

# **STORMWATER MANAGEMENT ORDINANCE**

**ORDINANCE NO. 2022 - 02**

**Upper Augusta Township**

**Northumberland County, Pennsylvania**

**Adopted at a Public Meeting Held on**

**December 5th, 20 22**

<b>Article I – General Provisions</b> .....	<b>1-2</b>
Section 101.....Short Title	1
Section 102.....Statement of Findings	1
Section 103.....Purpose	1
Section 104.....Statutory Authority	2
Section 105.....Applicability	2
Section 106.....Repealer	2
Section 107.....Severability	2
Section 108.....Compatibility with Other Requirements	2
Section 109.....Erroneous Permit	2
Section 110.....Waivers	2
<b>Article II – Definitions</b> .....	<b>3-6</b>
<b>Article III – Stormwater Management Standards</b> .....	<b>7-19</b>
Section 301.....General Requirements	7
Section 302.....Exemptions	8
Section 303.....Volume Controls	8
Section 304.....Rate Controls	10
Section 305.....Riparian Buffers	10
Section 306.....Technical Standards	11
<b>Article IV – Stormwater Management Site Plan Requirements</b> .....	<b>20-22</b>
Section 401.....Plan Requirements	20
Section 402.....Plan Submission	21
Section 403.....Plan Review	21
Section 404.....Modification of Plans	21
Section 405.....Resubmission of Disapproved SWM Site Plans	21
Section 406.....Authorization to Construct and Term of Validity	21
Section 407.....As-Built Plans, Completion Certificate and Final Inspection	22
<b>Article V – Operation and Maintenance</b> .....	<b>23</b>
Section 501.....Responsibilities of Developers and Landowners	23
Section 502.....Operation and Maintenance Agreements	23
Section 503.....Performance Guarantee	23
<b>Article VI – Fees and Expenses</b> .....	<b>24</b>
Section 601.....General	24
Section 602.....Expenses Covered By Fees	24
<b>Article VII – Prohibitions</b> .....	<b>25</b>
Section 701.....Prohibited Discharges and Connections	25
Section 702.....Roof Drains and Sump Pumps	25
Section 703.....Alteration of SWM BMPs	25
<b>Article VIII – Enforcement and Penalties</b> .....	<b>26-27</b>
Section 801.....Right-of-Entry	26
Section 802.....Inspection	26
Section 803.....Enforcement	26
Section 804.....Suspension and Revocation	26
Section 805.....Penalties	27
Section 806.....Appeals	27
<b>Article IX – References</b> .....	<b>28</b>
<b>Enactment</b> .....	<b>29</b>
<b>Appendix A – Operation and Maintenance Agreement</b>	
<b>Appendix B – Plan Submission Procedures Table</b>	
<b>Appendix C – Standard Design Assistance Manual for Minor Land Development Activities</b>	

## ARTICLE I – GENERAL PROVISIONS

### Section 101. Short Title

This Ordinance shall be known and may be cited as the “Upper Augusta Township Stormwater Management Ordinance.”

### Section 102. Statement of Findings

The governing body of the municipality finds that:

- A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases runoff volumes, flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.
- B. A comprehensive program of stormwater management (SWM), including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources, and the environment.
- C. Stormwater is an important water resource that provides groundwater recharge for water supplies and supports the base flow of streams.
- D. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.
- E. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES) program.

### Section 103. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the municipality and its watershed by minimizing the harms and maximizing the benefits described in Section 102 of this Ordinance, through provisions designed to:

- A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.
- B. Preserve natural drainage systems.
- C. Manage stormwater runoff close to the source, reduce runoff volumes and mimic predevelopment hydrology.
- D. Provide procedures and performance standards for stormwater planning and management.
- E. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- F. Prevent scour and erosion of stream banks and streambeds.
- G. Provide proper operation and maintenance of all stormwater best management practices (BMPs) that are implemented within the municipality.
- H. Provide standards to meet NPDES permit requirements.

#### **Section 104. Statutory Authority**

The municipality is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L. 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended, and/or the Act of October 4, 1978, P.L. 864 (Act 167), 32 P.S. Section 680.1, et seq., as amended, The Stormwater Management Act.

#### **Section 105. Applicability**

- A. All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Ordinance.
- B. Any submission which does not require stormwater management at the time of subdivision will be subject to the requirements of this Ordinance at such time as individual lots are developed.

#### **Section 106. Repealer**

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

#### **Section 107. Severability**

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

#### **Section 108. Compatibility with Other Requirements**

Approvals issued and actions taken under this Ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation or ordinance.

#### **Section 109. Erroneous Permit**

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the Municipality purporting to validate such a violation.

#### **Section 110. Waivers**

- A. If the Municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the Municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 110, paragraphs B and C.
- B. Waivers or modifications of the requirements of this Ordinance may be approved by the Municipality if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification.
- C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Municipality unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

## ARTICLE II – DEFINITIONS

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

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
- B. The word “includes” or “including” shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The words “shall” and “must” are mandatory; the words “may” and “should” are permissive.

These definitions do not necessarily reflect the definitions contained in pertinent regulations or statutes, and are intended for this Ordinance only.

**Agricultural Activity** – Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops or pasturing and raising of livestock and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

**Applicant** – A landowner, developer, or other person who has filed an application to the municipality for approval to engage in any regulated activity at a project site in the municipality.

**Best Management Practice (BMP)** – Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: “structural” or “non-structural.” In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site.

**Conservation District** – A conservation district, as defined in Section 3(c) of the Conservation District Law (3 P. S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

**Design Storm** – The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24 hours) used in the design and evaluation of stormwater management systems. Also see Return Period.

**Detention Volume** – The volume of runoff that is captured and released into the waters of the Commonwealth at a controlled rate.

**DEP** – The Pennsylvania Department of Environmental Protection.

**Development Site (Site)** – See Project Site.

**Disturbed Area** – An un-stabilized land area where an earth disturbance activity is occurring or has occurred.

**Earth Disturbance Activity** – A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials.

**Erosion** – The natural process by which the surface of the land is worn away by water, wind, or chemical action.

**Evapotranspiration** – The combined process of water surface evaporation, soil moisture evaporation, and plant transpiration.

**Existing Condition** – The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

**FEMA** – Federal Emergency Management Agency.

**Floodplain** – Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania DEP Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by DEP).

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

**Forest Management/Timber Operations** – Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

**Green Infrastructure** – Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

**Hydrologic Soil Group (HSG)** – Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS<sup>1,2</sup>).

**Impervious Surface (Impervious Area)** – A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs; additional indoor living spaces, patios, garages, storage sheds and similar structures; and any new streets or sidewalks. Decks and other features may not be counted as impervious surfaces if they do not prevent infiltration. For the purpose of this Ordinance, any areas designed to be covered by loose surfacing materials, such as gravel, stone, and/or crushed stone, and intended for storage of and/or travel by vehicles or pedestrians, shall be considered impervious, unless specifically designed, constructed, and maintained to permit infiltration.

**Infiltration** – Water flowing downward through the ground surface.

**Karst** – A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

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

**Loading Ratio** – The ratio of impervious area draining to a facility to the area of the stormwater management facility itself.

**Low Impact Development (LID)** – Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate, and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost-effective landscape features located on-site.

**Municipality** – (Municipality Name), (County Name) County, Pennsylvania.

**NRCS** – USDA Natural Resources Conservation Service (previously SCS).

**Peak Discharge** – The maximum rate of stormwater runoff from a specific storm event.

**Pervious Area** – Any area not defined as impervious.

**Project Site** – The specific area of land where any regulated activities in the municipality are planned, conducted, or maintained.

**Qualified Professional** – Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Ordinance.

**Reduction Factor** – A form of safety factor, when multiplied by the site-tested infiltration rate, is used to help determine the design infiltration rate for a stormwater management facility.

**Regulated Activities** – Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

**Regulated Earth Disturbance Activity** – Activity involving earth disturbance subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102, or the Clean Streams Law.

**Retention Volume/Removed Runoff** – The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

**Return Period** – The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the 25-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e., a 4% chance).

**Riparian Buffer** – A permanent area of trees and shrubs located adjacent to streams, lakes, ponds and wetlands.

**Runoff** – Any part of precipitation that flows over the land.

**Sediment** – Soils or other materials transported by surface water as a product of erosion.

**State Water Quality Requirements** – The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law.

**Storm Sewer** – A pipe or conduit, or a system of pipes or conduits, which intercepts and carries surface stormwater runoff, but excludes sewage, industrial wastes, and similar discharges.

**Stormwater** – Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

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

**Stormwater Management Site Plan** – The plan prepared by the developer or his representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance. **Stormwater Management Site Plan** will be designated as **SWM Site Plan** throughout this Ordinance.

**Subdivision** – As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247.

**USDA** – United States Department of Agriculture.

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

**Watershed** – Region or area drained by a river, watercourse, or other surface water of this Commonwealth.

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



## ARTICLE III – STORMWATER MANAGEMENT STANDARDS

### Section 301. General Requirements

- A. For all regulated activities, unless preparation of an SWM Site Plan is specifically exempted in Section 302:
1. Preparation and implementation of an approved SWM Site Plan is required.
  2. No regulated activities shall commence until the municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.
- B. SWM Site Plans approved by the municipality, in accordance with Section 406, shall be on site throughout the duration of the regulated activity.
- C. The municipality may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited to, the Clean Streams Law.
- D. For all regulated earth disturbance activities, erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g., during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the *Erosion and Sediment Pollution Control Program Manual (E&S Manual<sup>3</sup>)*, No. 363-2134-008, as amended and updated.
- E. Impervious areas:
1. The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.
  2. For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.
  3. For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance; except that the volume controls in Section 303 and the peak rate controls of Section 304 do not need to be retrofitted to existing impervious areas that are not being altered by the proposed regulated activity.
- F. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification to the adjacent property owner(s) and where applicable, a release for such discharge from the adjacent property owner. Such stormwater flows shall be subject to the requirements of this Ordinance.
- G. All regulated activities shall include such measures as necessary to:
1. Protect health, safety, and property.
  2. Meet the water quality goals of this Ordinance by implementing measures to:
    - a. Minimize disturbance to floodplains, wetlands, and wooded areas.
    - b. Maintain or extend riparian buffers.
    - c. Avoid erosive flow conditions in natural flow pathways.
    - d. Minimize thermal impacts to waters of this Commonwealth.
    - e. Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.

3. Incorporate methods described in the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual<sup>4</sup>). If methods other than green infrastructure and LID methods are proposed to achieve the volume and rate controls required under this Ordinance, the SWM Site Plan must include a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.
  - H. The design of all facilities over karst shall include an evaluation of measures to minimize adverse effects.
  - I. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.
  - J. Normally dry, open top, storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.
  - K. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the latest version of the Precipitation-Frequency Atlas of the United States, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland.
- NOAA's Atlas 14<sup>5</sup> can be accessed at: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.
- L. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.
  - M. Various BMPs and their design standards are listed in the BMP Manual<sup>4</sup>.

### **Section 302. Exemptions**

- A. The date of the enactment of this Ordinance shall be the starting point from which future development and the respective exemption criteria shall be cumulatively considered and regulated.
- B. Regulated activities, as defined under Article II, that result in cumulative earth disturbances less than one acre and new impervious areas less than 10,000 square feet may be exempt from the requirements in Section 303, Section 304, and Article IV of this ordinance. Refer to Appendix B of this Ordinance for exemption criteria and plan submission procedures. Exemptions under this Section shall only be authorized in conjunction with use of the "Design Assistance Manual."
- C. Agricultural activity, as defined under Article II, is exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.
- D. Forest management and timber operations are exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.
- E. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in Sections 301.D. through K.
- F. The Municipality may deny or revoke any exemption pursuant to this Section at any time for any project that the Municipality believes may pose a threat to public health and safety or the environment.

### **Section 303. Volume Controls**

The green infrastructure and low impact development practices provided in the BMP Manual<sup>4</sup> shall be utilized for all regulated activities wherever possible. Water volume controls shall be implemented using the *Design Storm Method* in Subsection A or the *Simplified Method* in Subsection B below. For regulated activity areas equal or less than one acre that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology and other factors.

