

**SECTION        COMPREHENSIVE STORMWATER MANAGEMENT**

**\_\_\_\_.1    PURPOSE**

The purpose of comprehensive stormwater management in \_\_\_\_ Township is to protect the health, safety, and general welfare of Township residents by protecting, sustaining, and enhancing the surface and groundwater of the Township through comprehensive stormwater management. Through provisions of this Ordinance (Section \_\_\_\_ Comprehensive Stormwater Management), the Township in general intends to integrate stormwater management comprehensively throughout the site planning and design process, maximizing preventive non-structural practices where feasible and implementing effective mitigative (structural) practices where appropriate. This Ordinance is intended to be compatible with the technical provisions set forth in the *Draft Pennsylvania Stormwater Best Management Practices Manual (April 15, 2006)*. Specifically, the Township intends:

- A.     To maintain the pre-development water cycle balance throughout all watersheds and sub-watersheds and the natural hydrology of stream and watershed systems (especially in first-order and other especially sensitive streams), and to work to restore natural hydrologic regimes wherever possible. Such hydrologic balance includes volume and rate of runoff, volume of infiltration and groundwater recharge, stream baseflow, evapotranspiration, and other elements of the hydrologic cycle.
- B.     To hold constant the pre-development volume of infiltration and groundwater recharge, avoiding lowering of the water table, adverse impacts on wells and springs and wetlands, reductions in stream baseflow and critical low flow.
- C.     To hold constant the pre-development volume of infiltration and evapotranspiration, where feasible.
- D.     To prevent increases in surface runoff volumes and peak runoff rates, pre-development to post-development, for larger storm events, in order to avoid worsened flooding downstream in the watershed, enlarged floodplains, and creation of other flood-related health-welfare-property losses.
- E.     To minimize worsening and increased frequency of bankfull flooding conditions resulting from increased stormwater runoff volumes and worsened peak rates of discharge, especially for smaller and more frequent storms, with attendant stream morphological, such as eroded stream banks, loss of stream substrate, and other adverse physical stream impacts, with related aquatic ecological impacts.
- F.     To minimize nonpoint source pollutant loadings to both ground and surface waters resulting from stormwater runoff throughout the Township.
- G.     To minimize impacts on stream temperatures, including excessive warming in the summer and excessive cooling in winter.
- H.     To minimize adverse impacts on aquatic biota and their habitats resulting from stormwater-linked land development impacts.
- I.     To minimize aesthetic impacts of stormwater management
- J.     To encourage development and re-development at already-disturbed and developed sites, rather than at undisturbed and undeveloped sites and in areas designated for growth, using comprehensive non-structural and structural stormwater management practices.

- K. To maximize use of preventive non-structural approaches for stormwater management, including conservation design, low impact development, and other techniques, which manage stormwater as close to its source as possible, which rely on natural processes, and which respect natural drainage patterns to the maximum extent feasible.
- L. To integrate comprehensive stormwater management into the overall site design process so that stormwater is a critical part of initial phase of site planning.
- M. Ensure effective long-term operation and maintenance of all permanent stormwater management facilities.
- N. Address certain requirements of the Municipal Separate Storm Sewer System (MS4) National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Regulations.
- O. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code Chapter 93.4a to protect and maintain “existing uses” and maintain the level of water quality to support those uses in all streams, and to protect and maintain water quality in “special protection” streams.

These stormwater regulations are intended to make sure that flooding from small to large storm events, as defined in this Ordinance, does not worsen as land development continues to occur. These stormwater regulations are intended to be used in conjunction with existing floodplain regulations as established in the \_\_\_ Township Zoning Ordinance as Amended. All development activity within a Special Flood Hazard Area designated by the Federal Emergency Management Agency (FEMA) shall comply with the appropriate floodplain regulations of the \_\_\_ Township Zoning Ordinance as Amended. All development 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.

It is important to emphasize that both these comprehensive stormwater regulations as well as the Township’s floodplain regulations are limited to storm events up to the 100-year storm and/or 100-year flood. Larger events have occurred in the past and may occur in the future. **Adverse impacts from stormwater and resultant flooding generated from these larger events is likely to occur. The most effective approach to managing these larger events beyond the 100-year storm is through expanded floodplain management, as set forth in sections below.**

## \_\_\_ .2 STATUTORY AUTHORITY

\_\_\_ Township is empowered to regulate land use activities that affect stormwater runoff by the authority of the Pennsylvania Municipalities Planning Code, Act 247 of 1968, as amended by Act 170 of 1988, as further amended by Act 209 of 1990 and Act 131 of 1992, 53 P.S. Section 10101, as well as the Pennsylvania Environmental Amendment. Stormwater management is also enabled by Pennsylvania’s Stormwater Management Act of 1978 (Act 167), as amended, and \_\_\_ Township as a Municipal Separate Storm Sewer System under Phase II of the National Pollution Discharge Elimination System (NPDES) Storm Water Program of the Environmental Protection Agency (EPA) is empowered to regulate stormwater by the authority of the Clean Streams Law, 35 P.S. §691.1, et seq. and The Clean Water Act, 33 U.S.C. §1251, et seq.

## \_\_\_ .3 APPLICABILITY

These regulations apply to all areas of \_\_\_\_ Township and to:

- all activities governed by the Township Subdivision and Land Development Ordinance (SLDO), including construction of new buildings or additions to existing buildings;
- construction of separate or additional impervious or semi-pervious surfaces (driveways, parking lots, additions to buildings, etc.);
- other earth disturbance and earth moving activities, including diversion or piping of any natural or human-made stream channel;
- outdoor storage;
- any other land disturbances.

No land or waterway shall be used or modified, no earth shall be disturbed, stripped, or moved, and no structure or other impervious surface shall be built or extended without full compliance with the terms of this Ordinance and other applicable regulations. Additional provisions in the SLDO provide for erosion and sedimentation control.

#### **\_\_\_\_.4 REPEALER**

An ordinance inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

#### **\_\_\_\_.5 SEVERABILITY**

Should any section or provision of this Ordinance be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of any remaining provisions of this Ordinance.

#### **\_\_\_\_.6 COMPATIBILITY WITH OTHER REGULATORY REQUIREMENTS**

Approvals issued/actions taken pursuant to this Ordinance do not relieve the Applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. To the extent that this Ordinance is more stringent in terms of the standards applied for stormwater management, the specific stormwater management standards, design criteria, and other provisions contained in this Ordinance are to be followed. Where differences exist between provisions specified in this Ordinance and those in PADEP Phase II NPDES regulations, as amended, and/or those contained in future Act 167 stormwater management planning, the more stringent requirements should be followed. This Ordinance is intended to be compatible with the technical provisions set forth in the *Draft Pennsylvania Stormwater Best Management Practices Manual (April 15, 2006)*.

