffer.
 - b. Provision for unpaved, ungraded, or natural trails parallel to the watercourse not to exceed six (6) feet in width. Such trail shall not come within ten (10) feet of any stream bank.
 - c. Clearing of a foot-path to the watercourse or trail access not to exceed six (6) feet in width, provided that a cleared line of sight to the watercourse through the buffer is not created.
 - d. Selective removal of a safety hazard, diseased trees, or invasive plant species.
 - e. A soil conservation project, including reforestation and streambank stabilization, or stormwater management practices approved by the Chester County Conservation District.
 - f. Installation and maintenance of municipal government infrastructure, in accordance with all other applicable permits, regulations, and requirements as applicable (DEP, etc.).
4. The outlet of any storm sewer piping system or stormwater management facility shall not be permitted within the Riparian Buffer Easement. The Riparian Buffer Easement will create a setback or separation distance from the receiving watercourse. In this way, a natural filter strip will be created so that the quality of stormwater runoff will be improved before reaching the watercourse.
5. Any activities within the Riparian Buffer Easement shall be completed in a manner that will preserve and protect the existing limits of the 100-year Floodplain and Floodway.

B. Resource Protection Standards.

1. Buffer Composition. A riparian buffer shall be a dense ground cover of grasses, shrubbery, and trees preserved with no buildings, structures, or impervious surface. This buffer shall not be cleared, regraded, filled, built upon or otherwise altered; with the exception to restore such area to its natural state or for those uses or activities listed below. Riparian buffers shall be established and maintained in accordance with the following guidelines:
 - a. Established through natural succession. Vegetation may be established through natural succession. Selective planting may be incorporated on site devoid of vegetation to stimulate native species and discourage invasive plant species.
 - b. Planted in accordance with the following:
 - 1) Planting plans may be prepared jointly by a PA registered Landscape Architect in consultation with other professionals having a practical knowledge of riparian ecosystems (such as horticulturist, wetlands specialists, wildlife biologists, ecologists) such as the Chester County Conservation District, the Department of Environmental Protection, of the Department of Conservation and Natural Resources. All planting plans shall include a planting schedule that summarizes the quantity, size, type and root condition of all plantings. All riparian buffer enhancements shall be installed using practices accepted by the American Association of Nurserymen.
 - 2) The preparation and planting procedures may include, but shall not be limited to, invasive plant removal and control; stream bank stabilization; the provision of animal browse protection, such as plastic tubes for seedling trees; erosion control matting; the provision of any markers or signs identifying the riparian buffer; and mowing schedules for meadow grass establishment.