

**NPDES Stormwater Discharges from MS4
Pollutant Reduction Plan
For
Sambo Creek
In
Middle Smithfield Township
Monroe County, Pennsylvania**

September 2017

Prepared For:

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Middle Smithfield Township, Monroe County is submitting this Pollution Reduction Plan (PRP) in accordance with the requirements of Individual Permit Authorization to Discharge Under the National Pollutant Discharge Elimination System (NPDES) Individual Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4); specifically, in accordance with the MS4 Requirements Table (Municipal) Anticipated Obligations for Subsequent NPDES Permit Term (last revised 6/26/2017). Middle Smithfield Township must create a PRP due to discharges from their MS4 to Impaired surface waters of the Sambo Creek (HUC 2040104), which is listed as impaired as noted below and in Appendix A:

Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Sambo Creek	Appendix E-Siltation (5)	Cause Unknown (5)
Brodhead Creek	Appendix B-Pathogens (5)	
Bush Kill		Mercury (5)
Delaware River		Mercury (5)

The intent of this MS4 PRP is to establish the existing loading of pollutants discharged from the MS4 to the Sambo Creek, and to present a plan to reduce these pollutants. This MS4 PRP is organized to follow the PRP Instructions included as part of the MS4 Individual Permit instruction package. This PRP may be evaluated and updated by Middle Smithfield Township on an as-needed basis, based on its effectiveness in reducing pollutant loads in discharges from the regulated small MS4. If this occurs, Middle Smithfield Township will work with the Department of Environmental Protection (DEP) for review and approval of any revisions or updates.

Each MS4 PRP must include the following Required PRP Elements:

Section A: Public Participation

Section B: Map

Section C: Pollutants of Concern

Section D: Determine Existing Loading for Pollutants of Concern

Section E: Select BMPs to Achieve the Minimum Required Reductions in Pollutant Loading

Section F: Identify Funding Mechanisms

Section G: Identify Responsible Parties for Operation and Maintenance (O&M) of BMPs

A. Public Participation

As part of the preparation of this MS4 PRP, public participation is required. The public participation measures that are required are:

- The Township shall make a complete copy of the PRP available for public review.
- The Township shall publish, in a newspaper of general circulation in the area, a public notice containing a statement describing the plan, where it may be reviewed by the public, and the length of time the permittee will provide for the receipt of comments. The public notice must be published at least 45 days prior to the deadline for submission of the PRP to DEP. **Attach a copy of the public notice to the PRP.**
- The Township shall accept written comments for a minimum of 30 days from the date of public notice. **Attach a copy of all written comments received from the public to the PRP.**
- The Township shall accept comments from any interested member of the public at a public meeting or hearing, which may include a regularly scheduled meeting of the governing body of the municipality or municipal authority that is the permittee.
- The Township shall consider and make a record of the consideration of each timely comment received from the public during the public comment period concerning the plan, identifying any changes made to the plan in response to the comment. **Attach a copy of the permittee's record of consideration of all timely comment received in the public comment period to the PRP.**

All required documentation of public participation is included as Appendix B.

- Date PRP public notice was published in newspaper: **July 26, 2017**
- Date PRP was made available for public review/comment: **August 1, 2017**
- End date for receipt of written comments (30 days from the date of public notice): **September 1, 2017**
- Date PRP listed on the public meeting agenda: **August 10, 2017**
- Date PRP comments were accepted at a public meeting: **September 14, 2017**

B. Map

Mapping of the existing land uses and the storm sewershed PRP planning areas are included in Appendix C. The mapped area is associated with the MS4 that discharge to impaired surface waters, and that are used to calculate the storm sewershed area that is subject to the Individual Permit. In addition, the proposed locations of structural BMPs that will be implemented to achieve the required pollutant load reductions are identified on the maps.

The Middle Smithfield Township MS4 PRP Planning Area Map identifies the storm sewershed boundary as well as the proposed locations of structural BMPs to be implemented in order to achieve required pollutant load reductions.

The Middle Smithfield Township MS4 PRP Land Uses Map shows the existing land uses.

C. Pollutants of Concern

Middle Smithfield Township shall calculate existing loading of the pollutant(s) of concern in lbs/year; calculate the minimum reduction in loading in lbs/year; select Best Management Practice(s) (BMP(s)) to reduce loading; and demonstrate that the selected BMPs will achieve the minimum reductions.

For PRPs developed for impaired waters (Appendix E), the pollutant(s) are based on the impairment listing, as provided in the MS4 Requirements Table. If the impairment is based on siltation only, a minimum 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., “Excessive Algal Growth” and “Organic Enrichment/Low D.O.”), a minimum 5% TP reduction is required. If the impairment is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed. PRPs may use a presumptive approach in which it is assumed that a 10% sediment reduction will also accomplish a 5% TP reduction. However, MS4s may not presume that a reduction in nutrients will accomplish a commensurate reduction in sediment.

According to the MS4 requirements Table, Middle Smithfield Township’s impaired surface water has an impairment of siltation. Since siltation is a listed impairment, a minimum 10% reduction is required. The MS4 PRP presents the minimum reduction in loading for siltation as pounds per year (lbs/yr).