#### **\_\_\_\_.7 DEFINITIONS**

(See \_\_\_\_)

#### **\_\_\_\_.8 STANDARDS FOR PERMANENT STORMWATER MANAGEMENT**

All land disturbances as listed in Table \_\_\_\_-1 shall comply with provisions of this Ordinance.

<b>Table -1</b> <b>LAND DISTURBANCES REQUIRED TO COMPLY WITH SECTION</b>
1. All minor and major subdivisions and land developments where land disturbance exceeds 5,000 sq ft
2. An impervious cover addition to an existing developed property which exceeds 5 percent of lot area or 500 sq ft, whichever is smaller, on slopes greater than 8 percent, or which exceeds 10 percent of lot area or 1,000 sq ft, whichever is smaller, on slopes less than 8 percent
3. A semi-impervious cover addition (gravel, lattice blocks) to an existing developed property which exceeds 1,000 sq ft on slopes greater than 8 percent.
4. A temporary storage of impervious or pervious materials (rock, soil, etc.) on an existing developed property where ground contact coverage exceeds 5 percent of lot area of 4,000 sq ft (whichever is less), where the material is placed either on slopes exceeding 8 percent or on alluvial soils or a drainage way.

A. Permanent Stormwater Management Standards

The comprehensive stormwater management program for \_\_\_ Township is based on standards, as set forth below. Although the standards themselves must be satisfied, \_\_\_ Township through this Ordinance allows for and promotes flexibility in determining how these standards are achieved. Applicants for all new land developments are directed to follow the Site Planning and Design Procedure for Comprehensive Stormwater Management and are directed to complete the Checklist Summary for Comprehensive Stormwater Management (Appendix \_\_\_), which is defined in more detail below.

1. **Standard 1:** Post-development and after installation of impervious cover, there shall be no increase in the **total volume** of stormwater runoff being discharged from the development site area for up to the 2-year frequency rainfall, pre-development to post-development, calculated using a methodology as described in this Ordinance. Pre-development ground cover conditions are assumed to be “Woods – Good“ or “Meadow” for all areas of the development site area which are not impervious, as defined below. This runoff volume standard can be achieved through use of infiltration-oriented stormwater management practices, although other techniques for runoff volume control such as rain barrels, cisterns, vegetated roofs, etc. are also acceptable. First priority in stormwater management planning and satisfying this standard, as well as all standards listed in this Ordinance, should be given to use of preventive approaches as set forth in Appendix \_\_\_, which serve to reduce the total runoff volume requirement.
  - a. Adjustments for Standard 1
 

In cases where natural site conditions, as listed below, indicate that the pre-development runoff volume is greater than that indicated in Standard 1 above, applicants may request a:

**Partial Adjustment:** where a portion of the Standard 1 runoff volume requirement is waived but at least 50 percent of the Standard 1 runoff volume is provided (i.e., volume control is achieved for a lesser storm such as the 1-year storm or 6-month storm).

**Total Adjustment:** where less than 50 percent of the Standard 1 runoff volume requirement is provided.

The need for either a Partial or Total Adjustment must be based on demonstration by the applicant that existing soil, bedrock, water table, and/or other natural constraints are pervasive at the site, such that pre-development conditions generate substantially increased volumes of stormwater runoff before the proposed development occurs. Furthermore, such pre-development site constraints would also make infiltration-oriented best management practices to be used for volume control extremely difficult, if not impossible, to apply at the site. Partial and Total Adjustments are discouraged by the Township and will be issued only after thorough scrutiny has been directed toward all possible stormwater management options at all possible locations at the site, as defined below.

b. Criteria for Partial and Total Adjustments

Standard 1 may be waived (Partial or Total) in those situations where site constraints indicate that greater runoff volumes and reduced infiltration occur in the pre-development condition. Such natural site constraints include factors such as presence of bedrock at or near the surface (defined as less than 2 ft in depth) and/or presence of Seasonal High Water Table (SHWT, typically defined as at less than 2 ft), and/or presence of “heavy” soils with extremely low permeability (generally less than 0.25 inches per hour at or close to the surface). Adjustments are to be issued in only those cases where applicant has demonstrated that one or more of these conditions exist throughout the majority of the site, as defined below.

**Adjustments are not to be issued simply because a building program preferred by the applicant precludes otherwise feasible site areas from being utilized for stormwater management BMPs.** A related secondary consideration relates to the practicality of constructing volume control stormwater management practices within the proposed development area; although non-infiltration-oriented practices are options for use, infiltration-oriented systems are likely to be deemed most cost effective. As site size increases, all else being equal, use of infiltration-oriented practices becomes potentially more practicable and, therefore, obtaining a waiver should become more difficult because there is potentially greater unconstrained area and ability to accommodate both the building program and infiltration-oriented stormwater management systems.

To be considered for an Adjustment, applicant must submit the following:

- 1) **Extent of site area with SHWT (less than 2 ft):** as extent of site areas with SHWT increases, pre-development runoff volume increases, and feasibility for volume/infiltration BMPs decreases, given the inability of infiltration to occur when water table is high.
- 2) **Extent of site area with less than 2 ft to bedrock:** as extent of site areas with shallow depth to bedrock increases, pre-development runoff volume increases, and feasibility for

volume/infiltration BMPs decreases, given the inability of infiltration to occur.

- 3) **Extent of site area with less than 0.25 inches/hr permeability:** sites with extremely "heavy" soils in situ, regardless of Soil survey designations, indicate greater pre-development runoff volumes with lesser infiltration volumes. Soil permeability must be tested onsite. Preferred permeability rate after recommended soil testing should be 0.25 inches per hour (can be reduced to 0.10 inches per hour in those cases with low density is being proposed and large site areas are available for infiltration). Soils classified as Hydrologic Soil Group (HSG) D may be assumed to be infeasible without recommended soil testing. Soils classified as HSG C or B (virtually all soils in \_\_\_ Township) must be verified with additional soil testing as set forth in this Ordinance (see Appendix \_\_\_).
- 4) **Site area constrained by foundation/use required buffers:** practically speaking, buffers/setbacks must be established from
  - basement foundations (50 ft, assuming infiltration system is sub-surface)
  - onsite septic systems/drainfields (50 ft)
  - wells (100 ft)
  - other sensitive building program elements which could be affected by the addition of volume control infiltrated water as described below in this Ordinance.
- 5) **Size of site:** practically speaking, the larger the site, the more flexibility and opportunity for accommodating runoff volume/infiltration BMPs, all else being equal; as site size increases, waiver requirements grow more stringent. Size of site relates also to the extent of proposed building/impervious area. The more intense (defined both in terms of building coverage and total impervious area) the proposed building program, the more difficult accommodating the required runoff volume becomes.