- A. The *Design Storm Method* (CG-1 in the BMP Manual<sup>4</sup>) is applicable to any size of regulated activity. This method requires detailed modeling based on site conditions.
1. Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.
  2. For modeling purposes:
    - a. Existing (pre-development) non-forested pervious areas must be considered meadow in good condition.
    - b. Twenty percent (20%) of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions.
- B. The *Simplified Method* (CG-2 in the BMP Manual<sup>4</sup>) provided below is independent of site conditions and should be used if the *Design Storm Method* is not followed. This method is not applicable to regulated activities greater than one acre or for projects that require design of stormwater storage facilities. For new impervious surfaces:
1. Stormwater facilities shall capture at least the first two (2) inches of runoff from all new impervious surfaces.
  2. At least the first one inch of runoff from new impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration.
  3. Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first 0.5 inch of the permanently removed runoff should be infiltrated.
  4. This method is exempt from the requirements of Section 304, Rate Controls.
- C. Infiltration Alternative: Where infiltration is not possible due to soil characteristics or is not desirable given other characteristics, water quality control may be proposed as an alternative to strict adherence to the volume control standards of Section 303 of this Ordinance. Where water quality control is proposed, the following standards shall be achieved.
1. At a minimum, the following documentation shall be provided to justify the proposal to reduce the infiltration requirements:
    - a. Description of and justification for field infiltration/ permeability testing with respect to the type of test and test locations.
    - b. An interpretive narrative describing existing soils of the site and their structure as these relate to the interaction between soils and water characteristics of the site. In addition to providing soil and soil profile descriptions, this narrative shall identify depth to seasonal water tables and depth to bedrock and provide a description of all subsurface elements (restrictive layers, geology, etc.) that influence the direction and rate of subsurface water movement.
    - c. A qualitative assessment of the site's contribution to annual aquifer recharge shall be made, along with the identification of any restrictions or limitations associated with the use of designed infiltration facilities.
    - d. The provided documentation must be signed and sealed by a professional engineer or geologist.
  2. Water Quality BMPs shall be implemented on all permanent stormwater discharges from the proposed project site to achieve pollutant removal efficiencies in accordance with the Table 304.1.

Table 304.1 Required Pollutant Removal Efficiencies for Infiltration Alternatives

Pollutant Load	Units	Required Removal Efficiency (%)
Total Suspended Solids (TSS)	Pounds	85%
Total Phosphorus (TP)	Pounds	85%

Total Nitrogen (TN)	Pounds	50%
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3. Design guidance from the most current version of the Pennsylvania Stormwater Best Management Practices Manual, or equivalent resource as pre-coordinated with the Municipality, shall be consulted when choosing design criteria for water quality BMPs.

**Section 304. Rate Controls**

- A. Post-development discharge rates shall not exceed the pre-development discharge rates for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the pre-development analysis for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.
  1. Where determined by the Township Engineer based on proximity of discharge to the Susquehanna River or where the discharge is discharged to facilities owned by the Sunbury Municipal Authority, the required release rate may be modified as recommended to be greater than the pre-development flow rate and up to direct discharge of the post-development flow rate. In this circumstance a written recommendation of the Township Engineer is required.
  2. For modeling purposes existing (pre-development) non-forested pervious areas must be considered meadow in good condition.
  3. Where discharge is to areas determined by the Township to be subject to existing flooding it may be required that twenty percent (20%) of existing impervious area be considered meadow in good condition in the model for existing conditions.

**Section 305. Riparian Buffers**

- A. In order to protect and improve water quality, a Riparian Buffer Easement may be created and recorded as part of any subdivision or land development that encompasses a Riparian Buffer. Where a Riparian Buffer is utilized, the following additional requirements shall apply.
- B. Except as required by Chapter 102, the Riparian Buffer Easement shall be measured to be the greater of the limit of the 100-year floodplain or a minimum of 35 feet from the top of the streambank (on each side).
- C. Minimum Management Requirements for Riparian Buffers.
  1. Existing native vegetation shall be protected and maintained within the Riparian Buffer Easement.
  2. Whenever practicable, invasive vegetation shall be actively removed and the Riparian Buffer Easement shall be planted with native trees, shrubs, and other vegetation to create a diverse native plant community appropriate to the intended ecological context of the site.
- D. The Riparian Buffer Easement shall be enforceable by the municipality and shall be recorded in the appropriate County Recorder of Deeds Office, so that it shall run with the land and shall limit the use of the property located therein. The easement shall allow for the continued private ownership and shall count toward the minimum lot area as required by Zoning, unless otherwise specified in the municipal Zoning Ordinance.
- E. Any permitted use within the Riparian Buffer Easement shall be conducted in a manner that will maintain the extent of the existing 100-year floodplain, improve or maintain the stream stability, and preserve and protect the ecological function of the floodplain.

- F. Unless otherwise agreed by the Municipality the following conditions shall apply when public and/or private recreation trails are permitted within Riparian Buffers:
1. Trails shall be for non-motorized use only.
  2. Trails shall be designed to have the least impact on native plant species and other sensitive environmental features.
- G. Septic drainfields and sewage disposal systems shall not be permitted within the Riparian Buffer Easement and shall comply with setback requirements established under 25 Pa. Code Chapter 73.

## **Section 306. Technical Standards**

### *Section 306.1. General Requirements*

- A. The plan shall show all drainage within the area affecting the subject property, all existing and proposed drainage facilities, all grading proposed for the subject property, as well as the additional plan information required in this Section.
- B. All land areas shall be graded to secure proper drainage away from buildings, on-lot sewage disposal facilities, and the like, and to prevent the collection of stormwater in pools. Drainage provisions shall be of such design as to carry surface waters to the nearest practical natural drainage channel, storm sewer system detention basin or other drainage facilities. The landowner or developer shall construct and/or install such drainage structures and/or pipes as are determined necessary by the Township to prevent soil erosion, damage, siltation and to satisfactorily carry off surface water. In the design of storm drainage facilities, special consideration must be given to preventing excess runoff onto adjacent developed or undeveloped properties. In no case may any slope exceeding the normal angle of slippage of the material involved. All slopes must be protected against erosion. In no case may a change be made in the existing topography which would:
1. Result in a slope of more than 10% within twenty (20) feet of a property line.
  2. Alter the existing drainage or topography in a way so as to adversely affect adjoining properties.
- C. Storm sewers, culverts, bridges, and related drainage installations shall be provided:
1. To permit unimpeded flow of natural watercourses.
  2. To ensure adequate drainage of all low points as may be related to streets.
  3. To intercept stormwater runoff along streets at intervals reasonably related to the extent and grade of the area drained to prevent flow of stormwater across intersections, and to prevent the flooding of intersections during the design storm.
  4. To insure adequate and impeded flow of stormwater under driveways in, near, or across natural watercourses or drainage swales. Properly sized pipes or other conduits shall be provided as necessary.
  5. To prevent excessive flow on or across streets, sidewalks, drives, parking areas, and any other paved surface or access way.
  6. To lead stormwater away from springs.
  7. Provide adequate drainage away from on-site sewage disposal systems.
- D. The stormwater management plan for each subdivision and/or land development shall take into account and provide for upstream areas within the entire watershed in computing discharge quantities, sizing of pipes, inlets and other structures. The runoff from any proposed development shall be subject to evaluation which includes the anticipated runoff from other existing or proposed developments within the same watershed. Stormwater management facilities designed to serve more than one property or development, in the same watershed are encouraged, in which case consultation with the Township is required prior to design.

- E. All natural streams, channels, swales, drainage systems and/or areas of concentration of surfaces water shall be maintained in their existing condition unless alteration is approved by the Township. In any event, all encroachment activities shall comply with Chapter 105 of the Commonwealth of Pennsylvania Department of Environmental Protection, Dam Safety and Waterway Management Rules and Regulations.
- F. Man-made structures shall be kept to a minimum and bridges, culverts; or rip-rap shall be constructed to maintain the natural characteristics of the stream and shall meet the approval of the Township.
- G. For the purpose of this subsection, streams and intermittent streams are defined as those watercourses on the Township Zoning Map, the USGS Quadrangle maps of the area, and/or determined as such pursuant to an onsite survey by the Township.
- H. Retention/detention 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.
- I. Any subdivision and/or land development within a Flood Hazard area shall comply with all of the provisions of the Township Zoning Ordinance.
- J. Any water originating, from non-natural sources such as swimming pools, air conditioning units, sump pumps, roof drain or other similar flow shall not be discharged directly onto any street or other public right-of-way used for pedestrian or vehicular access. The Township may require a plan that provides for these discharges.
- K. All lots, tracts, or parcels shall be graded to provide proper drainage away from buildings and dispose of the runoff without ponding, and all land within a development shall be graded to drain and dispose of surface water without ponding, except where other arrangements are approved by the Township. Grading shall not be done in such a way so as to divert water onto the property of another landowner without the expressed consent of the Township and the affected landowner.

*Section 306.2. Stormwater Management Plan Requirements*

In addition to the Drainage Plan Requirements in the adopted Township Subdivision and Land Development Ordinance the following requirements apply:

- A. A plan showing all pre-development and post-development stormwater flow to and from basins. A plan showing all post-development flows to all inlets, headwalls, swales, channels, and the like. The drainage areas and the design flow to each inlet or structure shall be delineated on a copy of the stormwater management plan where applicable.
- B. A map depicting the total watershed. A USGS Quadrangle Map is suitable as the source for such a map. However, the watershed area must be highlighted or otherwise distinguished from other areas outside the watershed.
- C. Maps and drawings showing all existing and proposed drainage facilities affecting the subject property.
- D. The following stormwater related items shall be included as part of the plan submission:
  - 1. Definition of existing on or off-site drainage problems.
  - 2. Appropriate stormwater management criteria such as release rate percentage, direct discharge and downstream impact elevation.
  - 3. Configuration of the storm sewer and sanitary sewer system layouts.
  - 4. Location and layout of the stormwater management system with a detailed description of its proposed design and operation.
  - 5. Profiles of all proposed sewers, including elevation, sizes, slopes and materials, at a scale of no less than one (1) inch equal fifty (50) feet horizontal and one (1) inch equal five (5) feet vertical. In addition, a plan (at a smaller scale where necessary) shall be provided which shows the overlay development drainage and grading.

6. Locations, dimensions and design details required for the construction of all facilities. All existing and proposed detention/retention basins shall, at a minimum, be shown in plan view and shall include but not be limited to the following information:
  - a. Emergency spillway crest elevations and widths
  - b. Embankment crest elevations and widths
  - c. Outfall structure types, sizes, lengths and elevations
  - d. Outfall orifice elevations and dimensions
  - e. Bottom of basin elevation
7. Soil percolation test results. Soil testing shall be completed and reported in accordance with the criteria established by the Township Engineer. Specific alternate criteria may be submitted for review and consideration.
8. Final provisions for ownership and maintenance of all stormwater related facilities.

*Section 306.3. Standards and Criteria*

A. Stormwater Collection System.

The design of stormwater collection and conveyance facilities shall be governed by the following criteria:

1. Peak discharge shall be computed using the Rational Formula:

$$Q = C I A$$

Where:

Q = Peak discharge in cubic feet per second

C = Runoff coefficient expressed as the ratio of peak runoff rate to the average amount of rainfall over a period of time equal to the time of concentration

I = Average rainfall intensity in inches per hour for a time equal to the time of concentration

A = Drainage area in acres

In general, the procedure from the Pennsylvania Department of Transportation, Design Manual, Part 2 shall be followed.

2. Runoff coefficients shall be computed as a weighted average of conditions which represent maximum development potential on the property. Soil types, ground slope, and storm frequency shall all be considered in the selection of Runoff Coefficients. Reference for the coefficients applied should be provided in the report.
3. Storm intensity (I) shall be computed as a function of the time of concentration (Tc). A Tc of five (5) minutes shall be used in determining intensity unless the drainage area parameters justify the use of a greater value. Use of a Tc greater than 5 min. shall be as approved by the Township Engineer.
4. The minimum full flow velocity of any storm sewer or culvert shall be 2.5 feet per second (fps).
5. Storm Frequency

The following storm frequencies are to be used for design:

- a. Local Streets - 25 year
- b. Major Intersections of Local Streets - 25 year
- c. Collector Streets and Arterial Streets - 50 year

All structures shall be designed to convey the 100-year storm flood without roadway overtopping. The Township may also require easements to convey the 100-year frequency storm through the entire project site.

Alternate criteria may be required following recommendation of the Township Engineer. In addition, functional classification of streets, for the purpose of determining storm frequencies, shall be as interpreted by the Township Engineer.

6. For storm sewers that will be dedicated to the Township, all pipe material shall either be reinforced concrete or smooth lined corrugated polyethylene pipe to be as determined by the Township. Standards as referenced from ASTM or other source acceptable to the Township Engineer shall be specified.
7. Minimum pipe size for storm sewers shall be fifteen (15) inches in diameter unless otherwise approved by the Township Engineer.
8. Installation:
  - a. Storm sewers shall be installed a sufficient time in advance of final street paving in order to allow for settlement of the trench.
  - b. Installation shall be in accordance with manufacturers recommendations, PennDOT Publication 408 and RC standards or as specified by the Township Engineer.
  - c. Minimum cover from the top of the pipe to the top of subgrade shall be twelve (12) inches.
9. Safety features shall be incorporated into the storm sewer system as necessary.
10. Minimum thickness of any corrugated steel or metal pipe shall be sixteen (16) gage or as otherwise required by the Township for anticipated load conditions.
11. Roof and basement drains must not be connected to streets, sanitary or storm sewers or roadside ditches in order to promote overland flow and infiltration/percolation of stormwater.