D. Determine Existing Loading for Pollutants of Concern

The date the existing loading was calculated / the date of development of this PRP is July 2017. Any methodology that calculates existing pollutant loading in terms of lbs per year, evaluates BMP-based pollutant reductions utilizing the BMP effectiveness values contained in 3800-PM-BCW0100m or Chesapeake Bay Program expert panel reports, uses average annual precipitation conditions, considers both overland flow and stream erosion, and is based on sound science may be considered acceptable.

Whatever tool or approach that is used to estimate existing loading from the PRP Planning Area must also be used to estimate existing loading to planned BMPs. This avoids errors in percent pollutant removal calculations that would result if different methods were used.

MS4s may claim “credit” for structural BMPs implemented prior to development of the PRP to reduce existing loading estimates. In order to claim credit, identify all such structural BMPs in Section D of the PRP along with the following information:

- A detailed description of the BMP;
- Latitude and longitude coordinates for the BMP;
- Location of the BMP on the storm sewershed map;
- The permit number, if any, that authorized installation of the BMP;
- Calculations demonstrating the pollutant reductions achieved by the BMP;
- The date the BMP was installed and a statement that the BMP continues to serve the function(s) it was designed for; and
- The operation and maintenance (O&M) activities and O&M frequencies associated with the BMP.

The MS4 permittee may optionally submit design drawings of the BMP for previously installed or future BMPs with the PRP. Middle Smithfield Township did not claim “credit” for any existing BMPs in the Sambo Creek Watershed.

In modeling the existing load, the software program known as MapShed was utilized in the development of this MS4 PRP to determine the source areas and the total load of sediment based on the existing land uses. MapShed is a customized GIS interface that is used to create

input data for an enhanced version of the Generalized Watershed Loading Functions – Enhanced (GWLF-E) watershed model originally developed at Cornell University. MapShed was improved by Dr. Barry Evans and his group at PSIEE using AVGWLFL, a GIS-based watershed modeling tool that uses hydrology, land cover, soils, topography, weather, pollutant discharges, and other critical environmental data to model sediment and nutrient transport within a watershed.

Middle Smithfield Township’s permit obligation applies to the land area that drains to the municipal separate storm sewer from within the jurisdiction of the MS4 permittee (the “storm sewershed”). The storm sewershed land area that drains to the municipal separate storm sewer from within the jurisdiction of the MS4 to Impaired Downstream Waters has been delineated using PAMAP data known as Light Detection and Ranging (LiDAR) contours. Drainage areas to proposed BMP locations have also been delineated (BMP DA) using LiDAR contours. This information was then converted into GIS data for use in the MapShed program, which was utilized in the development of this MS4 PRP to determine the total loading of siltation in the Impaired Downstream Waters watersheds. Please note that per discussions with Barry Evans, it was determined that the best way to model the storm sewersheds and BMP watersheds in MapShed was as a urban area overlay; this way the necessary information could be obtained while still correctly using MapShed to model on a watershed basis.

TABLE D-1: SUMMARY OF AREAS

	Land Area (acres)
Urban Area in Sambo Creek Sewershed	680
NPDES Permitted Parsed Area	61
Non-MS4 Parsed Area	345
Total Planning Area	274

MapShed was run for the total watershed to properly account for downstream channel impacts and include impaired waters identified in the MS4 Requirements Table. The output from

MapShed GWLF-E Existing Loads for both the Total Watershed and PRP Planning Area are in Appendix D. The existing loadings for sediment as determined by MapShed are as follows:

TABLE D-2: SAMBO CREEK - EXISTING LOADING FOR POLLUTANTS OF CONCERN FROM MAPSHED

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	0	0.00	0.00	0.00	0.00	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	0	0.00	0.00	0.00	0.00	0.00	0.00
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Residential	12	1120.80	93.40	24.00	2.00	2.80	0.23
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Source Weighting							
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		3831.91		1.9		0.5	0.010
Groundwater				112.7		2.7	0.009
Point Sources				0.0		0.0	0.000
Septic Systems				0.0		0.0	0.000
Totals	12	4952.7		138.6		6.0	

TABLE D-3: MICHAEL CREEK - EXISTING LOADING FOR POLLUTANTS OF CONCERN FROM MAPSHED

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	40	508.00	12.70	8.40	0.21	0.80	0.02
Wetland	7	16.10	2.30	3.40	0.49	0.20	0.03
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	30	5622.00	187.40	49.80	1.66	3.60	0.12
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	114	2793.00	24.50	62.70	0.55	6.80	0.06
MD Residential	69	6251.40	90.60	140.80	2.04	15.90	0.23
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		81773.70		40.9		10.1	0.024
Groundwater				725.2		19.7	0.039
Point Sources				0.0		0.0	0.000
Septic Systems				786.1		0.0	0.092
Totals	260	96964.2		1817.3		57.1	

TABLE D-4: MARSHALLS CREEK - EXISTING LOADING FOR POLLUTANTS OF CONCERN FROM MAPSHED

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	2	23.00	11.50	0.40	0.21	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	0	0.00	0.00	0.00	0.00	0.00	0.00
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		155.49		0.1		0.0	0.000
Groundwater				0.0		0.0	0.000
Point Sources				0.0		0.0	0.000
Septic Systems				0.0		0.0	0.000
Totals	2	178.5		0.5		0.0	

The Sambo Creek storm sewershed receives runoff from areas considered to be tributary to both the Michael Creek and Marshalls Creek. However, due to a significant cut-off swale which feeds the East Stroudsburg Reservoir, these areas are not tributary to those storm sewersheds. As identified above, those areas have been included in the Sambo Creek calculations, accordingly.