If the total of infiltration-constrained areas, defined as that area which includes 1 or more of the above constraints, exceeds:

75 percent	for sites less than 5 acres
80 percent	for sites 5 to 10 acres
85 percent	for sites 10 acres or greater

of the total site area and no feasible site area (defined as free of any of the above constraining features) exists downgradient from any logical site building areas, then a Partial or Total Waiver may be issued by the Township. The applicant determines whether a Partial or Total Waiver is requested based on the specific site and the proposed building program. Waivers should only be issued in those cases where applicant has demonstrated that site areas free of constraints are not adequate and feasible for use as volume- and infiltration-oriented stormwater BMPs.

c. Off-Site Mitigation

If either a Partial or Total Adjustment is issued by \_\_\_ Township, an applicant is strongly encouraged to provide Off-Site Mitigation subject to the approval of the Township, prior to project commencement. Several Off-Site

Mitigation options may be approved by the Township, as below; any Off-Site Mitigation, to be approved by the Township, must satisfy runoff volume requirements set forth in Standard 1.

- 1) Off-Site Mitigation on privately owned lands within the same sub-basin, to be permanently eased and/or dedicated for conservation purposes.
- 2) Off-Site Mitigation on previously developed properties, public or private, and preferably nearby within the same sub-basin (as above), that currently lack stormwater management facilities designed and constructed in accordance with the purposes and standards of this Ordinance.

2. **Standard 2:** After installation of impervious cover and assuming full compliance with Standard 1, the peak rate of stormwater discharges from the site for all design storms up to and including a 100-year frequency storm, post-development, shall not exceed the peak discharges from the site from the same storms, before disturbance. Design storms for peak rate control include:

- **2-year, 24-hour storm**
- **5-year, 24-hour storm;**
- **10-year, 24-hour storm;**
- **25-year, 24-hour storm;**
- **50-year, 24-hour storm;**
- **100-year, 24-hour storm.**

If a Partial Adjustment has been issued with at least 50 percent of the volume requirement specified under Standard 1 provided, these Standard 2 provisions for peak rate also apply.

3. **Standard 3:** In those cases where a Total Adjustment from the Standard 1 volume requirement is issued, then **additional peak rate** standards must be met, so that the post-development peak rate discharges from the site

- for the 6-month to 2-year storms do not exceed 75 percent of pre-development peak rates,
- for 2-year storms up to the 10-year storm do not exceed 80 percent of pre-development peak rates
- for all storms larger than the 10-year storm, do not exceed 85 percent of pre-development peak rates.

These additional peak requirements are assumed to be satisfied if Off-Site Mitigation consistent with the above provisions in this Ordinance is provided within the same sub-basin, with the review and approval of the Township.

4. **Standard 4:** Significant loadings of nonpoint source pollutants shall not be discharged into either surface or groundwater. If the total runoff volume standard above is met as in Standards 1 (including if a Partial Adjustment for runoff volume control is approved by the Township) through application of infiltration-oriented practices or through any of the other potentially applicable volume control-oriented practices, then nonpoint source water quality impacts are assumed to be adequately controlled, with the review and approval of the Township. Notwithstanding the fact that Standard 1 is satisfied, the Township will want to make sure that any areas of post-development uncontrolled flow, if they exist, are not contributing nonpoint source loads; if such areas do exist, additional water quality controls as specified below may

be required by the Township. If Off-Site Mitigation is provided and approved, \_\_\_\_ Township may after review conclude that this Standard 4 water quality requirement is also achieved.

If the requirements set forth in Standard 1 above are not achieved and a Total Adjustment is issued by the Township, then an additional water quality requirement must be met in order to guarantee that adverse water quality impacts will not result from the proposed development action. Water quality-oriented Best Management Practices (BMP) designed to capture and treat stormwater generated for up to the 1-inch rainfall event for all site areas being disturbed must be employed. These BMPs include, but are not limited to:

- **Constructed wetlands/wetland forebays**
- **Retention ponds/extended detention ponds**
- **Filters (sand-peat, underground sand, perimeter sand filter, organic sand, pocket sand filter, gravel, others)**
- **Grassed/vegetated swales and channels**
- **Vegetated filter strips**
- **Other bioretention BMPs**

**In these cases of Total Adjustments, applicants must demonstrate that for stormwater runoff generated for up to the 1-inch rainfall event for all site areas being disturbed, two BMPs from the above list are employed to treat stormwater runoff in sequence.** This dual treatment is required because research findings relating to pollutant removal effectiveness has demonstrated that infiltration BMPs are substantially more effective at pollutant removal (non-soluble pollutants) than the primarily non-infiltration BMPs listed above. BMP selection, design, and implementation shall be based upon appropriate reference materials such as the existing *Pennsylvania Handbook of Best Management Practices for Developing Areas, Design of Stormwater Filtering Systems, PADEP's Draft Pennsylvania Stormwater Best Management Practices Manual* as amended, and other sources.

5. **Special Provisions for "Hot Spot" Land Uses:** For all those projects involving land uses considered to be high pollutant producers or "hotspots" (see Table \_\_\_\_-2; e.g., vehicle service and maintenance facilities, vehicle salvage yards and recycling facilities, vehicle and equipment cleaning facilities, fleet storage areas for buses, trucks, etc., industrial/commercial or any hazardous waste storage areas or areas that generate such wastes, industrial sites, fast food businesses and convenience stores, any activity involving chemical mixing or loading/unloading, outdoor liquid container storage, public works storage areas, commercial container nurseries, and some high traffic retail uses characterized by frequent vehicle turnover), additional water quality requirements may be imposed by the Engineer in addition to those included in Standard 4 above in order to remove potential pollutant loadings from entering either groundwater or surface water systems. These pre-treatment requirements are included in Tables \_\_\_\_-2 and \_\_\_\_-3.

