

Pollutant Reduction Plan (PRP) and Total Maximum Daily Load (TMDL) Plan

for watersheds in
Penndel Borough
Bucks County, Pennsylvania



November 11, 2025

Prepared by:



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UNT to Neshaminy Stream Restoration Feasibility Study

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INTRODUCTION

Penndel Borough is required to implement a Stormwater Management Program to minimize the impacts of stormwater runoff. The Borough has an Individual Permit for Municipal Separate Storm Sewer Systems (MS4 permit). The terms of that permit include implementation of a Pollutant Reduction Plan (PRP) and Total Maximum Daily Load (TMDL) plan.

This amended plan is intended to replace the Penndel Borough PRP and TMDL Planning approved by the Pennsylvania Department of Environmental Protection on July 23, 2019. A primary component of those plans was use of Hydrodynamic Inlet Structures to achieve pollutant reductions for substantial drainage areas. The plan calculated capacity and pollutant reduction ratios using manufacturer supplied studies. Subsequent guidance documents issued by DEP reduced the assumed effectiveness and the allowable size of contributing drainage area for such structures. When the Borough initiated design for construction of hydrodynamic structures identified in the approved plans, it was determined that the proposed BMPs would not achieve sufficient credit for pollutant reduction to meet permit requirements. This updated plan is prepared in response to that determination.

The tables and calculations of Pollutant Loading Rates and Required Pollutant Reduction for each watershed have NOT been revised and are consistent with those presented in the approved plan of 2019.

The Borough must amend the PRP and TMDL planning for both watersheds to address pollutant reduction requirements. This plan must be presented to the public, adopted by Borough Council, and approved by DEP. The format which follows aligns with TMDL Plan Instruction and PRP Instructions guidance documents issued by the Department of Environmental Protection in March of 2017.

A. PUBLIC PARTICIPATION

- A copy of this plan has been made available for public review. A printed copy is available for review at the Borough Hall during regular business hours. A pdf of this document is also available for download through the Borough website.

Date Plan was made available for review: _____

- Public notice has been published as required, and a copy of that notice is attached to **Appendix A** of this report.

Public Notice was Published in: Bucks County Courier Times.

Date of publication was: _____

End Date for receipt of public comments: _____

Date of public hearing: _____

- All written comments received are attached to **Appendix A.1** of this report.
- All comments presented from any interested member of the public at the public hearing are attached in **Appendix A.1** of this report.
- Response to comments received and description of any resulting plan changes are provided in **Appendix A.2** of this report.

B. MAP

Maps for Penndel Borough are included in at the back of this report.

C. POLLUTANTS OF CONCERN

Pollutants of concern for watersheds in the MS4 Requirements Table (Municipal) dated 11/18/2019 Penndel are identified as follows:

Impaired Downstream Waters		Requirements	Other Causes of Impairment
Silver Lake	Appendix E-	Excessive Algal Growth, Nutrients, Suspended Solids (5)	Other Habitat Alterations (5)
Neshaminy Creek	Appendix B-	Pathogens (5),	
	Appendix C-	PCB (5)	
	Appendix E-	Nutrients, Organic Enrichment/Low D.O. (5)	
	TMDL Plan-	Siltation, Suspended Solids (4a)	
Magnolia Lake	Appendix E-	Excessive Algal Growth, Nutrients, Organic Enrichment/Low D.O., Suspended Solids (5)	
Mill Creek	Appendix C-	PCB (4a)	Other Habitat Alterations, Water/Flow Variability (4c)
	Appendix E-	Siltation (5)	
Delaware River		Appendix C-PCB (4a)	

*Category 4a – waters are impaired and a TMDL has been completed.
 Category 5 – waters are impaired and a TMDL has not yet been completed.*

Pollutants of concern are again identified in the Pollutant Aggregation Suggestions for MS4 Requirements Table dated 11/18/2019:

HUC 12 Name	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)
Burlington Island-Delaware River	Neshaminy Creek, Neshaminy Creek TMDL	Appendix B - Pathogens, TMDL Plan-Siltation, Suspended Solids
Mill Creek-Silver Lake	Magnolia Lake, Mill Creek, Silver Lake	Appendix E - Excessive Algal Growth, Nutrients, Organic Enrichment/Low D.O., Siltation, Suspended Solids
Burlington Island-Delaware River, Mill Creek-Silver Lake	Delaware River, Mill Creek, Neshaminy Creek	Appendix C - PCB
Core Creek-Neshaminy Creek	Neshaminy Creek, Neshaminy Creek TMDL	Appendix B - Pathogens, Appendix C - PCB, Appendix E Excessive Algal Growth, Nutrients, Organic Enrichment/Low D.O., Siltation, Suspended Solids, TMDL Plan-Siltation, Suspended Solids

The 2024 [Pennsylvania Integrated Water Quality Report Mapping](#) identifies the following impaired waterways within or near the Borough limits:

Chubb Run:

This waterway is located along the northwest boundary of the Borough and flows to the Neshaminy Creek.