Middle Smithfield Township has a total loading of 102,095 lbs/year in its Sambo Creek storm sewershed. The impairment is Siltation which requires a minimum 10% reduction.

The existing loading subject to the requirement was multiplied by 10% to determine the required siltation reduction. Table D-5 shows a summary of the reduction requirements:

TABLE D-5: REQUIRED 10% SILTATION REDUCTIONS

	Sambo Creek Storm Sewershed
Existing Load (lb/yr)	102,095
Percent Reduction	10%
Required Reduction (lb/yr)	10,210
Proposed Load Reduction (lb/yr)	10,242

E. Select BMPs to Achieve the Minimum Required Reductions in Pollutant Loading

Middle Smithfield Township has a requirement to reduce siltation. Implementation of BMPs or land use changes must be proposed that will result in meeting the minimum required reduction in pollutant loading within the storm sewershed(s) identified by the MS4. These BMP(s) must be implemented within 5 years of DEP's approval of coverage under the individual permit, and may be located on either public or private property. If the applicant is aware of BMPs that will be implemented by others (either in cooperation with the applicant or otherwise) within the Planning Area that will result in net pollutant loading reductions, the applicant may include those BMPs within its PRP.

PADEP indicates that historic street sweeping practices should not be considered in calculating credit for future practices. All proposed street sweeping practices may be used for credit if the minimum standard is met for credit (see 3800-PM-BCW0100m). In other words, if sweeping was conducted one time per month and will be increased to 25 times per year in the future, the MS4 does not need to use the "net reduction" resulting from the increased sweeping; it may take credit for the full amount of reductions from 25 times per year sweeping.

Opportunities for BMP installation vary across a municipality, and for that reason MS4s with multiple PRP obligations need not propose BMPs to address each impairment listed in the Table during the permit term. The existing loading must be calculated for the entire PRP Planning Area which drains to impaired waters, but pollutant controls to be installed during the subsequent permit term may be located such that they reduce the load in one sub-watershed by less than 10% and by more than 10% in another (as long as the overall amount of lbs reduced constitutes 10% of the existing loading for the entire PRP Planning Area).

MS4s may propose and take credit for only those BMPs that are not required to meet regulatory requirements or otherwise go above and beyond regulatory requirements. For example, a BMP that was installed to meet Chapter 102 NPDES permit requirements for stormwater associated with construction activities may not be used to meet permit term minimum pollutant reductions unless the MS4 can demonstrate that the BMP exceeded regulatory requirements; if this is

done, the MS4 may take credit for only those reductions that will occur as a result of exceeding regulatory requirements.

Middle Smithfield Township has not claimed credit from any Chapter 102 NPDES installed BMPs and plans to achieve the siltation reduction by designing, constructing, operating and maintaining Best Management Practices (BMPs). Middle Smithfield Township is required to implement this plan over the next five (5) years.

The Impaired Surface waters of the Sambo Creek Storm Sewershed require a 10% percent reduction in Siltation. Table E-1 is a summary of the proposed BMPs under consideration, including ID (as indicated on PRP Map), location, type, area treated, and Siltation removed:

TABLE E 1: SUMMARY OF BMPS

BMP ID	BMP LOCATION	BMP TYPE	AREA TREATED BY BMP	SILTATION REMOVED BY BMP
1	Wooddale Road	Vegetated Open Channel (C/D Soils)	0.5 acres	179 lb/yr
2	Havenwood Drive and Magnolia Drive	Vegetated Open Channel (C/D Soils)	2.5 acres	864 lb/yr
3	Big Bear Drive to Hikers Drive	Vegetated Open Channel (C/D Soils)	17 acres	6,407 lb/yr
4	Mountain Laurel Drive	Stream Restoration	24 acres	7,450 lb/yr

As illustrated in the previous section in Table D-5, the load after proposed BMPs are implemented for Impaired Surface waters to the Sambo Creek Storm Sewersheds should be 10,210 lb/yr. As demonstrated above in Table E-1 the proposed total load reduction will be 10,242 lb/yr, which meets and/or exceeds the minimum required reduction in pollutant loading.

The following table summarizes the siltation load and required siltation reduction for the Impaired Surface waters of Sambo Creek Storm Sewersheds. Also included is a summary of the proposed BMPs contemplated to achieve the required siltation load reduction.