**Table -2. Pre-Treatment Options for Stormwater Hot Spots**

<b>Stormwater Hot Spots</b>	<b>Minimum Pre-Treatment Options</b>
Vehicle Maintenance and Repair Facilities	A, E, F, G
Vehicle Fueling Stations	A, D, G
"Fast Food" Establishments	B, C, D, I, K
Convenience Stores	B, C, D, I, K
Storage Areas for Public Works	A, B, D, E, F, G, H
Outdoor Storage of Liquids	G
Commercial Nursery Operations	I, J, L
Salvage Yards and Recycling Facilities*	M
Fleet Storage Yards and Vehicle Cleaning Facilities*	M
Facilities that Store or Generate Regulated Substances*	M
Marinas*	M
Certain Industrial Uses (listed under NPDES)*	M
Other Uses or Activities Designated by Appropriate Authority	As Required

\*Regulated under the NPDES Stormwater Program

Note: As used in this list, the term "Regulated Substances" shall mean any substances regulated under federal, state, or county environmental, pollution control, hazardous substance, and drinking water laws and regulations.

**Table -3. Minimum Pre-Treatment Options**

<b>Minimum Pre-Treatment Options</b>	
A	Oil/Water Separators
B	Sediment Traps/Catch Basin Sumps
C	Trash/Debris Collectors in Catch Basins
D	Water Quality Inserts for Inlets
E	Use of Drip Pans and/or Dry Sweep Material under Vehicles/Equipment
F	Use of Absorbent Devices to Reduce Liquid Releases
G	Spill Prevention and Response Program
H	Diversion of Stormwater away from Potential Contamination Areas
I	Vegetated Swales/Filter Strips
J	Constructed Wetlands
K	Stormwater Filters (Sand, Peat, Compost, etc.)
L	Stormwater Collection and Reuse (especially for irrigation)
M	BMPs that are a part of a Stormwater Pollution Prevention Plan (SWPPP) under a NPDES Permit

6. **Additional Requirements:** Under certain conditions, the Township, upon recommendation by the Township Engineer, may impose the following additional restrictions on stormwater discharges:
  - a. Peak discharge may be further restricted when it can be shown that a probable risk to downstream structures or unique natural areas exists or that existing severe flooding problems could be further aggravated.

- b. Measures shall be imposed to protect against ground or surface water pollution where the nature of the soils or bedrock underlying a stormwater management structure constitutes substantial risk of contamination, such as might be the case in limestone formations. Special provisions to be followed in these cases will be provided by the Township Engineer.
- c. Where groundwater yields are very low or where a groundwater supply already is heavily used, the Township may require that the entire volume of the 2-year frequency rainfall (3.3 inches in 24 hours) be retained and infiltrated. If substantial irrigation needs are anticipated, portions of stored stormwater may be re-used for irrigation purposes.

B. Incentives for Environmentally Sensitive Conservation Design: Credits

As set forth in the Site Planning and Design Procedure for Comprehensive Stormwater Management, (Appendix \_\_\_), it is the intent of \_\_\_ Township to maximize use of preventive non-structural Best Management Practices (BMPs) in new land developments. These non-structural BMPs can be grouped as involving several different areas of site planning and design, all of which are further specified in more detail as separate BMPs in PADEP's *Draft Pennsylvania Stormwater Best Management Practices Manual (April 15, 2006)* as amended:

- Lot Configuration and Clustering
- Minimum Disturbance/Minimum Maintenance
- Impervious Coverage
- Disconnection/Distribution/Decentralization
- Source Control

Most of these non-structural BMPs typically have not been applied by site engineers and designers in the past; their application needs to be encouraged through reasonable and appropriate incentives, although some of these non-structural BMPs are methodologically self-crediting to some extent. The procedures set forth in Appendix \_\_\_ (Recommended Methodological Procedures, Including Measures to Integrate Non-Structural and Structural BMPs) include a variety of incentives which are designed to promote application of these non-structural BMPs. These procedures encourage environmentally sensitive, conservation-oriented site planning and design and are strongly encouraged by \_\_\_ Township.

C. Stormwater Management Calculation Methods

A variety of provisions which relate to stormwater calculation methodologies and assumptions used in stormwater calculations are set forth in this section of the Ordinance. These provisions must be satisfied; in some cases, alternative approaches and assumptions may be acceptable when approved by the Township. Applicants must be able to demonstrate that the standards set forth in this Ordinance are being achieved.

Because the standards in this Ordinance typically exceed standard engineering applications of standard engineering methodologies, including total runoff volume control, as well as peak rate control and water quality control and because considerable emphasis is placed on both preventive non-structural practices as well as mitigative structural practices to be accomplished through the Site Planning and Design Procedure for Comprehensive Stormwater Management (Appendix \_\_\_),

- 1. In establishing the antecedent conditions for calculating runoff prior to land disturbance, the following assumptions shall apply:
  - a. Average antecedent moisture conditions;

- b. A Type II distribution storm (as defined by the USDA-NRCS pursuant to the TR-55 methodology);
- c. "Woods – Good" shall be used as the pre-development curve number condition for those portions of the site having trees with greater than 6 inches caliper DBH or where such trees existed within 3 years of application;
- d. "Meadow" shall be used for all other pervious areas including areas of existing cultivation;
- e. In performing calculations an "averaged" or "weighted curve number" approach for the total site area, pervious and impervious, is not acceptable. Calculations must be performed separately for pervious and impervious areas and then summed for the total runoff calculation.
- f. For those sites where undisturbed open space is proposed, this undisturbed open space need not be included in the runoff calculations, provided that applicants make reasonable guarantee that these areas will remain as undisturbed open space.

- 2. In all plans and designs for stormwater management system and facilities submitted to the Township Engineer for approval, the Township recommends that stormwater peak discharge and runoff shall be determined through the use of the Soil Cover Complex Method as set forth in Urban Hydrology for Small Watersheds, Technical Release No. 55, with specific attention given to antecedent moisture conditions, flood routing, and peak discharge specifications included therein and in Hydrology National Engineering Handbook, Section 4, both by US Department of Agriculture, Natural Resources Conservation Service (Soil Conservation Service). Note that use of TR-55 with many of the natural system-based approaches and practices recommended by this Ordinance requires that calculations be performed on a detailed small sub-area basis. Although the Soil Cover Complex Method does have various methodological shortcomings, it is widely acknowledged as a reasonable methodology for performing stormwater runoff calculations.

The Township Engineer may permit the use of the Rational Method for calculation of runoff on land developments of 10 acres or less and for the design of storm structures. Additional stormwater calculation methodologies which may be approved by the Township Engineer are set forth in Table \_\_\_-4.