- Designated Use: WWF (Warm Water Fishes)
- Unnamed Tributary to Neshaminy Creek-25480548
- HUC 8 Code 2040201
- Encompassed by the Neshaminy Creek TMDL Plan of 2003.
- Listed as Impaired for Siltation in 2022. Impairment Source: Urban Runoff/Storm Sewers.
- Listed as impaired in for Perfluorooctane Sulfonate (PFOS) in 2022. The impairment cause is PFOS are human-made compounds, a subset of per- and polyfluoroalkyl substances (PFASs). These compounds were used in manufacturing a variety of industrial and consumer products, such as carpet and clothing treatments and firefighting foams.

Neshaminy Creek: This waterway is located west of Penndel Borough and outside the Borough boundary. The Neshaminy Creek accepts runoff from a substantial portion of Penndel Borough.

- Designated Use: WWF (Warm Water Fishes)
- Neshaminy Creek – 134237996 Reach Code 2040201000084
- HUC 8 Code 2040201
- Neshaminy Creek TMDL Plan of 2003.
- Listed as Impaired for Siltation in 1996.
- Listed as Impaired for Organic Enrichment in 1996.
- Listed as Impaired for Nutrients in 1996.
- Listed as Impaired for Pathogens in 2010.
- Listed as impaired in for Perfluorooctane Sulfonate (PFOS) in 2022.

Mill Creek: This waterway is located along the northeast boundary of the Borough. This waterway drains to Mill Creek, Magnolia Lake, Silver Lake, and ultimately to the Delaware River.

- Designated Use: WWF (Warm Water Fishes)
- Unnamed Tributary to Mill Creek-25480350
- HUC 8 Code 2040201
- Listed as impaired due to Habitat Alterations in 2002.
- Listed as impaired due to Urban Runoff/Storm Sewers in 2002.

Appendix B, attached to this report, details proposed Pollutant Control Measures for Waters Impaired by Pathogens.

Appendix C, attached to this report, details proposed Pollutant Control Measures for Waters Impaired by Priority Organic Compounds.

This report is provided to address pollutant control measures for waters impaired by suspended solids, siltation, sediment and nutrients.

D. DETERMINE EXISTING LOADING FOR POLLUTANTS OF CONCERN

The Existing Loading for Pollutants was calculated in the previously approved plan of 2019 and is reiterated below.

Loading Rates :

1. Neshaminy Creek TMDL:

The TMDL for the Neshaminy Creek focuses on sediment, only. EPA has developed subwatersheds for the entirety of the Neshaminy Creek watershed. The two subwatersheds that apply to this TMDL are:

- Neshaminy Creek South #1
- Neshaminy Creek South #3

Utilizing the conversion from NLCD 2011 Land Use Designation to Impervious and Pervious Areas and through the parsing of land that drains to Pennsylvania DOT and areas which do not drain to the MS4, the following TMDL planning areas were calculated:

a. Table D.1.a: TMDL Planning Area for Neshaminy Creek South #1

Land Use ¹	Area (ac) ³	Sediment Loading Rate ² (lbs/ac/year)	Sediment Loading (lbs/year)
Hay/Pasture		49.0	0.00
Cropland		1062.9	0.00
Coniferous Forest		7.7	0.00
Mixed Forest		10.3	0.00
Deciduous Forest		12.3	0.00
Transition		1255.4	0.00
Low Intensity, Developed ⁴	23.45	65.5	1535.98
High Intensity, Developed ⁵	13.19	26.3	346.90
Stream Bank			
Total	36.64		1882.87

1. Categories per EPA TMDL Report for Neshaminy Creek South #1 Watershed
2. Sediment Loading Rates per EPA TMDL Report for Neshaminy Creek South #1 Watershed.
3. Parsed Sewershed Area.
4. Lower Intensity, Developed = NLCD 2011 Categories: Open Space, Developed and Low Intensity, Developed.
5. High Intensity, Developed = NLCD 2011 Categories: Medium Intensity, Developed and High Intensity, Developed.