#### *Section 306.4. Inlets / Manholes / Junctions*

- A. In general, inlets, manholes, grates, covers, frames and the like shall conform to the Pennsylvania Department of Transportation Standard Specifications, Publication 408 and RC Standards. Design shall be performed in accordance with the Pennsylvania Department of Transportation or Federal Highway Administration Standards. Additional alternate criteria may be required following review of the Township Engineer.
  1. Inlets shall be spaced such that they are not subject to flows higher than five (5) cubic feet per second or at a distance greater than four hundred feet (400) along curbed streets and at low points on sag vertical curves with an inlet on each side of the street. Additional inlets shall be placed at the upper side of street intersections, to prevent stormwater from crossing the intersection. Inlets are not allowed on the intersection radii. In no case shall inlets be placed at a location where they function at less than sixty-five (65%) percent efficiency based on criteria in the PennDOT Design Manual. Design shall be such that the maximum allowable spread of water on streets shall not exceed one-half (1/2) of the travel lane or 3-inches in the gutter line, whichever is more restrictive. At intersections, depth of flow shall not exceed 1" for the 25-year storm event. .
  2. Inlets shall have weep holes placed at the appropriate elevations to drain the bottom of the inlet box and the subgrade prior to placing the base and surface courses.
  3. Where structures are subject to traffic loads, the structure shall be traffic rated.
  4. Inlet tops in residential developments shall be bicycle safe unless otherwise approved.
  5. Manholes shall not be placed more than five hundred (500) feet apart. Additionally, manholes shall be placed at points of change in horizontal and/or vertical direction of storm sewers. Inlets may be substituted for manholes where they will serve as a means of intercepting runoff.
  6. If less than a forty-eight (48) inch diameter, curves in pipes or box culverts, without junction are prohibited. Tee joints, elbows, and wyes are always prohibited.
  7. In all cases inlet and catch basin tops shall be designed and installed level with the road surface.



8. Inlets over four feet in depth shall be provided with steps for access. Inlets over 8-feet in depth may require structural design subject to recommendation of the Township Engineer.
9. Inlets shall be sumped up to 2" below grade as directed by the Township Engineer.

#### *Section 306.5. Channels and Culverts*

##### A. Culvert Design

In cases where drainage is collected by means of a headwall, and inlet or outlet conditions control, the pipe shall be designed as a culvert.

1. The minimum diameter of the culvert shall be eighteen (18) inches. Design shall be in accordance with the U.S. Federal Highway Administration design procedure.
2. The maximum HW/D ratio for inlet control shall be 1.25 or such that water surface elevation is one half (1/2) foot below the edge of street grade during a twenty-five (25) year storm event, whichever is more stringent. Roadway shall not be overtopped for a 100-year storm event.
3. Headwalls and endwalls shall be provided for all culverts unless otherwise approved by the Township Engineer. Material shall be reinforced concrete unless otherwise approved. Headwalls greater than five (5) feet in height shall be designed by a Professional Engineer.
4. Culvert pipe and material shall be the same as that required for storm sewers
5. All applicable modeling results, calculations and supporting documentation shall be submitted.

##### B. Channel Design

1. Manning's equation shall be used for the design of all open channels. Complete calculations shall be submitted which detail flow, depth, and velocity. For channels and swales, design for Erosion Control must be provided.
2. All channels shall be designed to prevent erosion of the channel bottom and sides. The flow velocity in all vegetated drainage channels shall not exceed the maximum permissible velocity to prevent soil erosion. Stabilization techniques such as rip-rap, sodding, geo-fabrics and/or premanufactured products shall be utilized where necessary to minimize erosion potential.
3. The design of swales and channels shall, as a minimum, conform to the design procedures as outlined by (a) The Federal Highway Administration, and (b) The Pennsylvania Department of Environmental Protection, Bureau of Soil and Water Conservation, Erosion and Sediment Pollution Control Manual.
4. Where swales are installed, and vegetative stabilization has not or will not occur between November 1 and March 1, other means of temporary stabilization shall be provided.
5. Design criteria for swales and channels shall be the same as that required for storm sewers.
6. Swales must be designed and constructed with a uniform slope to avoid ponding within the swale. Swales designed or constructed at less than 1.5% slope may be required to include an underdrain in the swale bottom.

#### *Section 306.6. Stormwater Management Facilities*

##### A. General Design Criteria

1. Peak discharge and runoff shall be computed using the soil-cover complex method contained in the "Urban Hydrology for Small Water Sheds", Technical Release No. 55, published by the Engineering Division, Soil Conservation Service, United States Department of Agriculture. Alternate methodology and /or computing software may be used subject to approval by the Township Engineer.

2. Stormwater shall not be re-routed or concentrated in a manner which is inconsistent with downstream conditions or where downstream properties are likely to be affected. In addition the proposed stormwater discharge at the perimeter of the site shall not exceed the capacity of any existing facility nor shall it alter the pre-development flow characteristics.

All new concentrated discharges of stormwater onto adjacent properties shall be within existing storm sewers or channels. The Township may require written acknowledgment or easement from adjacent property owners in the event that these conditions are not met.

3. The Township has the authority to require that computed existing runoff rates be reconciled with field observations and conditions. If the designer can substantiate through actual physical calibration that more appropriate runoff and time-of-concentration values should be utilized at a particular site, then appropriate variations may be made upon review and recommendations of the Township Engineer. Calibration shall require detailed gauge and rainfall data for the particular site in question.
4. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. Berwick Township reserves the right to disapprove any design that would result in the occupancy or continuation of an adverse hydrologic or hydraulic condition within the watershed.
5. The Township has the authority to require that computed existing runoff rates be reconciled with field observations and conditions. If the designer can substantiate through actual physical calibration that more appropriate runoff and time-of-concentration values should be utilized at a particular site, then appropriate variations may be made upon review and recommendations of the Township Engineer. Calibration shall require detailed gauge and rainfall data for the particular site in question.
6. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Township reserves the right to disapprove any design that would result in the occupancy or continuation of an adverse hydrologic or hydraulic condition within the watershed.

### *Section 306.7. Detention Basins*

#### A. Basin Design Criteria

1. Basins shall provide control of post development peak runoff rates as specified in Section 304 of this Ordinance.
2. In locations where known drainage or flooding problems exist and where stormwater management has not been previously provided and it is determined that the proposed development may contribute to the problem it may be recommended by the Township Engineer that the discharge of basins or other stormwater management peak flow rate controls be such that the post-development release rate from storms up to the ten (10) year frequency be limited to the pre-development flow rate from a two (2) year frequency storm.
3. The Modified PULS Routing technique or other method approved by the Township Engineer shall be used for routing computations.

#### B. Basin Construction Standards

1. Basins shall not be located over any existing or proposed utility lines.
2. The maximum slope of earthen embankments shall be four (4) to one (1), with three (3) to one (1) allowed following review and recommendation from the Township Engineer. The top or toe of any slope shall be located a minimum of fifteen (15) feet from adjacent property lines, except for a downstream property line where there shall be sufficient additional distance for energy dissipation and for access of maintenance equipment but in no case shall be less than forty (40) feet unless approved otherwise by the Township. Greater slopes may be allowed with the provision of a design basis which considers fill material and stabilization where approved by the Township Engineer. In areas which are not easily accessible for maintenance, side slopes shall not exceed five (5) to one (1).
3. Where possible the side slopes and basin shape shall blend with the natural topography.
4. The minimum top width of detention basin berms shall be six (6) feet.

5. All basins shall have provisions for de-watering so as not to create unmaintainable conditions. The minimum grade of the basin floor shall be two (2%) percent to insure proper drainage towards the outlet structure. One (1%) percent may be allowed following review and recommendation of the Township Engineer or if a paved or stabilized low flow channel is provided.
6. All submitted basin plans shall indicate the construction specifications and compaction requirements to be used during construction. All earth fill dams shall be designed and certified by a registered professional engineer. Construction specifications shall be reviewed and approved by the Township Engineer.
7. A cutoff trench shall be excavated along the centerline of any dam on an earth fill embankment. The minimum depth shall be three (3) feet. The minimum bottom width shall be ten (10) feet or wide enough to permit operation of compaction equipment.
8. A minimum of six (6) inches of topsoil shall be placed on all areas affected by the basin construction (i.e. basin floor, side slopes, top of berm, and the like) to allow for the establishment of vegetation.
9. All basins shall be stabilized using methods acceptable to the USDA Soil Conservation Service.
10. The maximum water depth of a finished detention basin (measured from the lowest point in the basin floor to the crest of the emergency spillway) shall not exceed eight (8) feet unless otherwise approved by the Township Engineer.
11. Fencing: Any stormwater management facility that is designed so that it detains water on a temporary or permanent basis may be subject to the following fencing regulations:
  - a. Facilities with water depths exceeding four (4) feet or greater may require fencing, if a public safety hazard is deemed possible by the Township Supervisors. In determining the need for fencing, the Township Supervisors shall consider at a minimum, the following:
    - i. Depth of pool
    - ii. Detention or dewatering time of the facility
    - iii. Accessibility of the facility
    - iv. Proximity of the facility to existing or potential residential development or other development that would expose public to safety risks.
  - b. All gates opening through a fence enclosure shall be equipped with a self-closing and self-locking device for keeping the gate securely closed at all times.
  - c. The Township may require the installation of a shrub barrier in lieu of a fence. The Township reserves the right to review and approve the proposed shrubbery for this application.
  - d. The fencing type, height and style shall be reviewed and approved at the discretion of the Township.
12. A minimum of one (1) foot freeboard shall be provided above the basin water surface elevation during a one hundred (100) year frequency storm.
13. Minimum floor elevations for all structures shall be two (2) feet (minimum) above the basin water surface elevation during a one hundred (100) year frequency storm. If basements will be provided, detailed calculations and water proofing design shall be provided which addresses the effects of stormwater on the structure.
14. The Township may, upon recommendation of the Township Engineer, impose additional requirements on earth fill dams for the safety and welfare of the Township.
15. For sites of geologic concern, a geotechnical analysis and design of the site as it relates to the proposed basin shall be provided.

### C. Emergency Spillway Standards

1. Minimum freeboard, or the distance between the design flow elevation and the top of the settled basin embankment, shall be one (1) foot for a one hundred (100) year frequency storm.
2. Emergency spillway design should be based on a one hundred (100) year design storm when neglecting the capacity of the outlet structure and outfall culvert.
3. Emergency spillways shall be constructed on undisturbed earth, where possible. Emergency spillways shall be constructed of vegetated earth, reinforced concrete or concrete mound slabs. Emergency spillways shall NOT discharge stormwater over earthen fill or other easily erodible material without adequate protection against soil erosion. Detailed calculations and design shall be submitted. Downstream channels shall be of adequate design to convey flows from the emergency spillway to an existing stream, storm sewer or other approved discharge point.

### D. Outlet Pipes and Structures

The following measures shall be incorporated into the design and construction of all outlet structures and pipes. Supporting calculations and drawings shall be submitted.

1. Anti-seep collars shall be installed around all outlet pipes through embankments. The anti-seep collars and their connections to the pipe barrel shall be watertight. Design calculations in accordance with the USDA Soil Conservation Service shall be submitted.
  2. Temporary sedimentation controls shall be provided during construction to prevent the flow of sediment-laden runoff through the basin outlet pipe. Such measures may include temporary riser pipes, rock-filled gabions, plywood stand boxes, silt fences, skimmers and the like. Design of such measures shall comply with the requirements of the County Conservation District.
  3. Energy dissipation shall be provided at the outlet of detention basins, along outfall channels, and at the discharge end of all conveyance pipes.
  4. Outlet control structures shall be constructed to prevent flotation.
  5. Outlet control structures shall be equipped with a childproof, non-clogging, removable, trash rack for all openings larger than twelve (12) inches in diameter.
  6. All pipes through earthen embankments shall be of a type, which watertight joint systems are available. Outfall pipes and culverts shall be reinforced concrete unless otherwise approved by the Township Engineer.
- E. Where required by the Township an analysis shall be conducted of the conditions downstream of the discharge from the property proposed for development. Such analysis shall consider existing and proposed flow rates, velocities, potential for erosion, and expected water surface elevations in relation to existing structures or properties. Such downstream analysis shall be submitted to the Township Engineer and where deemed necessary, to the Northumberland County Conservation District.