TABLE E-2: MS4 PRP STRATEGY SUMMARY

Description	Value	Unit
Sambo Creek Storm Sewershed	274	acres
Existing Siltation Load	102,095	lb/year
Required Siltation Pollutant Load Reduction Percentage	10	%
Minimum Required Pollutant Load Reduction	10,209	lb/year
Proposed Siltation Load Reduction from BMPs	10,242	lb/year

F. Identify Funding Mechanism(s)

Prior to approving coverage DEP will evaluate the feasibility of implementation of an applicant's PRP. Part of this analysis includes a review of the applicant's proposed method(s) by which BMPs will be funded. Applicants must identify all project sponsors and partners, and probable funding sources for each BMP. DEP does not expect that guaranteed sources are identified in the PRP, but does expect that applicants propose their preferred funding options with alternatives, in the event the preferred options do not materialize.

Funding sources for the proposed BMP projects outlined in this PRP include the following:

- MS4 General Fund
- MS4 Dedicated Stormwater Fund
- Bond
- Developer Cooperation
- MS4 Stormwater Fee
- Grant Funding
- PennVest Low-Interest Loan

Middle Smithfield Township will be working in the following five years (i.e., during the permit term) to determine the best funding source for each proposed BMP project, as each project is undertaken.

G. Identify Responsible Parties for Operation and Maintenance (O&M) of BMPs

Once implemented, the BMPs must be maintained in order to continue producing the expected pollutant reductions. Applicants must identify the following for each selected BMP:

- The party(ies) responsible for ongoing O&M;
- The activities involved with O&M for each BMP; and
- The frequency at which O&M activities will occur.

MS4 permittees will need to identify actual O&M activities in Annual MS4 Status Reports submitted under the Individual Permit.

Table G-1 OPERATION AND MAINTENANCE OF BMPs

NAME OF BMP	LOCATION OF BMP	OWNER/ RESPONSIBLE PARTY	O&M ACTIVITY & FREQUENCY
BMP #1 Vegetated Open Channels (C/D Soils)	Wooddale Road	Public Right-of- way/Middle Smithfield Township	Per PA BMP Manual (latest revision)
BMP #2 Vegetated Open Channels (C/D Soils)	Havenwood Drive and Magnolia Drive	Public Right-of- way/Middle Smithfield Township	Per PA BMP Manual (latest revision)
BMP #3 Vegetated Open Channels (C/D Soils)	Big Bear Drive to Hikers Drive	Public Right-of- way/Middle Smithfield Township	Per PA BMP Manual (latest revision)
BMP #4 Stream Restoration	Mountain Laurel Drive	Private Owner/Middle Smithfield Township	Per PA BMP Manual (latest revision)

H. GENERAL INFORMATION

Terms: The term “nutrients” refers to “Total Nitrogen” (TN) and “Total Phosphorus” (TP) unless specifically stated otherwise in DEP’s latest Integrated Report. The terms “sediment,” “siltation,” and “suspended solids” all refer to inorganic solids and are hereinafter referred to as “sediment.” The term, “storm sewershed” is defined in the PAG-13 General Permit as the land area that drains to the municipal separate storm sewer from within the jurisdiction of the MS4 permittee. This term is used in these instructions as well as the term, “PRP Planning Area” (or “Planning Area”), which refers to all of the storm sewersheds that an MS4 must calculate existing loads and plan load reductions for.

Pollutants of Concern and Required Reductions: For all PRPs, MS4s shall calculate existing loading of the pollutant(s) of concern, in lbs/year; calculate the minimum reduction in loading, in lbs/year; select BMP(s) to reduce loading; and demonstrate that the selected BMP(s) will achieve the minimum reductions.

For PRPs developed for impaired waters (Appendix E), the pollutant(s) are based on the impairment listing, as provided in the MS4 Requirements Table. If the impairment is based on siltation only, a minimum 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., “Excessive Algal Growth” and “Organic Enrichment/Low D.O.”), a minimum 5% TP reduction is required. If the impairment is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed. PRPs may use a presumptive approach in which it is assumed that a 10% sediment reduction will also accomplish a 5% TP reduction. However, MS4s may not presume that a reduction in nutrients will accomplish a commensurate reduction in sediment.

Existing Pollutant Loading: Existing loading must be calculated and reported for the portion of the Planning Area which drains to impaired waters as of the date of the development of the PRP. MS4s may not claim credit for street sweeping and other non-structural BMPs implemented in the past. If structural BMPs were implemented prior to development of the PRP and continue to be operated and maintained, the MS4 may claim pollutant reduction credit in the form of reduced existing loading.

Each impairment identified on the MS4 Requirements Table (“Table”) must be addressed in a PRP document. The Table listings for each MS4 are different because they reflect local conditions, which is why an MS4 must carefully interpret the information on the Table.

NOTE – An MS4 may not reduce its obligations for achieving permit term pollutant load reductions through previously installed BMPs. An MS4 may use all BMPs installed prior to the date of the load calculation to reduce its estimate of existing pollutant loading. For example, if a rain garden was installed ten years ago and is expected to remove 100 lbs of sediment annually, and the overall annual loading of sediment in the storm sewershed is estimated to be 1,000 lbs without specifically addressing the rain garden, an MS4 may not claim that the rain garden satisfies its obligations to reduce sediment loading by 10%. The MS4 may, however, use the rain garden to demonstrate that the existing load is 900 lbs instead of 1,000 lbs, and that 90 lbs rather than 100 lbs needs to be reduced during the term of permit coverage.