- 3. In calculating runoff after development, those areas covered by concrete lattice blocks on an appropriate base, porous pavement areas on an appropriate base, and roof areas which drain to properly designed and installed storage/groundwater infiltration beds, shall be considered adequate to infiltrate any increased runoff from a 2-year storm.

D. Special Standards Applicable during the Land Disturbance Process

- 1. During the period of land disturbance, when significant sediment can be contained in runoff, this runoff shall be controlled prior to entering any proposed infiltration area.
- 2. Peak discharges and discharge volumes from the site shall comply with the appropriate sections above, with the following additions:
  - a. For purposes of calculating required detention storage during land

disturbance, peak discharges and discharge volumes shall be calculated based upon the runoff coefficients for bare soils during the maximum period and extent of disturbance. Controls shall insure that the difference in volumes and rates of peak discharge before disturbance and during shall not exceed those peak discharges and discharge volumes noted above. It should be understood that detention storage during the period of land disturbance and prior to establishment of permanent cover may require additional facilities on a temporary basis. Such measures shall be located so as to preserve the natural soil infiltration capacities of the planned infiltration bed areas.

- b. Wherever soils, topography, cut and fill or grading requirements, or other conditions suggest substantial erosion potential during land disturbance, the Township, as recommended by the Township Engineer, may require that the entire volume of all storms up to a 2-year storm from the disturbed areas be retained on site and that special sediment trapping facilities (such as check dams, etc.) be installed.
  - c. Sediment in runoff water shall be trapped in accordance with criteria of the \_\_\_\_\_ County Conservation District and PADEP and removed through means approved by the Township Engineer to assure proper functioning and adequate capacity in the basins or traps.
3. Procedures shall be established for protecting soils or geologic structures with water supply potential from contamination by surface water or other disruption by construction activity.

**Table \_\_\_-4 Computation Methodologies for Stormwater  
Runoff Calculations in \_\_\_\_\_ Township, \_\_\_\_\_ County PA**

METHOD	SOURCE	APPLICABILITY
TR-55 or Commercial Package Based on TR-55: Soil Cover Complex*	USDA – NRCS	Applicable for plans within the model's limitations
TR-20 or commercial Package Based on TR-20	USDA – NRCS	When use of full model is desirable or necessary
HEC – HMS	U.S. Army Corps of Engineers	When full model is desirable or necessary
PSRM	Penn State University	When full model is desirable or necessary
VT/PSUHM	Virginia Polytechnic Institute & Penn State University	When full model is desirable or necessary
Modified Rational Method or Commercial package based on this method	Emil Kuiching (1889)	For sites less than 20 acres
SWMM or commercial package based on SWMM	U.S. EPA	Most applicable in urban areas
Small Storm Hydrology Method (as included in SLAMM)	PV & Associates, or the website <a href="http://www.winslamm.com">www.winslamm.com</a>	Calculation of runoff volume from urban and suburban areas
Other Methods	Various	As approved by the municipal engineer

\*Deemed acceptable by the Township Engineer; other methodologies are acceptable with the review and approval of the Township Engineer.

## .9 SPECIFIC STORMWATER MANAGEMENT SYSTEM DESIGN REQUIREMENTS

### A. Infiltration/Recharge Facilities

1. Infiltration devices shall be selected based on suitability of soils and site conditions. Measures may include porous pavement with underground infiltration beds, vegetated infiltration beds, swales and filter strips, trenches and other seepage structures as described in PADEP's *Draft Pennsylvania Stormwater Best Management Practices Manual (April 15, 2006)*, the *Pennsylvania Handbook of Best Management Practices for Developing Areas (1998)*, related references prepared by the USEPA, the Washington Metropolitan Council of Governments, the Center for Watershed Protection, the USDA-NRCS, and other guidance documents.
2. Site infiltration and soil permeability tests shall be performed for all proposed infiltration areas; these tests shall include evaluation of selected soil horizons using acceptable techniques such as test pits with permeability measurements, taken at the base elevation of the proposed infiltration system. Care must be taken to avoid compaction in the testing process. Site Infiltration and Soil Testing protocols are set forth in Appendix      and should be reviewed and approved by the Township Engineer in advance. The soil infiltration rate of discharge from the infiltration area being used in the proposed design shall be based on these measurements. Minimum permeability of 0.25 inches per hour is customary, although under certain circumstances where substantial site area is available (i.e., low density or low intensity development), a rate as low as 0.10 inches per hour is acceptable.
3. The lowest elevation of the infiltration area shall be at least two (2) feet above the Seasonal High Water Table (SHWT) and bedrock, except in the case of limestone formations, in which case the distance shall be four (4) feet.
4. All roof drains shall discharge to infiltration systems, unless specifically approved by the Township Engineer, with appropriate measures such as leaf traps and cleanouts taken to prevent clogging by vegetation.
5. All infiltration systems shall have appropriate positive overflow controls to prevent storage within one (1) foot of the finished surface or grade.
6. All infiltration systems shall have a setback of fifteen (15) from all residential structures. Care should be taken to prevent any seepage into sub-grade structures. Infiltration systems greater than three (3) feet deep shall be located at least fifty (50) feet from any basement wall, wastewater treatment or wastewater treatment system replacement area. Any recharge system designed to handle runoff from any commercial or industrial impervious parking or outside storage areas shall be a minimum of one hundred (100) feet from any water supply well and fifty (50) feet from any wastewater treatment or wastewater treatment system replacement area.
7. All infiltration systems shall be designed to infiltrate the stored volume within seventy-two (72) hours; this limit may be extended with approval from the Township Engineer.
8. All surface inflows shall be designed to prevent the discharge of sediment into the infiltration system; accumulated sediment reduces stormwater storage capacity and ultimately clogs the infiltration mechanism. If sediment is reasonably expected to be generated, treatment to remove this sediment prior to entering the infiltration device

must be provided. No sand or other particulate matter may be applied to a pervious surface for winter ice conditions.