### *Section 306.8. Subsurface Disposal / Retention Basin Systems*

#### A. Installation Requirements

1. The following procedures and materials shall be required for all subsurface facilities:
  - a. Excavation for infiltration facility shall be performed with equipment which will not compact the bottom of the seepage bed, infiltration trench or like facility.
  - b. The bottom of the bed or trench shall be roughened prior to placement of aggregate.
  - c. Only clean, open graded aggregate, free of fines, shall be used in subsurface systems.

- d. The top, sides, and bottom of all seepage beds, infiltration trenches, or like facilities shall be covered with a drainage filtration fabric which meets the requirements of the Pennsylvania Department of Transportation, Publication 408 for Class I Geofabrics.
- e. All pipes leading into subsurface drainage systems shall be equipped with screening devices to prevent debris from entering the system.
- f. The bottom of all subsurface disposal or retention basin systems shall be a minimum of twelve (12) inches above the limiting zone as established by the site specific soil profile. Depths of less than twelve (12) inches above the limiting zone will only be allowed where the developer provides a written report certified by a registered professional engineer, geologist, or hydrogeologist, which certifies that the condition will not create an environmental hazard.
- g. Inspection points, cleanouts and overflow facilities shall be provided for subsurface disposal systems.
- h. All subsurface stormwater disposal systems or retention basins shall be located a minimum of one hundred (100) feet from any potable water wells.

*Section 310.9. Basins with Permanent Pools (Wet Basins)*

- A. Basins designed to have a permanent pool of water stored in the reservoir shall conform to the design standards of detention or retention basins. Where deemed to be necessary, after consulting with the Township Engineer, the Township may impose additional criteria for design and construction of wet basins. Earthen embankment designs shall be sealed by a registered professional engineer experienced in such design.
- B. Embankments shall have a slope not exceeding four (4) horizontal to one (1) vertical.
- C. Adequate stabilization shall be provided to control anticipated erosion due to wave or water level fluctuation.
- D. Where necessary wet pond embankments shall be protected from rodent intrusion.

## ARTICLE IV – STORMWATER MANAGEMENT (SWM) SITE PLAN REQUIREMENTS

### Section 401. Plan Requirements

The following items shall be included in the SWM Site Plan:

- A. Appropriate sections from the municipal's Subdivision and Land Development Ordinance, and other applicable local ordinances, and the requirements of the reviewing engineer, shall be followed in preparing the SWM Site Plans. In instances where the Municipality lacks Subdivision and Land Development regulations, the content of SWM Site Plans shall follow the county's Subdivision and Land Development Ordinance.
- B. The Municipality shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when a SWM Site Plan is found to be deficient, the municipality may either disapprove the submission and require a resubmission, or in the case of minor deficiencies, the Municipality may accept submission of modifications.
- C. Provisions for permanent access or maintenance easements for all physical SWM BMPs, such as ponds and infiltration structures, as necessary to implement the Operation and Maintenance (O&M) Plan discussed in paragraph E.9 below.
- D. The following signature block for the municipality:

“(Municipal official or designee), on this date (Signature date), has reviewed the SWM Site Plan in accordance with design standards and criteria of the Stormwater Management Ordinance No. (number assigned to ordinance).”
- E. The SWM Site Plan shall provide the following information:
  - 1. The overall stormwater management concept for the project.
  - 2. A determination of site conditions in accordance with the BMP Manual<sup>4</sup>. A detailed site evaluation shall be completed for projects proposed in areas of carbonate geology or karst topography, and other environmentally sensitive areas, such as brownfields.
  - 3. Stormwater runoff design computations and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance, including the recommendations and general requirements in Section 301.
  - 4. Expected project time schedule.
  - 5. A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.
  - 6. The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.
  - 7. Plan and profile drawings of all SWM BMPs, including drainage structures, pipes, open channels, and swales.
  - 8. SWM Site Plan shall show the locations of existing and proposed on-lot wastewater facilities and water supply wells.
  - 9. The SWM Site Plan shall include an O&M Plan for all existing and proposed physical stormwater management facilities. This plan shall address long-term ownership and responsibilities for O&M as well as schedules and costs for O&M activities.
  - 10. A justification must be included in the SWM Site Plan if BMPs other than green infrastructure methods and LID practices are proposed to achieve the volume, rate and water quality controls under this Ordinance.

## **Section 402. Plan Submission**

Five copies of the SWM Site Plan shall be submitted as follows:

1. (Typically two) copies to the municipality.
2. (Typically one) copy to the municipal engineer (when applicable).
3. (Typically one) copy to the County Conservation District (when applicable).
4. (Typically one) copy to the Sunbury Municipal Authority (when applicable).

## **Section 403. Plan Review**

- A. SWM Site Plans shall be reviewed by the municipality, or designated official, for consistency with the provisions of this Ordinance.
- B. The Municipality shall notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved. If the SWM Site Plan involves a Subdivision and Land Development Plan, the notification shall occur within the time period allowed by the Municipalities Planning Code (90 days). If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the municipality.
- C. For any SWM Site Plan that proposes to use any BMPs other than green infrastructure and LID practices to achieve the volume and rate controls required under this Ordinance, the Municipality will not approve the SWM Site Plan unless it determines that green infrastructure and LID practices are not practicable.
- D. If the Municipality disapproves the SWM Site Plan, the Municipality will state the reasons for the disapproval in writing. The Municipality also may approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing.
- E. Where discharge is to facilities owned by the Sunbury Municipal Authority and when directed by the Township, it is the applicant's responsibility to submit a copy of the plan and supporting calculations to the Authority for their review and comment. Such discharge shall be approved by the Sunbury Municipal Authority.

## **Section 404. Modification of Plans**

A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Municipality shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

## **Section 405. Resubmission of Disapproved SWM Site Plans**

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Municipality's concerns, to the Municipality in accordance with this Article. The applicable review fee must accompany a resubmission of a disapproved SWM Site Plan.

## **Section 406. Authorization to Construct and Term of Validity**

The Municipality's approval of an SWM Site Plan authorizes the regulated activities contained in the SWM Site Plan for a maximum term of validity of 5 years following the date of approval. The Municipality may specify a term of validity shorter than 5 years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 407 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 405 of this Ordinance.

#### **Section 407. As-Built Plans, Completion Certificate, and Final Inspection**

- A. The developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.
- B. The as-built submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. The latitude and longitude coordinates for all permanent SWM BMPs must also be submitted, at the central location of the BMPs. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate.
- C. After receipt of the completion certification by the Municipality, the Municipality may conduct a final inspection.



## **ARTICLE V – OPERATION AND MAINTENANCE**

### **Section 501. Responsibilities of Developers and Landowners**

- A. The Municipality shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The municipality may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the municipality will accept the facilities. The municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.
- B. Facilities, areas, or structures used as SWM BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.
- C. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land.
- D. The Municipality may take enforcement actions against an owner for any failure to satisfy the provisions of this Article.

### **Section 502. Operation and Maintenance Agreements**

- A. Prior to final approval of the SWM Site Plan, the property owner shall sign and record an Operation and Maintenance (O&M) Agreement (see Appendix A) covering all stormwater control facilities which are to be privately owned.
  - 1. The owner, successor and assigns shall maintain all facilities in accordance with the approved maintenance schedule in the O&M Agreement.
  - 2. The owner shall convey to the Municipality conservation easements to assure access for periodic inspections by the Municipality and maintenance, as necessary.
  - 3. The owner shall keep on file with the Municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Municipality within ten (10) working days of the change.
- B. The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

### **Section 503. Performance Guarantee**

For SWM Site Plans that involve subdivision and land development, the applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as required by the approved SWM Site Plan and this Ordinance in accordance with the provisions of Sections 509, 510, and 511 of the Pennsylvania Municipalities Planning Code.

## **ARTICLE VI – FEES AND EXPENSES**

### **Section 601. General**

- A. The Municipality shall, by resolution, establish a fee schedule to defray costs incurred by the Municipality associated with the administration and enforcement of this Ordinance.

### **Section 602. Expenses Covered By Fees**

The review fee may include, but not be limited to, costs for the following:

- A. Administrative/clerical processing.
- B. Review of the SWM Site Plan.
- C. Attendance at meetings.
- D. Inspections.

## **ARTICLE VII – PROHIBITIONS**

### **Section 701. Prohibited Discharges and Connections**

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the surface waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in paragraph C below and (2) discharges authorized under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution of a regulated small MS4 or to the waters of this Commonwealth:
  - 1. Discharges or flows from firefighting activities.
  - 2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).
  - 3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
  - 4. Diverted stream flows and springs.
  - 5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.
  - 6. Non-contaminated HVAC condensation and water from geothermal systems.
  - 7. Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.
  - 8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
- D. In the event that the municipality or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

### **Section 702. Roof Drains and Sump Pumps**

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs wherever feasible.

### **Section 703. Alteration of SWM BMPs**

No person shall modify, remove, fill, landscape, or alter any SWM BMPs, facilities, areas, or structures that were installed as a requirement of this Ordinance without the written approval of the Municipality.

## **ARTICLE VIII – ENFORCEMENT AND PENALTIES**

### **Section 801. Right-of-Entry**

Upon presentation of proper credentials, the municipality or its designated agent may enter at reasonable times upon any property within the municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

### **Section 802. Inspection**

The landowner or the owner's designee, shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:

1. Annually for the first 5 years.
2. Once every 3 years thereafter.
3. During or immediately after the cessation of a 10-year or greater storm (4.15 inches in 24 hours).

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Municipality within 30 days following completion of the inspection.

### **Section 803. Enforcement**

- A. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 302.
- B. It shall be unlawful to violate Section 703 of this Ordinance.
- C. The Municipality may conduct inspections regarding compliance with the SWM Site Plan.

### **Section 804. Suspension and Revocation**

- A. Any approval or permit issued by the Municipality pursuant to this Ordinance may be suspended or revoked for:
  1. Non-compliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement.
  2. A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the Regulated Activity.
  3. The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.
- B. A suspended approval may be reinstated by the Municipality when:
  1. The Municipality has inspected and approved the corrections to the violations that caused the suspension.
  2. The Municipality is satisfied that the violation has been corrected.
- C. An approval that has been revoked by the Municipality cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.

- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for

the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.

#### **Section 805. Penalties**

- A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than \$ 500 for each violation, recoverable costs and reasonable attorneys' fees. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.
- B. In addition, the municipality may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

#### **Section 806. Appeals**

- A. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of this Ordinance, may appeal to the Municipality within 30 days of that action.
- B. Any person aggrieved by any decision of the Municipality, relevant to the provisions of this Ordinance, may appeal to the County Court of Common Pleas in the county where the activity has taken place within 30 days of the Municipality's decision.

## ARTICLE IX – REFERENCES

1. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). *National Engineering Handbook*. Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available from the NRCS online at: <http://www.nrcs.usda.gov/>.
2. U.S. Department of Agriculture, Natural Resources Conservation Service. 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.
3. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
4. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.
5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14*, Volume 2, Version 3.0, Silver Spring, Maryland. Internet address: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.

Upper Augusta Township – Stormwater Management Ordinance

2022 - 02

**ENACTED** and **ORDAINED** at a regular meeting of the

Upper Augusta Township Board of Supervisors

on this 5<sup>th</sup> day of December, 2022

This Ordinance shall take effect immediately.

  
\_\_\_\_\_  
David Hanes, II

\_\_\_\_\_  
Chairman

  
\_\_\_\_\_  
Ed Markowski, Jr.

\_\_\_\_\_  
Vice-Chairman

  
\_\_\_\_\_  
Rebecca Ray

\_\_\_\_\_  
Member

ATTEST:

  
\_\_\_\_\_  
Darlene Kern - Secretary



## APPENDIX A

### OPERATION AND MAINTENANCE (O&M) AGREEMENT STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)

**THIS AGREEMENT**, made and entered into this day of \_\_\_\_\_, 20\_\_\_\_\_, by and between \_\_\_\_\_ (hereinafter the "Landowner"), and Upper Augusta Township, Northumberland County, Pennsylvania (hereinafter "Municipality");

#### WITNESSETH

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

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

**WHEREAS**, the SWM BMP Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

**WHEREAS**, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

**WHEREAS**, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, successors, and assigns.

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

1. The Landowner shall construct the BMPs in accordance with the plans and specifications identified in the SWM Site Plan.
2. The Landowner shall operate and maintain the BMPs as shown on the SWM Site Plan in good working order in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMPs whenever necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMPs per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.
5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the on-site BMPs by the Landowner; provided, however, that this Agreement shall not be deemed to create any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interest, shall release, defend, indemnify, and hold harmless the Municipality, and its agents, from all damages, accidents, casualties, occurrences, causes of action, or claims which arises, might arise, or be asserted against said Municipality, or its agents, from the construction, presence, existence, maintenance or repair of the BMP(s) by the Landowner or Municipality.



8. The landowner or the owner's designee, shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:
  - a. Annually for the first 5 years.
  - b. Once every 3 years thereafter.
  - c. During or immediately after the cessation of a 10-year or greater storm (4.15 inches in 24 hours).