b. Table D.1.b: TMDL Planning Area for Neshaminy Creek South #3

Land Use ¹	Area (ac) ³	Sediment Loading Rate ² (lbs/ac/year)	Sediment Loading (lbs/year)
Hay/Pasture		16.3	0.00
Cropland		280.5	0.00
Coniferous Forest		3.5	0.00
Mixed Forest		2.4	0.00
Deciduous Forest	6.58	3.1	20.40
Transition		324.9	0.00
Low Intensity, Developed ⁴	56.05	20.8	1165.84
High Intensity, Developed ⁵	6.65	6.5	43.23
Stream Bank			
Total	69.28		1229.46

1. Categories per EPA TMDL Report for Neshaminy Creek South #1 Watershed
2. Sediment Loading Rates per EPA TMDL Report for Neshaminy Creek South #1 Watershed.
3. Parsed Sewershed Area.
4. Lower Intensity, Developed = NLCD 2011 Categories: Open Space, Developed and Low Intensity, Developed.
5. High Intensity, Developed = NLCD 2011 Categories: Medium Intensity, Developed and High Intensity, Developed.

2. Neshaminy Creek PRP:

The PRP Planning area is for Phosphorus as the Neshaminy Creek has been identified by Pennsylvania DEP as being impaired with nutrients. The aggregate area for the PRP Planning area encompasses both Neshaminy Creek South Watersheds #1 and #3.

a. Table D.2.a: PRP Planning Area for the Neshaminy Creek Watershed

Land Use ¹	Area (ac)	% Impervious ²	Impervious Area (ac)	Pervious Area (ac)
Developed, Open Space	32.50	19	6.18	26.33
Developed, Low Intensity	46.66	49	22.86	23.80
Developed, Medium Intensity	13.61	79	10.75	2.86
Developed, High Intensity	6.57	100	6.57	0.00
Hay/Pasture		0	0.00	0.00
Cultivated Crops		0	0.00	0.00
Shrub/Scrub		0	0.00	0.00
Deciduous Forest	6.58	0		6.58
Mixed Forest		0	0.00	0.00
Total	105.92		46.36	59.56

1. NLCD 2011 Land Use and Areas
2. Highest % of impervious used for each NLCD 2011 definition per DEP.

For the PRP, the existing loading rates were calculated utilizing the Simplified Method. In the Developed Land Loading Rates for PA Counties (DEP document: 3800-PM-BCW0100k, 05/16), the loading rates for 'All Other Counties' were utilized as Bucks County does not have a specific value.

The loading rates are as follows:

b. Table D.2.b: Pollutant Loading Rates for the Neshaminy Creek watershed.

Land Use	Pollutant Loading Rates ¹				Pollutant Load		
	Area (ac)	TN (lbs/ac/yr)	TP (lbs/ac/yr)	TSS [Sediment] (lbs/ac/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS [Sediment] (lbs/yr)
Impervious, Developed	46.36	23.06	2.28	18,399.00	1069.06	105.70	85,256.04
Pervious, Developed	59.56	20.72	0.84	264.96	1234.08	50.03	15,781.02
Neshaminy Creek Total Pollutant Load	105.92				2,303.14	155.73	101,037.06

1. From PADEP PRP Instructions Attachment B - Developed Land Loading Rates for PA Counties

Based on the above calculations, any BMPs will have to cumulatively reduce the phosphorus loading by 5% (7.79 lbs/yr) as well as sediment loading by 10% (10,103.7 lbs/yr).

3. Mill Creek, Magnolia Lake and Silver Lake PRP:

Utilizing GIS, two MS4 sub-sewersheds were identified within the PRP planning area:

- Center Street
- Park Avenue.

Utilizing the conversion from NLCD 2011 Land Use Designation to Impervious and Pervious Areas and through the parsing of land that drains to Pennsylvania DOT and areas which do not drain to the MS4, the following PRP planning areas were calculated:

a. Table D.3.a: PRP Planning Area for the Center Street Sub-Watershed

Land Use ¹	Area (ac)	% Impervious ²	Impervious Area (ac)	Pervious Area (ac)
Developed, Open Space		19	0.00	0.00
Developed, Low Intensity	6.78	49	3.32	3.46
Developed, Medium Intensity		79	0.00	0.00
Developed, High Intensity	0.97	100	0.97	0.00
Hay/Pasture		0	0.00	0.00
Cultivated Crops		0	0.00	0.00
Shrub/Scrub		0	0.00	0.00
Deciduous Forest		0		0.00
Mixed Forest		0	0.00	0.00
Total	7.75		4.29	3.46

6. NLCD 2011 Land Use and Areas

7. Highest % of impervious used for each NLCD 2011 definition per DEP.

b. Table D.3.b: PRP Planning Area for the Park Avenue Sub-Watershed

Land Use ¹	Area ¹ (ac)	% Impervious ²	Impervious Area (ac)	Pervious Area (ac)
Impervious, Developed	9.38	100	9.38	0.00
Pervious, Developed	0.40	0	0.00	0.40
Total	9.78		9.38	0.40

1. Area measured from GIS.

In total, there are 17.53 acres within the PRP Planning Area;

The existing loading rates were calculated utilizing the Simplified Method. In the Developed Land Loading Rates for PA Counties (DEP document: 3800-PM-BCW0100k, 05/16), the loading rates for 'All Other Counties' were utilized as Bucks County does not have a specific value.