NOTE - MapShed, or any other watershed model where channel erosion is explicitly modeled, should be run on a minimum of ~10 mi² area to properly account for downstream channel impacts and include impaired waters identified in the MS4 Requirements Table. Aggregation of these waters up to approximately the 12-digit HUC scale for modeling purposes is acceptable. Modeling may not be done at the individual storm sewershed or municipal scale where the extent of downstream impact is not included in load calculation.

BMP Effectiveness: All MS4s must use the BMP effectiveness values contained within DEP's BMP Effectiveness Values document (3800-PM-BCW0100m) or Chesapeake Bay Program expert panel reports for BMPs listed in those resources when determining pollutant load reductions in PRPs, except as otherwise approved by DEP. An example of other approaches that may be approved by DEP include the use of thoroughly vetted mechanistic models with self-contained BMP modules (e.g., Storm Water Management Model (SWMM), WinSLAMM) to demonstrate achievement of reduction targets. Application of these data intensive models could allow for a streamlining of the planning and design phases of BMPs that may provide future cost savings as municipalities move toward implementation of the plan. Such resources must be documented in the PRP, and must reflect both overland flow and in-stream erosion components.

NOTE - Calculation of sediment load reductions for PRP purposes using the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects report should be done as follows:

- Where existing sediment loads are calculated using the Chesapeake Bay loading rates (i.e., the "simplified method" illustrated in Attachments C and D), the Sediment Delivery Ratio (SDR) of 0.181 must be applied and the effectiveness value contained in Table 3 of the Expert Panel Report applies (44.88 lb/ft/yr TSS). The effectiveness values in document 3800-PM-BCW0100m implicitly apply the SDR; thus, sediment load reductions calculated from stream restoration projects must be consistent.

Alternately, sediment reduction from streambank restoration projects when existing loads are calculated using the simplified method may be estimated using the Protocols outlined in Section 5 of the report and must then apply the 0.181 SDR along with the 50% efficiency uncertainty factor.

- Where existing sediment loads were calculated using modeling at a local watershed scale, the default rate to be used is 115 lb/ft/yr. This default rate comes from a convergence of MapShed modeled streambank erosion loads from a group of urbanized watersheds, the 248 lb/ft default edge-of-field (EOF) rate in the Expert Panel Report with the 50% efficiency uncertainty factor specified for the Protocols applied, and field data were collected following the BANCS methodology where projects have been implemented and load reductions calculated using the Protocols.

Alternately, sediment reduction from streambank restoration projects when existing loads are calculated using modeling at a local scale may be estimated using the Protocols outlined in Section 5 of the report and must then apply the 50% efficiency uncertainty factor.

NOTE – Use of default effectiveness values (44.88 lb/ft/yr and 115 lb/ft/yr) will be accepted for the subsequent permit term. It is recommended that the data required to complete load calculations using the Protocols be collected during the design phase for use in subsequent load reduction calculations.

NOTE – Desktop MapShed users may not use the streambank restoration or street sweeping components included in the MapShed BMP editor for pollutant reduction calculations. Pollutant reductions associated with streambank restoration projects must use the methods described above; whereas, reductions from street sweeping must be calculated in accordance with the Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices or the BMP Effectiveness Values Table.

NOTE – If BMP effectiveness values are updated in DEP's BMP Effectiveness Values document or in Chesapeake Bay Program expert panel reports between the time the PRP is approved and the time the final report is developed to document compliance with the permit, those updated effectiveness values may optionally be used.

Combining PRPs: If an MS4 discharges stormwater to local surface waters that drain to the Chesapeake Bay watershed (Appendix D) that are also impaired for nutrients and/or sediment (Appendix E), separate or combined PRPs may be submitted, at the MS4's discretion.

For MS4s within the Chesapeake Bay watershed who are submitting combined PRPs to address both Appendices D and E, it is recommended that permittees focus on the impaired local surface waters first, and then determine if the BMPs proposed in the Planning Area(s) for locally impaired waters will be sufficient to meet the overall pollutant reduction requirements for the Planning Area for the Chesapeake Bay. In general, PRPs that include both local impaired waters (Appendix E) and Chesapeake Bay watershed (Appendix D) must address the local impaired waters (i.e., credit cannot generally be claimed under Appendix E for BMPs implemented outside of the Planning Area of the local impaired waters).

Joint PRPs: An MS4 may develop and submit a joint PRP in concert with (an)other MS4(s). In general, the MS4s participating in a joint PRP should have contiguous land areas. The area to be used to calculate existing loads is the PRP Planning Area for all MS4 jurisdictions.

DEP requires that joint PRP participants document their involvement with a written agreement. DEP recommends that such agreements include the following topics:

- Scope of the Agreement
 - Complete Pollutant Reduction Plan implementation (or individual BMP implementation)
- Roles and Responsibilities
 - How projects will be selected
 - Selection of engineering and other contracted services
 - Long-term O&M
 - Adaptive management of the PRP (or the individual BMPs) over the permit term
 - Commitment to using the Plan (or to implementing the individual BMP)
- Allocations of Cost and pollutant reduction
 - Methodology for sharing the cost

- Methodology for distributing the pollutant reductions
- Timeline for implementation
 - Schedule of milestones to complete and implement the plan (or the individual BMP)

MS4s participating in collaborative efforts are encouraged to contact DEP's Bureau of Clean Water during the PRP development phase for feedback on proposed approaches.