9. Construction Phase Precautions. During site construction all infiltration system 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. All areas designated for infiltration shall not receive runoff until the contributory drainage area has achieved final stabilization. These provisions should be included in the specifications provided for the proposed development.
10. System Overflow Design. All infiltration facility designs shall incorporate measures to provide for the overflow of runoff which exceeds the capacity of the proposed system, either in those cases of larger storm events or in those cases where the proposed system becomes clogged or otherwise dysfunctional, without increasing erosion or creating damage to any other stormwater management system components.
11. Special Construction Requirements. The following procedures and materials shall be required for all sub-surface infiltration facilities during construction:
  - a. Excavation for the infiltration facility shall be performed with equipment which will not compact the bottom of the infiltration bed/trench, or like facility. Proper sequencing of excavated material and placement of gravel and other material also can minimize compaction.
  - b. The bottom of the infiltration bed and/or trench shall be scarified prior to the placement of filter fabric and aggregate.
  - c. Only clean aggregate, free of fines, shall be allowed.
  - d. The top, bottom, and sides of all infiltration beds, trenches, or like facilities shall be covered with drainage filtration fabric in order to prevent the migration of sediment and soil from migrating into the infiltration system and causing clogging.
  - e. Perforated distribution pipes connected to centralized catch basins and/or manholes with provisions for the collection of debris shall be provided in all facilities. The perforated pipes shall distribute stormwater throughout the entire infiltration bed/trench, or like facility.
  - f. A positive outlet drain pipe placed at the top of the infiltration bed and/or trench or like facility shall be provided to safely convey larger storms events, as needed. Provision for positive outlet drains also may be made at lower elevations in the infiltration facility in those cases where permeability of the soil is near the lower acceptable limit and concern exists that water may remain in the infiltration facility for extended periods.
  - g. Observation ports should be included in sub-surface infiltration facilities whenever feasible, in order to evaluate their successful functioning.

#### B. Extended Detention and Retention Basin Facilities

Extended detention basins may be used in \_\_\_ Township to satisfy peak rate control Standards 2 and 3 (Standard 4 to a very limited extent). Extended detention basins must be designed to drain completely within an acceptable period of time, in order to eliminate mosquito generation and other problems. Retention basins are defined as having a permanent pool of water and must be designed

and maintained to be aquatically successful with a healthy biota. Additional specifications for extended detention basins and retention basins beyond that which is provided in this Ordinance are included in PADEP's *Draft Pennsylvania Stormwater Best Management Practices Manual (April 15, 2006)* and other sources. It is important to note that design and development of successful retention basins is difficult and must be guided not only by in situ stormwater management needs, but also by the requirements for healthy wet pond development.

1. Basin Design Criteria. The following design criteria shall be used in the design of all detention basins in \_\_\_\_ Township. The basins shall be designed to detain the quantity of water resulting from storms from the 2, 5, 10, 25, 50 and 100 year twenty-four (24) hour storms (see the USDA-NRCS Technical Release No. 55) under full development conditions released at a maximum outflow rate equal to that resulting from the same storms under existing (pre-development) conditions. In addition, standards set forth above which further reduce pre-development to post-development peak rates of runoff where runoff volume control is not being provided also are applicable (Standard 3). If an Act 167 stormwater management plan for any designated watershed in \_\_\_\_ is completed in the future and generates more specific peak rate control standards, these standards would also apply and would supersede standards set forth in this ordinance, to the extent that such 167 standards were more stringent than those included in this Ordinance. All flows in excess of the above mentioned standard(s) shall flow over an emergency spillway.
2. Riser. A riser or other acceptable outfall shall be provided at the outlet of all detention basins. The riser shall be constructed of precast or poured in place concrete with controlled orifices. The riser shall extend to an elevation one (1) foot below the crest elevation of the emergency spillway. The riser shall be designed so that the rate of outflow is controlled by the pipe barrel through the basin berm when the depth of water within the basin exceeds the height of the riser. A trash rack or similar appurtenance shall be provided to prevent debris from entering the riser. All risers shall have a concrete base attached with a watertight connection. The base shall be of sufficient weight to prevent flotation of the riser. An anti-vortex device shall be provided on the top of the riser.
3. Maximum Depth of Detention Basins. The maximum depth of water in a detention basin shall be three (3) feet unless a greater depth is approved by the Township Engineer. The minimum depth of permanent water in a retention basin shall be four (4) feet.
4. Emergency Spillway. Whenever possible, the emergency spillway for detention/retention basins shall be constructed on undisturbed ground. Emergency spillways shall be designed according to the USDA-NRCS Engineering Field Manual. All emergency spillways shall be constructed so that the detention/retention basin berm is protected against erosion. The minimum capacity of all emergency spillways shall be such that the combined capacity of the emergency spillway and the principal pipe barrel equal the peak flow rate from the one hundred (100) year design storm. Emergency spillways shall extend along the upstream and downstream berm embankment slopes. The upstream edge of the emergency spillway shall be a minimum of two (2) feet below the spillway crest evaluation. The downstream edge of the spillway shall, as a minimum, extend to the toe of the berm embankment. The emergency spillway shall not discharge over earthen fill and/or easily erodible material.
5. Anti-Seep Collars. Anti-seep collars shall be installed around the principal pipe barrel within the normal saturation zone of the detention/retention basin berms. The

anti-seep collars and their connections to the pipe barrel shall be watertight. The anti-seep collars shall extend a minimum of two (2) feet beyond the outside of the principal pipe barrel. The maximum spacing between collars shall be fourteen (14) times the minimum projection of the collar measured perpendicular to the pipe.

6. Freeboard. Freeboard is the difference between the design flow elevations in the emergency spillway and the top of the settled detention/retention basin embankment. The minimum freeboard shall be one (1) foot.
7. Slope of Extended Detention/Retention Basin Embankment. Extended detention/retention basins shall be designed to utilize the natural contours of the land. When such design is impracticable, the construction of the basin shall utilize slopes as shallow as possible to blend the structures into the existing terrain. The maximum slope of earthen extended detention/retention basin embankments shall meet the requirements set forth below. Whenever possible, the side slopes and basin shape shall blend with the natural topography. Straight side slopes and rectangular basins shall be avoided whenever possible. The use of multiple extended detention facilities, which are smaller and less intrusive on the site, is encouraged to meet the requirements.
8. Width of Berm. The minimum top width of extended detention/retention basin berms shall be ten (10) feet.
9. Slope of Basin Bottom. In order to insure proper drainage of the extended detention/retention basin, a minimum grade of two (2) percent shall be maintained for all sheet flow. A minimum grade of one (1) percent shall be maintained for all channel flow.
10. Energy Dissipators. Energy dissipating devices (rip-rap, end sills, etc.) shall be placed at all basin outlets. Any pipe or other component which discharges directly into the basin shall be equipped with energy dissipating devices and shall outlet into the bottom of the basin.
11. Design Information. As part of the stormwater management plan and report, all design information shall be submitted, including, but not limited to, the following:
  - a. A sketch of the berm embankment and outlet structure indicating the embankment top elevation, embankment side slopes, top width embankment emergency spillway elevation, perforated riser dimensions, pipe barrel dimensions, and dimensions and spacing of anti-seep collars.
  - b. Design computations for the pipe barrel and riser.
  - c. Stage-storage data (cubic-feet vs. elevation) and all supporting computations.
  - d. Flood routing computations utilizing computer analysis of generally accepted format.
  - e. A detailed plan of the trash rack and anti-vortex device.
  - f. A plan, at a scale of one (1) inch equals fifty (50) feet, showing the grading, landscaping, and fencing around the detention/retention basin, if so required by the Board of Supervisors.