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Municipality within 30 days following completion of the inspection.

9. The Municipality may inspect the BMPs at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of \_\_\_\_\_ County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs, and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

\_\_\_\_\_

For the Landowner:

\_\_\_\_\_

ATTEST:

\_\_\_\_\_ (City, Borough, Township)

County of \_\_\_\_\_, Pennsylvania

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

**GIVEN UNDER MY HAND THIS** \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
**NOTARY PUBLIC**

\_\_\_\_\_  
**(SEAL)**

APPENDIX B

## Upper Augusta Township, Northumberland County Stormwater Management Plan Submission Procedures

Total Proposed Impervious Area	Total Proposed Disturbed Area	SWM Plan Requirement <sup>(1)</sup>	Procedure
≤ 2,500 ft <sup>2</sup>	< one (1) acre	May be Exempt	Submit Sketch Plan & Worksheet
2,501 ≤ 10,000 ft <sup>2</sup> & 100% DIA <sup>(3)</sup>	< one (1) acre	May be Exempt <sup>(6)</sup>	Submit Sketch Plan & Worksheet
2,501 ≤ 10,000 ft <sup>2</sup> not 100% DIA <sup>(2)</sup>	< one (1) acre	May be Exempt from Peak Rate	Submit Minor SWM Site Plan, Worksheet, Standard Design <sup>(4)</sup> , O&M Agreement <sup>(7)</sup>
> 10,000 ft <sup>2</sup>	< one (1) acre	Formal SWM Plan	Consult a Qualified Professional
Any amount	≥ one (1) acre	Formal SWM Plan & NPDES Permit	Consult a Qualified Professional & NCCD <sup>(5)</sup>

(1) Municipality may deny any request for exemption.

(2) Maximum 10,000 ft<sup>2</sup> of connected impervious area to use Standard Design.

(3) DIA = Disconnected Impervious Area; refer to Ordinance for definition and limits. **DIA is considered a stormwater BMP.**

(4) The applicant may choose to submit a Formal SWM Plan.

(5) NCCD = Northumberland County Conservation District

(6) Impervious area may not be directly connected to an existing impervious area.

(7) See Section 502 of the Ordinance for Operation & Maintenance Agreement Provisions.

Refer to Appendix C of the Stormwater Management Ordinance.

**APPENDIX C**

**UPPER AUGUSTA TOWNSHIP**

**NORTHUMBERLAND COUNTY, PA**

**STORMWATER MANAGEMENT &  
STANDARD DESIGN ASSISTANCE  
MANUAL**

**For Minor Land Development Activities**

## TABLE OF CONTENTS

<b>Introduction.....</b>	<b>2</b>
<b>Importance of Stormwater Management.....</b>	<b>2</b>
<b>Standard Terms Used in the Manual.....</b>	<b>3</b>
<b>Determining What Type of Stormwater Management Plan is Required.....</b>	<b>4</b>
<b>Using Municipal Stormwater Management Worksheets.....</b>	<b>4</b>
<b>Plan Requirements.....</b>	<b>5</b>
<b>Disconnected Impervious Area (DIA).....</b>	<b>8</b>
<b>Selecting BMPs.....</b>	<b>13</b>
<b>Stormwater Management Worksheets.....</b>	<b>14</b>
<b>Guide to Choosing Stormwater BMPs.....</b>	<b>Part 2</b>

## **Introduction**

This design manual has been created as a tool to help property owners manage stormwater on their property and streamline the process of designing on-site stormwater management facilities for new, relatively minor residential and accessory structure projects. Through the use of this manual, residents have the ability to determine the appropriate facilities for their property, project and budget. This design method is not intended to be used with large-scale subdivision/ land development or activities that include infrastructure such as roadways.

## **Importance of Stormwater Management**

Stormwater is the runoff produced by precipitation, snow melt, or ice melt. When land is developed or changed, the flow patterns of water and quality of water are also changed. Land development activities can affect characteristics of stormwater runoff, including the rate of runoff, volume of runoff, and quality of runoff. When runoff is not managed, the increased volume may aggravate flooding.

The objective of stormwater management is to prevent or mitigate the adverse impacts of the increase in rate and volume of stormwater runoff, while also protecting health, safety, and property. Stormwater Best Management Practices aim to maintain water quality, encourage infiltration in appropriate areas, promote groundwater recharge, maintain the natural drainage characteristics of the site to the maximum extent practicable, and protect stream banks and beds.

## Standard Terms Used in the Manual

**Best Management Practice (BMP)** - Activities, facilities, designs, measures, or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance.

**Disconnected Impervious Area (DIA)** - An impervious or impermeable surface that is disconnected from any stormwater drainage or conveyance system and is redirected or directed to a pervious area, which allows for infiltration, filtration, and increased time of concentration.

**Disturbed Area** - An unstabilized land area where an earth disturbance activity is occurring or has occurred.

**Flow Path** – The path that stormwater flows from the discharge point to the nearest property line or channelized flow (ie stream, drainage ditch, etc.). The length of the path is measured along the ground slope.

**Impervious Surface (Impervious Area)** - A surface that prevents the infiltration of water into the ground. Impervious surfaces and areas include but are not limited to roofs, additional indoor living spaces, patios and decks, garages, storage sheds and similar structures, streets, driveways, access drives, parking areas, and sidewalks. Any areas designed to be covered by loose surfacing materials such as gravel, stone and/or crushed stone, and intended for storage of and/or travel by vehicles, or pedestrians shall be considered impervious. Surfaces or areas designed, constructed and maintained to permit infiltration may be considered pervious.

**Karst** - A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

**Minor Stormwater Site Plan** – A site plan prepared and submitted to the municipality for proposed projects which may qualify to use the Simplified Approach. The plan depicts existing conditions on the property, proposed impervious areas, and, if required, the location of proposed BMPs.

**Regulated Activit(ies)y** - Any earth disturbing activity or any activity that involves the alteration or development of land in a manner that may affect stormwater runoff.

**Runoff** - Any part of precipitation that flows over the land.

**Sketch Plan** – An informal plan, not necessarily to exact scale, indicating existing features of a tract, its surroundings, and the general layout of a proposed stormwater plan.

## Determining What Type of Stormwater Management Plan is Required

The chart on the following page provides a guide to determine what type of stormwater plan is needed. Some projects will be exempt from preparing a stormwater management plan, but documentation of the project must still be filed with the municipality. Completion of the **Municipal Stormwater Management Worksheets** will determine what type of documentation is required for each project.

SMP Plan Requirement	Impervious Area	Disturbed Area	Steps*
Exempt	Up to 2,500 ft <sup>2</sup> - must be attested to not directly impact neighboring properties	Less than 1 acre	Submit Worksheet A and Sketch Plan.
May be Exempt - Complete a Minor Stormwater Site Plan	2,501 to ≤ 10,000 ft <sup>2</sup> , If shown to be 100% disconnected from impervious areas	Less than 1 acre	Submit Worksheet A & B and Minor Stormwater Site Plan.
Not Exempt - Complete a Minor Stormwater Site Plan with BMP's	2,501 ft <sup>2</sup> to ≤ 10,000 ft <sup>2</sup> If connected to impervious areas	Less than 1 acre	Submit Worksheet A & B, Minor Stormwater Site Plan showing BMP facilities and O& M Agreement.
Formal Stormwater Management Plan	Greater than 10,000 ft <sup>2</sup>	Greater than 1 acre	Consult a Qualified Professional

\* A General Township Stormwater Management Application and associated fee is required to be submitted with all applications.

### Using Municipal Stormwater Management Worksheets

Determining the impervious area of a proposed project is the first step in using this Manual. Municipal Stormwater Management Worksheets have been included in the Simplified Approach, which will assist the property owner, or applicant, and municipality determine the impervious area of a proposed project and provide guidance through the next steps.

Step 1 - If the proposed new impervious surface area is up to 2,500 square feet, the project may be exempt from the requirements in this guide. The applicant must complete and submit Worksheet A and a Sketch Plan and file it with the Township for review. If the project is considered exempt the application is complete. *If the project is not exempt, go to Step 2.*

Step 2 – If the proposed impervious area is between 2,500 square feet and 10,000 square feet or not deemed exempt in Step 1, the applicant must complete and submit Worksheet A and B and a Minor Stormwater Site Plan to be able to compute items requested in Worksheet B. Worksheets A and B and Minor Stormwater Site Plan shall be filed with the Township for review. If DIA requirements (100% disconnection) can be met, projects of this size may be exempt from the requirement to install BMP's. *Go to Step 3 if the project is not deemed exempt from providing SWM facilities in this step.*

Step 3- If not deemed to be exempt in Step 2 then preparation and submission of a Minor Stormwater Management (SWM) Site Plan showing the proposed location and size of BMP's on the property is required. These BMP's shall be sized in accordance with the chart in Worksheet B as outlined in Part 2 of the Design Assistance Manual. The Minor Site Plan, Worksheets A and B and an executed and Recorded BMP Facilities Operations and Maintenance Agreement should be filed with the Municipality for review.

All requests for exemptions will be reviewed / determined by Township Staff. A Stormwater Management/ BMP Facilities & Maintenance Agreement will be required for any project which requires installation of stormwater management facilities (BMP's).

## **Plan Requirements**

### **Sketch Plan Requirements (to be filed with Worksheet A - < 2,500 SF impervious area)**

1. Property address and name of applicant
2. Date
3. Property boundary.
4. North Arrow.
5. Location of all existing and proposed structures (house, shed, addition, etc.) and any proposed downspouts with approximate distance to property lines or other permanent fixtures. Include the dimensions of all proposed structures.
6. Site conditions (grassed areas, agricultural fields, direction of slope and stormwater flow on the property).
7. All existing and proposed driveways and impervious areas (stone and gravel driveways are considered impervious).
8. Any other pertinent information that may be significant to the project site (existing drainage ways, steep slopes, etc.).
9. Utility lines, water service, sewer service, wells and on-site septic systems.

### **Minor Stormwater Site Plan Requirements**

A minor stormwater site plan depicts the existing conditions of a property and the location of proposed impervious surfaces. Depicting the relationship between the proposed activities and distances to things like property lines, streams, and vegetated areas will help determine if the stormwater runoff created by the proposed project can be managed naturally within the property or if additional best management practices (BMPs) are needed to accommodate the stormwater runoff.

If a project qualifies for use of a minor stormwater site plan, the applicant must prepare and submit to the Municipality a minor stormwater site plan and the Municipal



Stormwater Management Worksheets. The Northumberland County GIS Office may also provide assistance to applicants to obtain property maps of existing features. A minor stormwater site plan depicting the key features of the site must be drawn, or depicted, to scale to show the following: (may be submitted in conjunction with site grading plan so as to not duplicate effort)

1. Property address and name of applicant
2. Date
3. Property boundary and building setbacks.
4. North Arrow and plan scale.
5. Aerial map of property.
6. Topography. Contours at 2 foot intervals.
7. Location of all existing and proposed structures (house, shed, addition, etc.) and any proposed downspouts. Include the dimensions of proposed structures.
8. Site conditions (grassed areas, agricultural fields, direction of slope and stormwater flow on the property).
9. Downslope distance from proposed downspouts to property line.
10. All existing and proposed driveways and impervious areas (stone and gravel driveways are considered impervious).
11. Natural features such as streams, wetlands, tree lines and other vegetation on the property and within 50 feet of the property line for lots smaller than 5 acres.
12. Distance from proposed structures or downspouts along the stormwater flow path to any stream or wooded area.
13. Any other pertinent information that may be significant to the project site (existing drainage ways, steep slopes, etc.).
14. Utility lines, water service, sewer service, wells and on-site septic systems.
15. Soil boundaries and types.

If BMPs are required, the following information must also be shown on the plan:

16. Location, size and depth of proposed stormwater BMPs.
17. Proposed materials to be used in construction of the BMP's.

Other Considerations for Minor Plans:

- While soil testing is not mandatory for the simplified approach, soil testing is highly recommended to select and apply the appropriate stormwater BMPs. The use of soil maps, infiltration tests, and/ or perc tests may provide the applicant basic information about soil characteristics.
- Proposed stormwater management facilities must be designed to handle flows from the contributing area.
- The site shall not have any pre-existing stormwater drainage-related problems (as verified by the municipality), at the discretion of the Municipality.

- Ø Water quality shall be protected per Chapter 93 of PA Code.
- Ø The municipality may inspect all BMPs during and after construction/ installation.
- Ø Infiltration BMPs should not be constructed nor receive runoff until the entire contributory drainage area has achieved final stabilization.
- Ø Ensure that infiltration in geologically susceptible areas such as, but not limited to, carbonate geology/ karst topography do not cause adverse effects. The minor stormwater site plan should incorporate steps to ensure that salt or chloride will not contaminate the groundwater.
- Ø Selected BMPs shall be designed, constructed, and maintained in accordance with the manufacturer's recommendation, the BMP Manual, or other written guidance acceptable to the municipality.
- Ø Proposed sump pumps shall discharge to infiltration or vegetative BMPs to the maximum extent practicable.