BMP Selection: MS4s may propose and take credit for only those BMPs that are not required to meet regulatory requirements or otherwise go above and beyond regulatory requirements. For example, a BMP that was installed to meet Chapter 102 NPDES permit requirements for stormwater associated with construction activities may not be used to meet permit term minimum pollutant reductions unless the MS4 can demonstrate that the BMP exceeded regulatory requirements; if this is done, the MS4 may take credit for only those reductions that will occur as a result of exceeding regulatory requirements.

NOTE – Street sweeping may be proposed as a BMP for pollutant loading reductions if 1) street sweeping is not the only method identified for reducing pollutant loading, and 2) the BMP effectiveness values contained in 3800-PM-BCW0100m or Chesapeake Bay Program expert panel reports are utilized.

Offsets: DEP may authorize the use of offsets toward meeting PRP load reduction requirements, if an individual permit application is submitted. Please refer to DEP's TMDL Plan Instructions (3800-PMBCW0200d) for additional information.

Submission of PRP: Attach one copy of the PRP with the NOI or individual permit application that is submitted to the regional office of DEP responsible for reviewing the NOI or application. In addition, one copy of the PRP (not the NOI or application) must be submitted to DEP's Bureau of Clean Water (BCW). BCW prefers electronic copies of PRPs, if possible. Email the electronic version of the PRP, including map(s) (if feasible), to RA-EPPAMS4@pa.gov. If the MS4 determines that submission of an electronic copy is not possible, submit a hard copy to: PA Department of Environmental Protection, Bureau of Clean Water, 400 Market Street, PO Box 8774, Harrisburg, PA 17105-8774.

PRP Implementation and Final Report: Under the PAG-13 General Permit, the permittee must achieve the required pollutant load reductions within 5 years following DEP's approval of coverage under the General Permit, and must submit a report demonstrating compliance with the minimum pollutant load reductions as an attachment to the first Annual MS4 Status Report that is due following completion of the 5th year of General Permit coverage.

For example, if DEP issues written approval of coverage to a permittee on June 1, 2018, the required pollutant load reductions must be implemented by June 1, 2023 and the final report documenting the BMPs that were implemented (with appropriate calculations) must be attached to the annual report that is due September 30, 2023.

Appendix A

Appendix A-1: Applicable portion of the MS4 Requirements Table (Municipal) Anticipated Obligations for Subsequent NPDES Permit Term (Revised 6/26/17)

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Monroe County						
DELAWARE WATER GAP BORO		No		Delaware River		Mercury (5)
EAST STROUDSBURG BORO		No		Sambo Creek	Appendix E-Siltation (5)	Cause Unknown (5)
				Delaware River		Mercury (5)
				Brodhead Creek	Appendix B-Pathogens (5)	
HAMILTON TWP		Yes	SP	Little Pocono Creek	Appendix E-Siltation (5)	
				McMichael Creek	Appendix B-Pathogens (5)	
				Brodhead Creek	Appendix B-Pathogens (5)	
JACKSON TWP		Yes	SP		No known water quality impairments at this time. Must comply with all other permit requirements.	
MIDDLE SMITHFIELD TWP		Yes	SP	Sambo Creek	Appendix E-Siltation (5)	Cause Unknown (5)
				Brodhead Creek	Appendix B-Pathogens (5)	
				Bush Kill		Mercury (5)
				Delaware River		Mercury (5)
POCONO TWP		Yes	SP	Unnamed Tributaries to Brodhead Creek	Appendix E-Organic Enrichment/Low D.O., Suspended Solids (5)	
				McMichael Creek	Appendix B-Pathogens (5)	
				Brodhead Creek	Appendix B-Pathogens (5)	
PRICE TWP		Yes	SP	Brodhead Creek	Appendix B-Pathogens (5)	
				Sambo Creek	Appendix E-Siltation (5)	Cause Unknown (5)
ROSS TWP		Yes	SP	Lake Creek	Appendix B-Pathogens (5)	
SMITHFIELD TWP		Yes	SP	Brodhead Creek	Appendix B-Pathogens (5)	
				Sambo Creek	Appendix E-Siltation (5)	Cause Unknown (5)
				Delaware River		Mercury (5)

Appendix B

- Appendix B-1: Public Notice & Proof of Advertisement
- Appendix B-2: Public Comments Received
- Appendix B-3: Public Meeting Agenda and Meeting Minutes
- Appendix B-4: Record of Consideration

LEGAL NOTICE

NOTICE IS HEREBY GIVEN that Middle Smithfield Township Board of Supervisors will hold a public hearing on Thursday, August 10, 2017 at 7:00 p.m. in the public meeting room of the Middle Smithfield Township Municipal Building located at 147 Municipal Drive, East Stroudsburg, PA 18302 for the purpose of receiving public comment on the Middle Smithfield Township Municipal Separate Storm Sewer System (MS4) Pollution Reduction Plan (PRP) for the Sambo Creek. The MS4 PRP outlines the plan the Township will use to reduce pollutants discharged from the Middle Smithfield Township MS4 in accordance with permit requirements. The Township is soliciting written comments on the PRP until September 1, 2017. Comments must be submitted in writing to the attention of the Township Secretary at 147 Municipal Drive, East Stroudsburg, PA 18302 or by email at (mclewelll@mstowship.com). Comments submitted via facsimile will not be accepted. Comments, including comments submitted by email, must include the originator's name and address. The draft document will be available for review after August 1, 2017 at the Municipal Building during regular office hours Monday – Friday 8:00 a.m. to 4:00 p.m.