12. Landscaping and Grading of Extended Detention/Retention Basins. All landscaping and grading standards shall be as follows:

- a. Stormwater management facilities shall not be constructed in wooded areas if alternative locations exist which will not require disturbance of wooded areas. Clearing of existing trees in order to construct stormwater management basins should be avoided unless no other alternatives exist.
- b. Facilities which are constructed in wooded areas shall have side slopes of three (3) horizontal to one (1) vertical. These slopes shall be seeded with a non-mowable ground cover such as crown vetch.
- c. Facilities which are constructed in non-wooded areas shall have the following slope requirements:
  - slopes ranging from; three (3) horizontal to one (1) vertical; to but not including five (5) horizontal to one (1) vertical are permitted if seeded with a non-mowable ground cover such as crown vetch.
  - slopes of five (5) horizontal to one (1) vertical or less are permitted and may be seeded with a mowable lawn or grass cover.
- d. The top of any fill or toe of the slope of any fill shall be located twenty-five (25) feet from any property line with the exception of a downstream property line where the toe of the embankment shall be placed a sufficient distance to allow for energy dissipating devices, but in no case less than forty (40) feet unless approved otherwise by the Township.

13. Open Space and Storm Management Areas.

- a. Planting Requirements. All proposed stormwater management areas which are also proposed for recreational use, whether active or passive, shall be planted to effectively naturalize the areas to become an integral and harmonious element in the natural landscape.
- b. Drainage Channels. All storm drainage channels, whether existing or proposed, shall be graded and planted as effectively naturalized areas so as to become an integral and harmonious part of the landscape; planting should taken into account contour, slope, and type of plant material employed.
- c. All earthen basins shall be hydroseeded with temporary and permanent grasses or other approved ground covers within seventy-two (72) hours after final grading.
- d. Fencing or vegetative screening shall be provided if required by the Planning Commission and/or Board of Supervisors.

C. Stormwater Collection (Drainage) System Design Requirements

1. Design Flow Rate. The storm drain system, to the extent that it is necessary, shall be designed to carry a twenty-five (25) year peak flow rate, and a fifty (50) year peak flow rate at the sump area. The design twenty-five (25) year peak flow rate into each inlet shall be indicated on the stormwater management plan. The twenty-five (25) year flow rate (the Township Engineer may increase this to the 50-year

flow rate if the proposed development is 50 percent impervious or more) shall be determined by the rational formula,  $Q=CIA$ . Where:

Q = Peak runoff rate, cubic feet per second (cfs):

C = Runoff coefficient equal to the ratio of the runoff rate to the average rate of rainfall over a time period equal to the time of concentration;

I = Average rainfall intensity to inches per hour for a time equivalent to the time of concentration;

A = Drainage area in acres.

Approximate values for the runoff coefficient and rainfall intensity can be found in the following source:

Commonwealth of Pennsylvania  
Department of Transportation  
Design Manual, Part 2  
Highway Design Chapter 12

2. **Overflow System.** An overflow system shall be provided to carry flows safely when the capacity of the stormwater collection system as proposed is exceeded. The overflow system shall be of sufficient capacity to carry the difference between the hundred (100) year and the twenty-five (25) year peak flow rates.
3. **Inlet Capacity.** All inlets, when utilized, must be designed to accommodate the twenty-five (25) year peak flow rate. The capacity of all C, M or S type inlets shall be determined from the following source:

Commonwealth of Pennsylvania  
Department of Transportation  
Design Manual, Part 2 Highway Design

The capacity of each inlet shall be indicated in the design calculations.

4. **Straight Pipe Sections.** Wherever possible, all storm drain pipes, when utilized, shall be designed to follow straight courses. No angular deflections of storm sewer pipe sections in excess of five (5) degrees shall be permitted. No vertical curves shall be permitted in the storm drain pipe system.
5. **Minimum Grade and Size.** All storm drain pipes shall be designed to maintain a minimum grade of one-half (1/2) percent. All storm pipes shall have a minimum inside diameter of fifteen (15) inches, except that pipes under a twenty-five (25) or greater fill shall not be less than twenty-four (24) inches, or a cross-sectional area of four hundred fifty-three (453) square inches.
6. **Pipe Material and Thickness.** All storm sewers shall be reinforced concrete or corrugated metal pipe of the proper class and thickness to support the loads and fill material and meet the life expectancy requirements of PADOT for local roads. The use of smooth-lined, corrugated polyethylene pipe shall be reviewed and approved by the Township Engineer on a case-by-case basis.
7. **Pipe Capacity.** The capacity of all pipe culverts shall, as a minimum, provide the required carrying capacity as determined by the following sources:

United States Department of Commerce  
Bureau of Public Roads  
Hydraulic Engineering Circular No. 5  
Hydraulic Charts for the Selection of Highway  
Culverts

United States Department of Commerce  
Bureau of Public Roads  
Hydraulic Engineering Circular No. 10  
Capacity Charts for the Hydraulic Design of Highway  
Charts