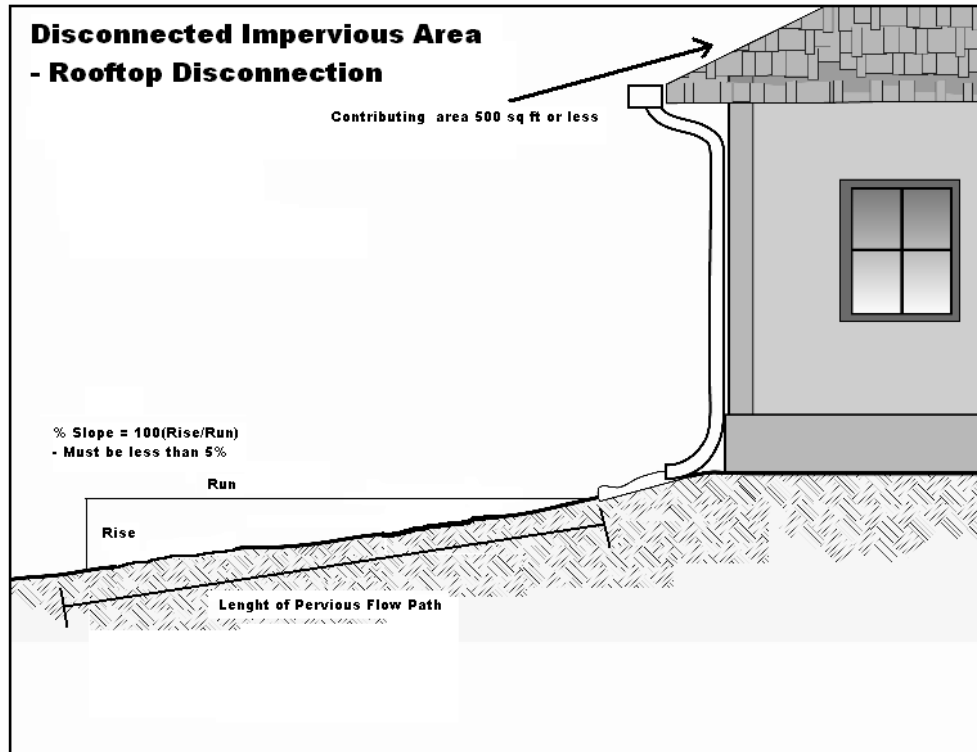
## **DISCONNECTED IMPERVIOUS AREA (DIA)**

When impervious surface areas such as rooftops and paved areas are directed to a pervious area such as lawn or grassed areas that allow for infiltration, filtration, and increased time of concentration, the impervious surface areas may qualify to be treated as Disconnected Impervious Area (DIAs).

**Impervious Area is defined as:** A surface that prevents the infiltration of water into the ground. Impervious surfaces and areas shall include roofs, home additions, patios and decks, garages, storage sheds and similar structures, driveways, access drives, parking areas, walkways and sidewalks. Any areas designed to be covered by loose surfacing materials such as gravel, stone and/or crushed stone, and intended for storage of and/or travel by vehicles, or pedestrians shall be considered impervious. Surfaces or areas designed, constructed and maintained to permit infiltration may be considered pervious.

**Rooftop Disconnection** A rooftop is considered to be completely disconnected if it meets the requirements listed below:

- The contributing area of rooftop to each disconnected discharge (downspout) is 500 square feet or less.
- The overland flow path from roof runoff discharge point has a positive slope of five percent (5%) or less.
- The length of the overland flow path is greater than 75 feet.
- Soils along the overland flow path are not classified as hydrologic group “D” i.e. infiltration is at least 1 inch per 24-hour day.
- The minimum required receiving pervious area shall not include another person’s property unless written permission has been obtained from the affected property owner.



Note: Downspout not required.

### Determining Status of DIA

**Step 1:** Determine contributing area of the roof to each disconnected discharge (downspout). If it's 500 ft<sup>2</sup> or less, continue to step 2. If it's greater than 500 ft<sup>2</sup>, the area does not qualify as DIA.

**Step 2:** Determine the length of down slope pervious flow path available for each disconnected discharge.

**Step 3:** Determine the % slope of the pervious flow path, % slope = (rise/ run) x 100. Must be 5% or less.

**Step 4:** See the table on the next page to determine the percentage of the area that can be treated as disconnected. If the available length of the flow path is equal to or greater than 75 ft, the discharge qualifies as entirely disconnected.

Partial Rooftop Disconnection		
Length of Pervious Flow Path* (ft) Lots 10,000 ft <sup>2</sup> and Under	Length of Pervious Flow Path* (ft)	Roof Area Treated as Disconnected
0 – 7.9	0 – 14	0%
8 – 15.9	15 – 29	20%
16 – 22.9	30 – 44	40%
23 – 29.9	45 – 59	60%
30 – 34.9	60 – 74	80%
35 or more	75 or more	100%
*Pervious flow path must be at least 15 feet from any impervious surface and cannot include impervious surfaces.		

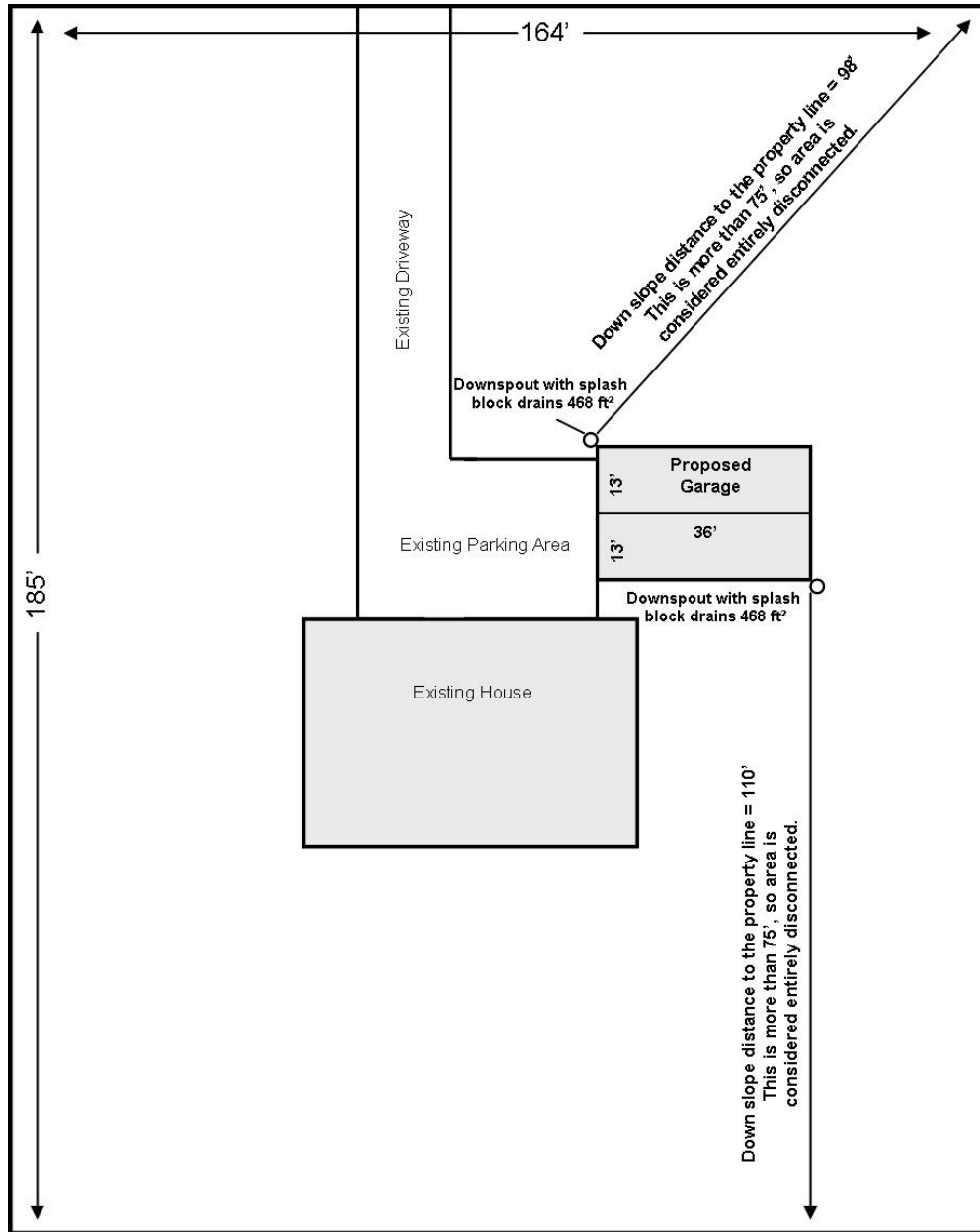
**Paved Disconnection** - When runoff from paved surfaces is directed to a pervious area that allows for infiltration, filtration, and increased time of concentration, the contributing pavement area may qualify as disconnected. This applies generally to only small or narrow pavement structures such as driveways and walkways. Paved surfaces can be considered disconnected if they, or the adjacent areas, meet the following requirements:

- The contributing flow path over the impervious area is not more than 75 feet
- The length of overland flow is greater than or equal to the maximum length of flow over the impervious area
- The slope of the contributing impervious area is five percent (5%) or less
- The slope of the overland flow path is five percent (5%) or less
- If discharge is concentrated at one or more discrete points, no more than 500 ft<sup>2</sup> may discharge to any one point. In addition, a gravel strip or other spreading device is required for concentrated discharges. For non-concentrated discharges along the entire edge of paved surface, a level spreader is not required; however, there must be provisions for the establishment of vegetation along the paved edge and temporary stabilization of the area until the vegetation is established.

REFERENCE: Philadelphia Water Department. 2006 & 2011. Stormwater Management Guidance Manual. Section 4: Integrated Site Design. Philadelphia, PA.

The following example determines the status of DIA for a proposed 936 ft<sup>2</sup> garage.

This example meets the criteria to use the Simplified Approach.



**Step 1:** Determine the area to each disconnected discharge. The area draining to each downspout is 468 ft<sup>2</sup>. This is less than 500 ft<sup>2</sup>, proceed to step 2.

**Step 2:** The discharge on the north side of the garage has a 98 ft pervious flow path available. The south discharge has 110 ft pervious flow path available.

**Step 3:** The rise of the north discharge is 2 ft and the run is 75 ft for a slope of 2.6%. This is 5% or less so it qualifies. For the south discharge the rise is 4 ft and the run is 100 ft equaling a slope of 4%. This is 5% or less, so it qualifies.

**Step 4:** Both of these discharges have pervious flow paths greater than 75 ft, so they qualify as entirely disconnected.

## Selecting BMPs

If BMPs are required, the Owner/ Designer should review the compiled information in the enclosed “Guide to Choosing Stormwater BMPs”, as taken from the *PA Handbook of Best Management Practices for Developing Areas* and the *PA Stormwater Management BMP Manual*. These documents identify stormwater BMPs that have been deemed to be of a nature and cost that will accomplish the goals of the Northumberland County Stormwater Management Plan, while not unduly burdening the residents. It will then be the Owner’s responsibility to select a facility, determine the appropriate size and agree to construct and maintain that facility or facilities. The property owner is encouraged to utilize both multiple and hybrid versions of the facilities, as outlined in the documents mentioned above.

# **Stormwater Management Worksheets**



# Upper Augusta Township Standard Design Assistance Manual Worksheet A

Property Owner's Name \_\_\_\_\_  
Applicant Name \_\_\_\_\_

Applicant / Owner Address \_\_\_\_\_  
and phone number \_\_\_\_\_  
\_\_\_\_\_

Address of Property \_\_\_\_\_

Tax Map Parcel ID # \_\_\_\_\_  
Parcel Size (approx) \_\_\_\_\_

A Sketch Plan must be included and show the following:

Total existing impervious area on the property \_\_\_\_\_  
New impervious area proposed \_\_\_\_\_  
Total impervious area on the property after  
project completion \_\_\_\_\_

Are there any known existing drainage problems or the potential for the proposed project to create drainage problems? (if yes, please explain)

*Acknowledgement* – I declare that I am the property owner, or representative of the owner, and that the information provided is accurate to the best of my knowledge. I understand that stormwater may not adversely affect adjacent properties or be directed onto another property without written permission. I also understand that false information may result in a stop work order or revocation of permits. Municipal representatives are also granted access to the property for review and / or inspection of this project if necessary.