Michelle Clewell
Township Secretary

Appendix C

Appendix C-1: Middle Smithfield Township MS4 PRP Land Use Map

Appendix C-2: Middle Smithfield Township MS4 PRP Planning Area Map

Appendix D

Appendix D-1: MapShed GWLF-E Existing Loads for PRP Planning Areas



Watershed Totals

Municipality Loads

Regulated Loads

Unregulated Loads

View loads for municipality: (00200)

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	0	0.00	0.00	0.00	0.00	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	0	0.00	0.00	0.00	0.00	0.00	0.00
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Residential	12	1120.80	93.40	24.00	2.00	2.80	0.23
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Source Weighting							
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		3831.91		1.9		0.5	0.010
Groundwater				112.7		2.7	0.009
Point Sources				0.0		0.0	0.000
Septic Systems				0.0		0.0	0.000
Totals	12	4952.7		138.6		6.0	



Watershed Totals

Municipality Loads

Regulated Loads

Unregulated Loads

View loads for municipality: (00200)

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	2	23.00	11.50	0.40	0.21	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	0	0.00	0.00	0.00	0.00	0.00	0.00
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Source Weighting							
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		155.49		0.1		0.0	0.000
Groundwater				0.0		0.0	0.000
Point Sources				0.0		0.0	0.000
Septic Systems				0.0		0.0	0.000
Totals	2	178.5		0.5		0.0	



Watershed Totals

Municipality Loads

Regulated Loads

Unregulated Loads

View loads for municipality: (00200)

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	40	508.00	12.70	8.40	0.21	0.80	0.02
Wetland	7	16.10	2.30	3.40	0.49	0.20	0.03
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	30	5622.00	187.40	49.80	1.66	3.60	0.12
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	114	2793.00	24.50	62.70	0.55	6.80	0.06
MD Residential	69	6251.40	90.60	140.80	2.04	15.90	0.23
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
				Source Weighting			
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		81773.70		40.9		10.1	0.024
Groundwater				725.2		19.7	0.039
Point Sources				0.0		0.0	0.000
Septic Systems				786.1		0.0	0.092
Totals	260	96964.2		1817.3		57.1	

Appendix E

Appendix E-1: MapShed GWLF-E Proposed Loads for BMPs

Appendix E-2: 3800-PM-BCW0100m BMP Effectiveness Values



Watershed Totals

Municipality Loads

Regulated Loads

Unregulated Loads

View loads for municipality: (00200)

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	0	0.00	0.00	0.00	0.00	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	0	0.00	0.00	0.00	0.00	0.00	0.00
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Residential	20	490.00	24.50	11.00	0.55	1.20	0.06
MD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Source Weighting							
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		5093.91		2.5		0.6	0.001
Groundwater				74.4		2.0	0.004
Point Sources				0.0		0.0	0.000
Septic Systems				136.7		0.0	0.016
Totals	20	5583.9		224.6		3.8	

**NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
STORMWATER DISCHARGES FROM
SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS
BMP EFFECTIVENESS VALUES**