8. Pipe Arches. Where headroom is restricted, equivalent pipe arches may be used in lieu of circular pipes.
9. Allowable Headwater Depth. At all inlets or manholes, the maximum allowable headwater depth shall be one (1) foot below the top of the inlet grate or the manhole cover.
10. Horizontal Pipe Deflections. A manhole or inlet shall be provided at all horizontal deflections in the storm pipe system exceeding five (5) degrees.
11. Minimum and Maximum Cover. A minimum of eighteen (18) inches of cover shall be maintained over all storm drain pipes. The top of storm drain pipes shall be at least one-half (1/2) foot below subgrade elevation.
12. Diversion of Runoff. All storm drain pipes shall be designed to carry the runoff into a stormwater management practice facility adequate to control the proposed volume, rate, and quality of runoff in accord with the standards set forth in this Ordinance. No discharge at the top or side of basin embankments will be permitted.
13. Culverts and Drainage Channels.
  - a. Design Flow Standard. All culverts and drainage channels, except those utilized for conveying existing stream flow, shall be designed to carry a flow rate equal to a fifty (50) year, twenty-four (24) hour storm. All culverts and drainage channels utilized for conveying existing stream flow shall be designed to carry a flow rate equal to a one hundred (100) year, twenty-four (24) hour storm (USDA-NRCS Technical Release No. 55).
  - b. Erosion Prevention. All drainage channels shall be designed to prevent the erosion of the bed and bank areas. The flow velocity in all vegetated drainage channels shall not exceed three (3) feet per second to prevent erosion unless special provisions are made to protect banks and channel bottoms against erosion. Water course erosion protection measures such as jute matting, wood excelsior blanket, or nylon erosion control mat are required to prevent erosion of the drainage channels. Where storm sewers discharge into existing drainage channels at an angle greater than thirty (30) degrees from parallel with the downstream channel flow, the far side bank shall be stabilized by the use of rip-rap or masonry, and/or concrete walls. The stabilization shall be designed to prevent erosion and frost heave under and behind the stabilizing media.

- c. Maximum Side Slope. Any vegetated drainage channel requiring mowing of the vegetation shall have a maximum grade of five (5) horizontal to one (1) vertical on those areas to be mowed.
- d. Design Standard. Because of the critical nature of the vegetated drainage channels, the design of all vegetated channels shall, as a minimum, conform to the design procedures outlined in the PADEP, Erosion and Sediment Pollution Control Program Manual. Several acceptable sources outline procedures for non-vegetated drainage channels, including the following:
  - United States Department of Commerce  
Bureau of Public Roads  
Hydraulic Engineering Circular No. 5  
Hydraulic Charts for the Selection of Highway  
Culverts
  - Federal Highway Administration  
Hydraulic Engineering Circular No. 13  
Hydraulic Design of Improved Inlets for Culverts
- e. Reference to publications and source documents in this Ordinance shall be deemed to include any amendments and revisions thereof.

**\_\_\_10 RIPARIAN BUFFER ZONE (RBZ) MANAGEMENT**

(Note to \_\_\_ Township: we are including 6 special resource area sections here, 414.10 through 414.15, which deal with management of stormwater-related features in indirect, though important ways. Although it is appropriate to include these provisions in subdivision/land development regulations, virtually all of these provisions should also be included in the zoning ordinance, in most cases as regulatory “overlays,” in order to reinforce their effectiveness. In some cases, such as floodplain protection and steep slopes, \_\_\_ Township already has some degree of regulation provided; however, these proposed regulations provide substantially more comprehensive management of the resource. In other cases, such as the Riparian Buffer Zone below, no regulation and overall management is currently provided and needs to be included if the Township is to have a comprehensive stormwater management program.)

The purpose of this section of the Ordinance is to:

- Regulate the land use, siting, and engineering of all development to be consistent with the intent and objectives of this ordinance, accepted conservation practices, so as to respect the carrying capacity of existing natural resources as further development occurs.
- Reduce the amount of nutrients, sediment, organic matter pesticides, and other harmful substances that reach watercourses, wetlands, and other surface water bodies as well as subsurface waters by optimizing scientifically-proven processes including filtration, deposition, absorption, adsorption, plant uptake, biodegradation, denitrification through stabilizing concentrated flows and encouraging distributed sheet flow, and by improving infiltration in all watersheds and especially in watersheds designated as Special Protection Waters by the Commonwealth of Pennsylvania.
- Provide for shading (i.e., cooling) of the aquatic environment so as to moderate temperatures, protect fish habitat, retain more dissolved oxygen, and encourage the growth of diatoms, beneficial algae, and aquatic insects in all watersheds and especially in

watersheds designated as Special Protection Waters by the Commonwealth of Pennsylvania.

- Provide organic matter through leaf debris which falls into the stream and becomes trapped by woody debris (fallen trees and limbs) and rocks where such provides food and habitat for small bottom dwelling organisms (insects, amphibians, crustaceans, and small fish), essential to maintain the food chain in all watersheds and especially in watersheds designated as Special Protection Waters by the Commonwealth of Pennsylvania.
- Increase stream bank stability and maintain natural fluvial geomorphology of the stream system, reducing streambank erosion and sediment production and protecting fish habitat in all watersheds and especially in watersheds designated as Special Protection Waters by the Commonwealth of Pennsylvania.
- Conserve the natural features important to land and water resources (e.g., headwater areas, groundwater recharge zones, floodway, floodplain, springs, streams, wetlands, woodlands, prime wildlife habitats) and other features constituting high recreational value or containing amenities that exist on developed and undeveloped land.
- Conserve natural, scenic, and recreation areas within and adjacent to stream areas for the community's benefit, promoting the positive functions of greenways.
- Improve and maintain the safety, reliability and adequacy of the water supply for domestic, agricultural, commercial, industrial and recreational uses along with sustaining diverse populations of aquatic flora and fauna.
- Work with floodplain and other ordinances that regulate environmentally sensitive areas to minimize hazards to life, property, and stream features.
- Assist in the implementation of pertinent state laws concerning erosion and sediment control practices.

#### A. Riparian Buffer Zone (RBZ) Definition

Areas immediately adjacent to the Township's perennial streams and waterways as mapped on US Geological Survey 1:24,000-scale quadrangle maps shall be defined as the Riparian Buffer Zone (RBZ). In the RBZ, special requirements as set forth in this section shall apply in order to maintain important natural functions. These RBZ requirements are based on both the heightened sensitivity of the RBZ zone in terms of stormwater-related impacts and the potential to negatively impact the stream system when the vegetation and soil of this RBZ zone is disturbed. Additionally, the RBZ has the potential to mitigate to the maximum extent the negative effects of development in areas adjacent to the stream system. The RBZ shall include three sub-zones, Zones 1 through 3, extending landward from the top of the streambank where different requirements are imposed:

1. Zone 1, a 25-foot setback zone/increased to a 50-foot setback zone in Special Protection Waters, measured from the top of the bank of the waterbody, where no disturbance of vegetation and soil except for restoration shall occur, in order to shade the stream with natural vegetation, to provide a source of numerous other organic inputs to the aquatic system, to anchor the streambank and floodplain areas, and to consume and otherwise remove nitrogen, sediment, and other substances which can adversely affect stream systems.
2. Zone 2, a 75-foot managed buffer zone/increased to a 150-foot managed buffer zone in Special Protection Waters, extending outward from Zone 1, where disturbance of natural vegetative cover shall be limited to selective logging and other activities which