Applicant Signature \_\_\_\_\_ Date \_\_\_\_\_

---

### ***To be completed by authorized municipal official***

Type of Stormwater Management Required:

- Exempt from stormwater management plan preparation (Worksheet A and Sketch Plan) \_\_\_\_\_
- Minor stormwater management site plan preparation (Complete Worksheet B to determine necessary BMP's) \_\_\_\_\_
- Formal stormwater management plan preparation (Consult a professional) \_\_\_\_\_

Determined by: \_\_\_\_\_ Date: \_\_\_\_\_

---

# Upper Augusta Township Standard Design Assistance Manual Worksheet B

**Step 1:** Determine the amount of impervious area created by the proposed projects. This includes any new surface area that inhibits the infiltration of stormwater into the ground. New stone and gravel areas are considered impervious. Existing impervious areas are not included in this calculation.

<b>Table # 1</b>				
Surface	Length	x	Width =	Total Impervious Area (SF)
Buildings				
Buildings				
Driveways				
Parking Areas				
Patios/Walkways				
Decks				
Other				
			<b>Total Proposed Impervious Area =</b>	

**Step 2:** Determine the Disconnect Impervious Area (DIA). All or parts of proposed impervious surfaces may qualify as Disconnected Impervious Area if runoff is directed to a pervious area that allows for infiltration, filtration and increased time of concentration. The volume of stormwater that needs to be managed could be reduced through DIA. Prepare a Minor Stormwater Management Site Plan to determine DIA.

### Determining Status of DIA

- a) Determine contributing area of the roof/driveway to each disconnected discharge. If it's 500 ft<sup>2</sup> or less (for a roof) or 1,000 ft<sup>2</sup> or less (for a driveway), continue to "b". If it's greater than these amounts, the area does not qualify as a DIA.
- b) Determine the length of down slope pervious flow path available for each disconnected discharge.
- c) Determine the % slope of the pervious flow path, % slope = (rise/ run) x 100. Must be 5% or less.
- d) See the table on the next page to determine the percentage of the area that can be treated as disconnected. If the available length of the flow path is equal to or greater than 75 ft, the discharge qualifies as entirely disconnected.

Partial Disconnections		
Length of Pervious Flow Path* (ft) Lots 10,000 ft <sup>2</sup> and Under	Length of Pervious Flow Path* (ft) Lots >10,000 ft <sup>2</sup>	DIA Credit Factor
0 – 7.9	0 – 14	1.0
8 – 15.9	15 – 29	0.8
16 – 22.9	30 – 44	0.6
23 – 29.9	45 – 59	0.4
30 – 34.9	60 – 74	0.2
35 or more	75 or more	0
*Pervious flow path must be at least 15 feet from any impervious surface and cannot include impervious surfaces.		

Using step 2 calculations calculated from the minor stormwater site plan, complete the table below. This will determine the impervious area that may be excluded from the area that needs to be managed through stormwater management BMP's. If total impervious area to be managed is zero, the area can be considered entirely disconnected and further calculations are not needed.

Table # 2				
Surface	Area (SF)	x	DIA Credit =	Impervious Area to be Managed (SF)
Buildings				
Buildings				
Buildings				
Buildings				
Buildings				
Driveways				
Driveways				
Parking Areas				
Patios/Walkways				
Decks				
Other				
			<b>Total Proposed Impervious Surface Area to be Managed (SF) =</b>	

\*If total impervious surface area to be managed is greater than zero, continue to Step 3.

**Step 3:** Calculate the volume of stormwater runoff created by proposed impervious surfaces.

$$\begin{array}{rclcl}
 \text{Impervious Area (SF) to be} & \times & 3.16\text{in}/12\text{in} = 0.263 = & & \text{Volume of Stormwater} \\
 \text{Managed (Sum from Table 2)} & & \text{(from 24hr rainfall)} & & \text{to be Managed (CF)} \\
 \hline
 & \times & 0.263 & = & \\
 \hline
 \end{array}$$

**Step 4:** Select BMP's and size according to the volume of stormwater that needs to be managed in Step 3.

<b>BMP Type</b>	<b>Necessary Volume**</b> (from Step 3 above)	<b>Length</b>	<b>Width</b>	<b>Depth</b>	<b>Void Ratio</b>	<b>Volume ***</b>
Infiltration Bed or Trench					0.4	
Infiltration Berm					1	
Rain Garden					0.4 in stone 1.0 above ground	
Rain Barrel or other usable storage		Use known volume of rain barrel, etc. 1 cubic foot is equal to 7.48 gallons.			1	
Other						
* Chart should only be used when a formal SWM Site Plan is not required.						
** Should not include areas that were proven to be 100% disconnected						
*** Volume = Length x Width x Depth x Void Ratio						

**VOLUME CALCULATIONS:**

$$\frac{\text{PROPOSED IMPERVIOUS AREA (TO BE CONTROLLED)} \times \text{CG-1 RAINFALL AMOUNT} \times 3.16 \text{ IN.}}{\text{CONVERSION}} \times 1 \text{ FT.} / 12 \text{ IN.} = \text{C.F.} \times \frac{\text{REQUIRED VOLUME}}{\text{C.F.}}$$

**SIZING CALCULATIONS:**

$$\frac{\text{FT.} \times \text{FT.} \times \text{FT.}}{(\text{LENGTH}^*) \times (\text{WIDTH}^*) \times (\text{BERM HEIGHT})} = \text{REQUIRED VOLUME} \quad \text{*AT 1/2 BERM HEIGHT}$$

**EXAMPLE CALCULATION:**

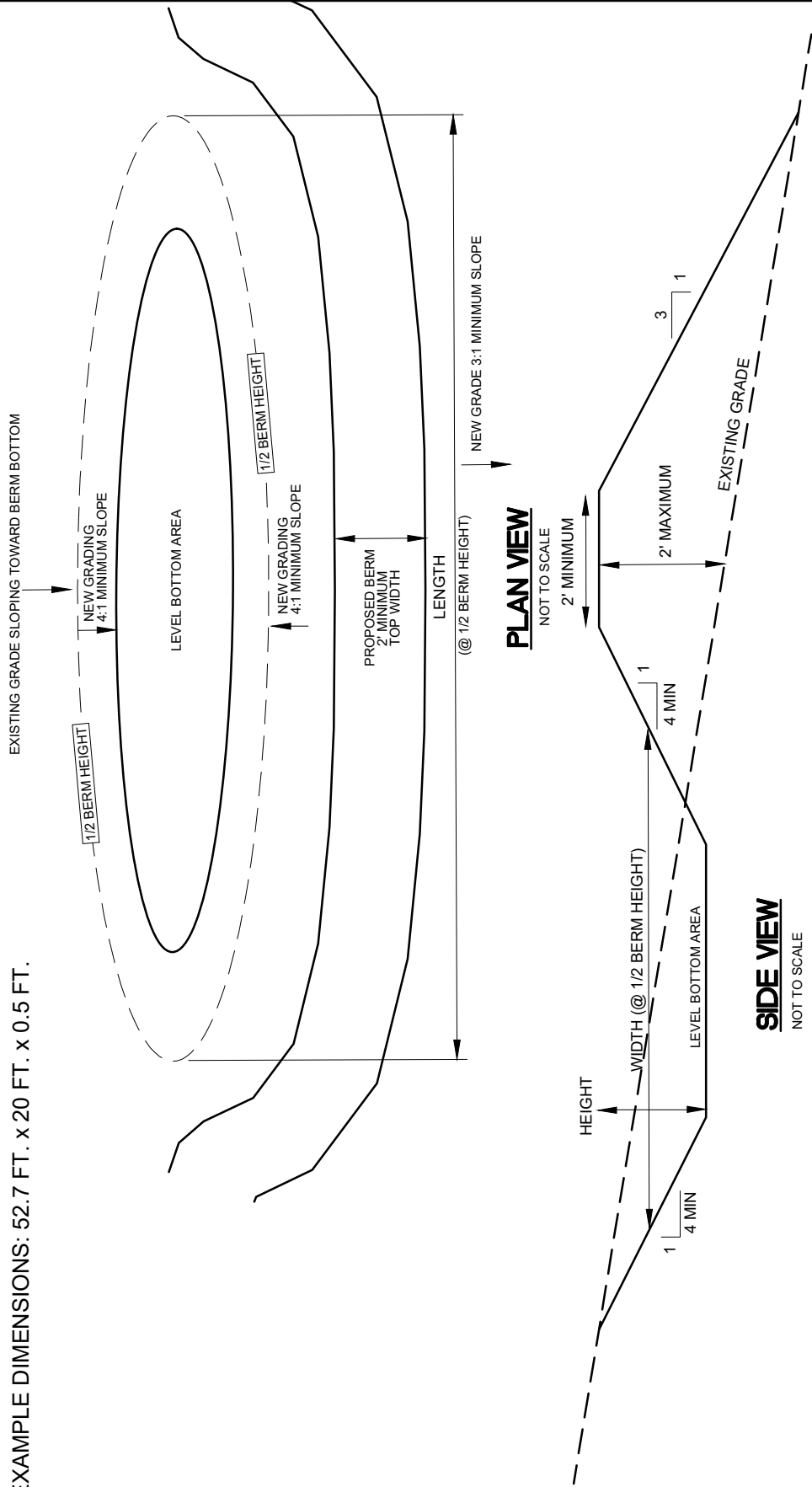
2,000 S.F. OF PROPOSED IMPERVIOUS;

$$2,000 \text{ S.F.} \times 3.16 \text{ IN.} \times 1 \text{ FT.} / 12 \text{ IN.} = 526.6 \text{ C.F.}$$

EXAMPLE DIMENSIONS: 52.7 FT. x 20 FT. x 0.5 FT.

**NOTES:**

1. MAKE EVERY EFFORT TO MINIMIZE COMPACTION IN THE AREA OF DISTURBANCE WHEN CONSTRUCTING THE BERM.
2. BERM SHALL BE LOCATED AS FAR AWAY AS POSSIBLE FROM BUILDING FOUNDATIONS, SEPTIC AREAS, AND WELLS, MINIMUM TEN (10) FEET.
3. LIGHTLY SCARIFY THE SOIL IN THE AREA OF THE PROPOSED BERM PRIOR TO TRANSFERRING SOIL.
4. USE ON-SITE SOILS TO CREATE THE BERM WHEN POSSIBLE. WHEN EXISTING SOILS ARE CLASS "D" THEY SHOULD BE MIXED WITH SAND TO IMPROVE INFILTRATION CAPABILITIES.
5. BERMS SHALL BE INSTALLED ALONG THE CONTOUR TO MAXIMIZE BERM VOLUMES AND INFILTRATION POTENTIAL.
6. SOIL SHOULD BE ADDED IN 8" LIFTS AND LIGHTLY COMPACTED AFTER EACH LIFT.
7. THE BERM MAY BE PLANTED WITH GRASS, PLANTS, SHRUBS OR TREES AS DESIRED.
8. OVERLAND FLOW TO THE INFILTRATION BERM SHOULD BE INCORPORATED WHEN POSSIBLE.
9. STANDARD DESIGNS ARE INTENDED TO PROVIDE A RESOURCE FOR SMALL PROJECT OWNERS. BY USING THE STANDARDIZED DESIGN, THE OWNER / APPLICANT / USER HEREBY AGREES THAT THEY ARE USING SUCH DESIGN AT THEIR OWN RISK.