This table of BMP effectiveness values (i.e., pollutant removal efficiencies) is intended for use by MS4s that are developing and implementing Pollutant Reduction Plans and TMDL Plans to comply with NPDES permit requirements. The values used in this table generally consider pollutant reductions from both overland flow and reduced downstream erosion, and are based primarily on average values within the Chesapeake Assessment Scenario Tool (CAST) (www.casttool.org). Design considerations, operation and maintenance, and construction sequences should be as outlined in the Pennsylvania Stormwater BMP Manual, Chesapeake Bay Program guidance, or other technical sources. The Department of Environmental Protection (DEP) will update the information contained in this table as new information becomes available. Interested parties may submit information to DEP for consideration in updating this table to DEP's MS4 resource account, RA-EPPAMS4@pa.gov. Where an MS4 proposes a BMP not identified in this document or in Chesapeake Bay Program expert panel reports, other technical resources may be consulted for BMP effectiveness values. Note – TN = Total Nitrogen and TP = Total Phosphorus.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Wet Ponds and Wetlands	20%	45%	60%	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.
Dry Detention Basins and Hydrodynamic Structures	5%	10%	10%	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
Dry Extended Detention Basins	20%	20%	60%	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Infiltration Practices w/ Sand, Veg.	85%	85%	95%	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration. Design specifications require infiltration basins and trenches to be built in good soil, they are not constructed on poor soils, such as C and D soil types. Engineers are required to test the soil before approval to build is issued. To receive credit over the longer term, jurisdictions must conduct yearly inspections to determine if the basin or trench is still infiltrating runoff.
Filtering Practices	40%	60%	80%	Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.
Filter Strip Runoff Reduction	20%	54%	56%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.4 design ratio of filter strip length to impervious flow length is recommended for runoff reduction urban filter strips.
Filter Strip Stormwater Treatment	0%	0%	22%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.2 design ratio of filter strip length to impervious flow length is recommended for stormwater treatment urban filter strips.
Bioretention – Raingarden (C/D soils w/ underdrain)	25%	45%	55%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in C or D soil.
Bioretention / Raingarden (A/B soils w/ underdrain)	70%	75%	80%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Bioretention / Raingarden (A/B soils w/o underdrain)	80%	85%	90%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has no underdrain and is in A or B soil.
Vegetated Open Channels (C/D Soils)	10%	10%	50%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in C or D soil.
Vegetated Open Channels (A/B Soils)	45%	45%	70%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil.
Bioswale	70%	75%	80%	With a bioswale, the load is reduced because, unlike other open channel designs, there is now treatment through the soil. A bioswale is designed to function as a bioretention area.
Permeable Pavement w/o Sand or Veg. (C/D Soils w/ underdrain)	10%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in C or D soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/ underdrain)	45%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/o underdrain)	75%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (A/B Soils w/ underdrain)	50%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Permeable Pavement w/ Sand or Veg. (A/B Soils w/o underdrain)	80%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, has sand and/or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (C/D Soils w/ underdrain)	20%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in C or D soil.
Stream Restoration	0.075 lbs/ft/yr	0.068 lbs/ft/yr	44.88 lbs/ft/yr	An annual mass nutrient and sediment reduction credit for qualifying stream restoration practices that prevent channel or bank erosion that otherwise would be delivered downstream from an actively enlarging or incising urban stream. Applies to 0 to 3rd order streams that are not tidally influenced. If one of the protocols is cited and pounds are reported, then the mass reduction is received for the protocol.
Forest Buffers	25%	50%	50%	An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals. (Note – the values represent pollutant load reductions from stormwater draining through buffers).
Tree Planting	10%	15%	20%	The BMP effectiveness values for tree planting are estimated by DEP. DEP estimates that 100 fully mature trees of mixed species (both deciduous and non-deciduous) provide pollutant load reductions for the equivalent of one acre (i.e., one mature tree = 0.01 acre). The BMP effectiveness values given are based on immature trees (seedlings or saplings); the effectiveness values are expected to increase as the trees mature. To determine the amount of pollutant load reduction that can be credited for tree planting efforts: 1) multiply the number of trees planted by 0.01; 2) multiply the acreage determined in step 1 by the pollutant loading rate for the land prior to planting the trees (in lbs/acre/year); and 3) multiply the result of step 2 by the BMP effectiveness values given.
Street Sweeping	3%	3%	9%	Street sweeping must be conducted 25 times annually. Only count those streets that have been swept at least 25 times in a year. The acres associated with all streets that have been swept at least 25 times in a year would be eligible for pollutant reductions consistent with the given BMP effectiveness values.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Storm Sewer System Solids Removal	0.0027 for sediment, 0.0111 for organic matter	0.0006 for sediment, 0.0012 for organic matter	1 – TN and TP concentrations	<p>This BMP (also referred to as “Storm Drain Cleaning”) involves the collection or capture and proper disposal of solid material within the storm system to prevent discharge to surface waters. Examples include catch basins, stormwater inlet filter bags, end of pipe or outlet solids removal systems and related practices. Credit is authorized for this BMP only when proper maintenance practices are observed (i.e., inspection and removal of solids as recommended by the system manufacturer or other available guidelines). The entity using this BMP for pollutant removal credits must demonstrate that they have developed and are implementing a standard operating procedure for tracking the material removed from the sewer system. Locating such BMPs should consider the potential for backups onto roadways or other areas that can produce safety hazards.</p> <p>To determine pollutant reductions for this BMP, these steps must be taken:</p> <ol style="list-style-type: none"> 1) Measure the weight of solid/organic material collected (lbs). Sum the total weight of material collected for an annual period. Note – do not include refuse, debris and floatables in the determination of total mass collected. 2) Convert the annual wet weight captured into annual dry weight (lbs) by using site-specific measurements (i.e., dry a sample of the wet material to find its weight) or by using default factors of 0.7 (material that is predominantly wet sediment) or 0.2 (material that is predominantly wet organic matter, e.g., leaf litter). 3) Multiply the annual dry weight of material collected by default or site-specific pollutant concentration factors. The default concentrations are shown in the BMP Effectiveness Values columns. Alternatively, the material may be sampled (at least annually) to determine site-specific pollutant concentrations. <p>DEP will allow up to 50% of total pollutant reduction requirements to be met through this BMP. The drainage area treated by this BMP may be no greater than 0.5 acre unless it can be demonstrated that the specific system proposed is capable of treating stormwater from larger drainage areas. For planning purposes, the sediment removal efficiency specified by the manufacturer may be assumed, but no higher than 80%.</p>