**SIDE VIEW**  
NOT TO SCALE

**PLAN VIEW**  
NOT TO SCALE

**LEVEL SPREADER / INFILTRATION BERM**

**STORMWATER MANAGEMENT STANDARD DESIGN**

Upper Augusta Township  
Northumberland County, Pennsylvania

UPPER AUGUSTA TOWNSHIP  
SHEET: 1

143 Carlisle St.  
Gettysburg, PA 17325  
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310 Market St.  
Elysburg, PA 17824  
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1 East Harrisburg St.  
Elysburg, PA 17019  
tel: (717) 502-0884  
fax: (717) 502-0945



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**VOLUME CALCULATIONS:**

$$\frac{\text{PROPOSED IMPERVIOUS AREA (TO BE CONTROLLED)}}{\text{CG-1 RAINFALL AMOUNT}} \times \frac{\text{CONVERSION}}{\text{REQUIRED VOLUME}} = \frac{\text{C.F.}}{\text{NECESSARY VOLUME}}$$

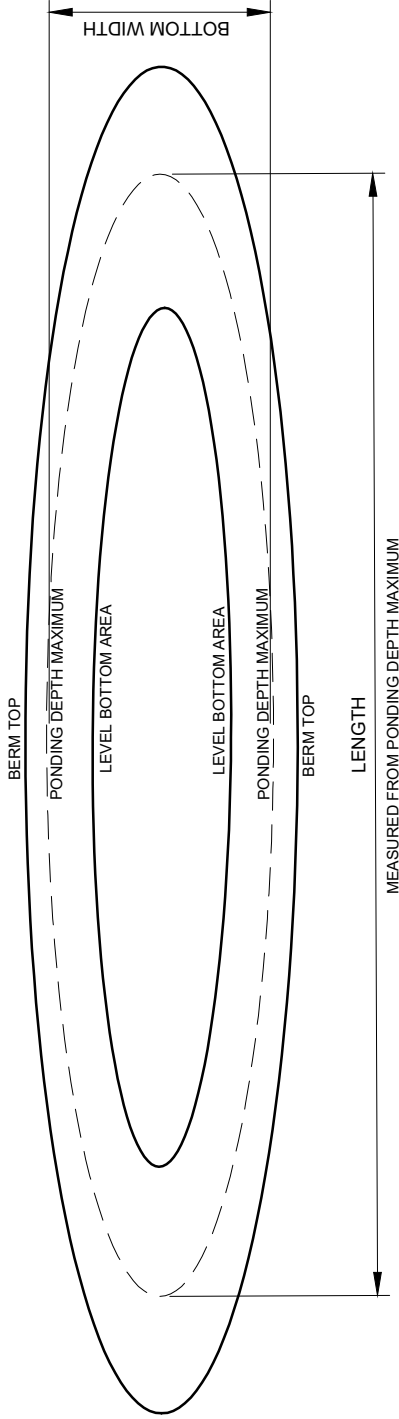
**SIZING CALCULATIONS:**

$$\frac{\text{FT.} \times \text{(WIDTH*)}}{\text{(LENGTH*)}} \times \frac{\text{FT.} \times \text{(DEPTH*)}}{\text{FT.}} = \text{NECESSARY VOLUME}$$

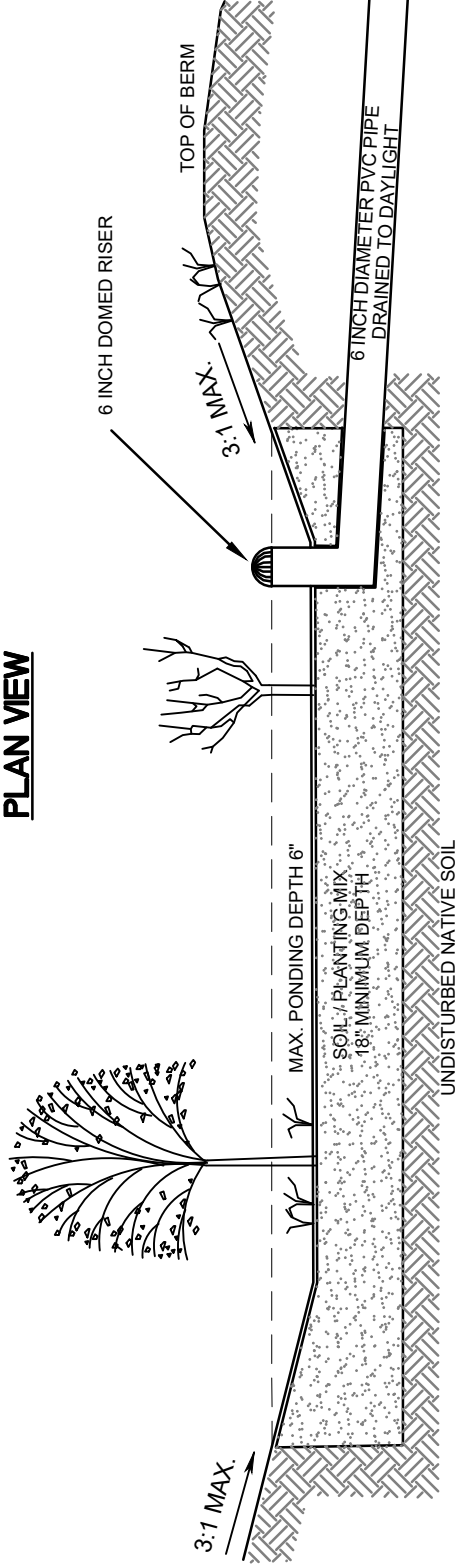
\*AT MAXIMUM PONDING DEPTH

**EXAMPLE CALCULATION:**

2,000 S.F. OF PROPOSED IMPERVIOUS;  
 2,000 S.F. x 3.16 IN. x 1 FT. / 12 IN. = 526.6 C.F.  
 EXAMPLE DIMENSIONS: 52.7 FT. x 20 FT. x 0.5 FT.



**PLAN VIEW**



**SECTION VIEW**

- NOTES:**
1. THE RAIN GARDEN BERM SHALL BE INSTALLED ALONG THE CONTOUR WITH THE TOP OF THE BERM ON A LEVEL GRADE.
  2. USE A MINIMUM OF 25% COMPOST WHEN SUPPLEMENTING SOIL. USE UP TO 25% SAND WHEN PARENT SOIL HAS A HIGH CLAY CONTENT. DO NOT COMPACT SOIL WHEN CONSTRUCTING THE RAIN GARDEN.
  3. INSTALL SOLID OVERFLOW PIPE WITH DOMED RISER AT AN ELEVATION THAT CREATES A 6 INCH MAXIMUM PONDING DEPTH.
  4. INSTALL PLANTS PER SUPPLIER'S RECOMMENDATION.
  5. ENSURE PLANTINGS ARE WATERED ONCE A WEEK IN THE FIRST YEAR IF IT DOES NOT RAIN.
  6. KEEP A 3" MAXIMUM LAYER OF MULCH ON THE GARDEN.
  7. WEED AND REMOVE DEBRIS FROM THE RAIN GARDEN AS NEEDED.
  8. PRUNING OF RAIN GARDEN PLANTINGS IS NOT RECOMMENDED.
  9. OVERLAND FLOW TO THE RAIN GARDEN SHOULD BE INCORPORATED WHEN POSSIBLE.
  10. THIS IS A GOOD OPTION WHERE THE QUALITY OF WATER RUNOFF MAY BE A CONCERN.
  11. RAIN GARDEN SHALL BE LOCATED AS FAR AWAY AS POSSIBLE FROM BUILDING FOUNDATIONS, SEPTIC AREAS, AND WELLS, MINIMUM TEN (10) FEET.
  12. STANDARD DESIGNS ARE INTENDED TO PROVIDE A RESOURCE FOR SMALL PROJECT OWNERS. BY USING THE STANDARDIZED DESIGN, THE OWNER/ APPLICANT / USER HEREBY AGREES THAT THEY ARE USING SUCH DESIGN AT THEIR OWN RISK.

DRAWN BY: BLG
DESIGNED BY: BLG
CHECKED BY: TRK
SCALE: N.T.S.
DATE: OCTOBER 2022
SHEET: 1

**RAIN GARDEN**

**STORMWATER MANAGEMENT STANDARD DESIGN**

Upper Augusta Township  
 Northumberland County, Pennsylvania

**UPPER AUGUSTA TOWNSHIP**

**KPI TECHNOLOGY**

CIVIL & ENVIRONMENTAL ENGINEERING CONSULTANTS

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**VOLUME CALCULATIONS:**

$$\frac{\text{PROPOSED IMPERVIOUS AREA (TO BE CONTROLLED)} \times \text{S.F.} \times 3.16 \text{ IN.} \times 1 \text{ FT.} / 12 \text{ IN.}}{\text{CG-1 RAINFALL AMOUNT} \times \text{CONVERSION}} = \frac{\text{REQUIRED VOLUME}}{\text{C.F.}}$$

**SIZING CALCULATIONS:**

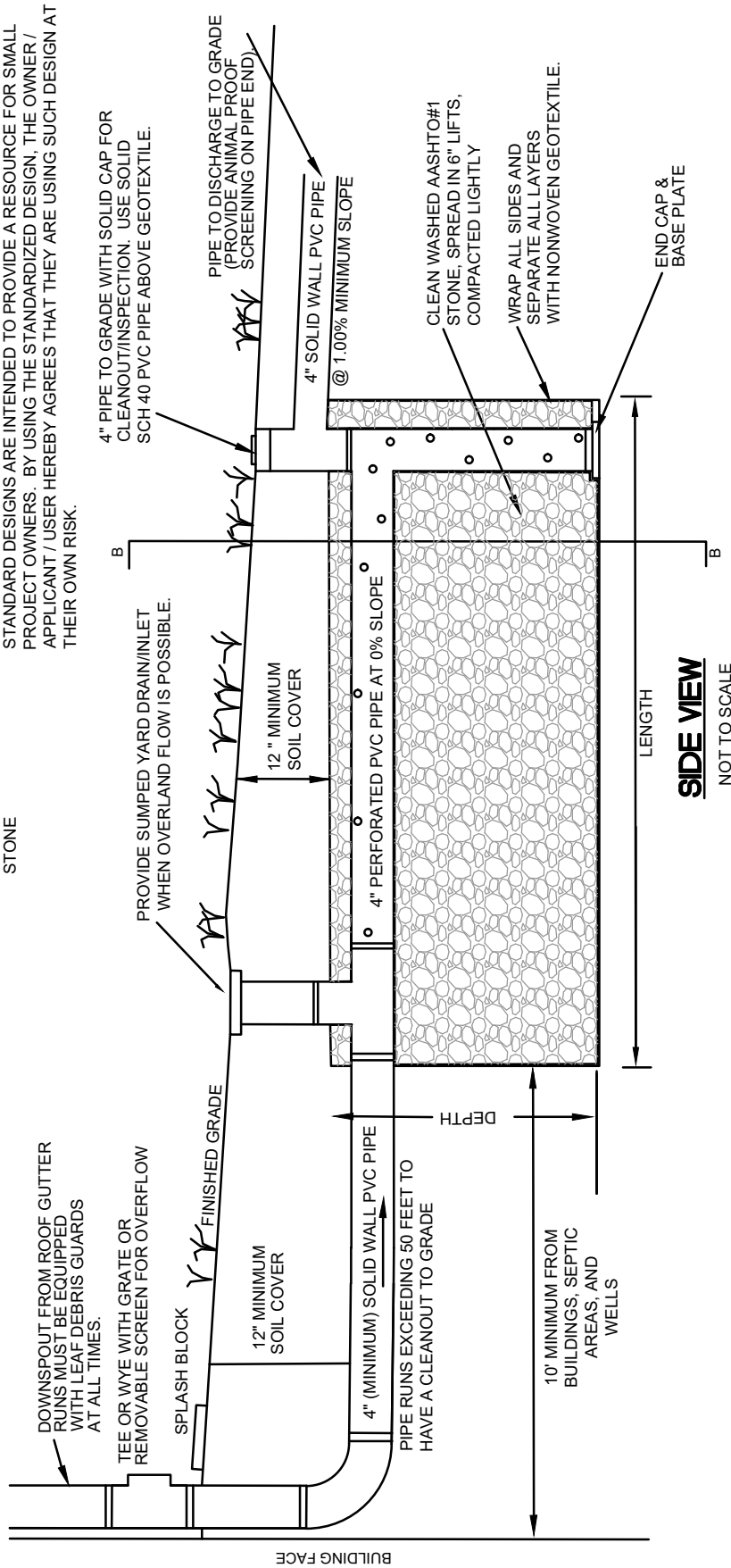
$$\frac{\text{FT.} \times \text{FT.} \times \text{FT.}}{(\text{LENGTH}) \times (\text{WIDTH}) \times (\text{DEPTH})} \times 0.40 = \text{REQUIRED VOLUME}$$

**EXAMPLE CALCULATION:**

2,000 S.F. OF PROPOSED IMPERVIOUS;  
 2,000 S.F. x 3.16 IN. x 1 FT. / 12 IN. = 526.6 C.F.  
 EXAMPLE DIMENSIONS: 526.6 C.F. / 0.40 = 1,316.5 C.F. (EXCAVATED)  
 33 FT. x 20 FT. x 2 FT.

A LAYER OF NONWOVEN GEOTEXTILE AROUND STONE

**NOTE:**  
 STANDARD DESIGNS ARE INTENDED TO PROVIDE A RESOURCE FOR SMALL PROJECT OWNERS. BY USING THE STANDARDIZED DESIGN, THE OWNER / APPLICANT / USER HEREBY AGREES THAT THEY ARE USING SUCH DESIGN AT THEIR OWN RISK.



DRAWN BY: BLG
DESIGNED BY: BLG
CHECKED BY: TRK
SCALE: N.T.S.
DATE: OCTOBER 2022
SHEET: 1

**INFLTRATION BED**  
 STORMWATER MANAGEMENT STANDARD DESIGN  
 Upper Augusta Township  
 Northumberland County, Pennsylvania

1 East Harrisburg St.  
 Harrisburg, PA 17019  
 tel: (717) 502-0884  
 fax: (717) 502-0945

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