The loading rates are as follows:

c. Table D.3.c: Pollutant Loading Rates for the Mill Creek Watershed

Land Use	Pollutant Loading Rates ¹				Pollutant Load		
	Area (ac)	TN (lbs/ac/yr)	TP (lbs/ac/yr)	TSS [Sediment] (lbs/ac/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS [Sediment] (lbs/yr)
Impervious, Developed	13.67	23.06	2.28	1,839.00	315.23	31.17	25139.13
Pervious, Developed	3.86	20.72	0.84	264.96	79.98	3.24	1022.75
Mill Creek Total Pollutant Load					395.21	34.41	26,161.88

2. From PADEP PRP Instructions Attachment B – Developed Land Loading Rates for PA Counties

4. Summary of pollutant loading rate calculations:

The cumulative loadings are tabled below for convenient reference.

a. Table D.4.a: Summary of Pollutant Loading Rates

Watershed	Phosphorous (lbs/year)	Sediment Loading (lbs/year)
Neshaminy Creek South #1 TMDL		1,882.87
Neshaminy Creek South #3 TMDL		1,229.46
Neshaminy Creek PRP	155.73	101,037.06
Mill Creek, Magnolia Lake and Silver Lake PRP	34.41	26,161.88

E. WASTE LOAD ALLOCATIONS / REQUIRED POLLUTANT REDUCTIONS

1. Neshaminy Creek TMDL:

The EPA has calculated existing loading rates as well as required reductions for nutrients. These existing loading rates and required reductions are as follows:

The impairment of the Neshaminy Creek is sediment, a minimum 10% short-term reduction and a minimum 30% (Neshaminy Creek South #1 and 36% (Neshaminy Creek South #3) long-term reductions are required. The Plan presents the minimum reduction in loading for sediment as pounds per year (lbs/yr).

This means that the minimum required reductions for pollutants are:

a. Table E.1.a Sediment Loading Rates and Required Reductions for the Neshaminy Creek Watershed TMDL

Sub-watershed	Sediment Loading (lbs/yr)	Short-Term Reduction (lbs/yr)	Long-Term Reduction (lbs/yr)
Neshaminy South #1	1882.87	182.9	564.9 (30%)
Neshaminy South #3	1229.46	122.9	442.6 (36%)

2. Neshaminy Creek PRP:

Pollutant Reduction Plans for waters identified in Appendix E as impaired by both sediment and nutrients must address a 10% reduction in sediment and a 5% TP reduction.

a. Table E.2.a Pollutant Loading Rates for the Neshaminy Creek Watershed PRP

Land Use	Pollutant Loading Rates ¹				Pollutant Load		
	Area (ac)	TN (lbs/ac/yr)	TP (lbs/ac/yr)	TSS [Sediment] (lbs/ac/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS [Sediment] (lbs/yr)
Impervious, Developed	46.36	23.06	2.28	18,399.00	1069.06	105.70	85,256.04
Pervious, Developed	59.56	20.72	0.84	264.96	1234.08	50.03	15,781.02
Neshaminy Creek Total Pollutant Load	105.92				2,303.14	155.73	101,037.06

3. From PADEP PRP Instructions Attachment B – Developed Land Loading Rates for PA Counties

Based on the above calculations, any BMPs will have to cumulatively reduce the phosphorus loading by 5% (7.79 lbs/yr) as well as sediment loading by 10% (10,103.7 lbs/yr).

3. Mill Creek, Magnolia Lake and Silver Lake PRP:

b. Table E.3.a: Pollutant Loading Rates for the Mill Creek Watershed PRP

Land Use	Pollutant Loading Rates ¹				Pollutant Load		
	Area (ac)	TN (lbs/ac/yr)	TP (lbs/ac/yr)	TSS [Sediment] (lbs/ac/yr)	TN (lbs/yr)	TP (lbs/yr)	TSS [Sediment] (lbs/yr)
Impervious, Developed	13.67	23.06	2.28	1,839.00	315.23	31.17	25139.13
Pervious, Developed	3.86	20.72	0.84	264.96	79.98	3.24	1022.75
Mill Creek Total Pollutant Load					395.21	34.41	26,161.88

4. From PADEP PRP Instructions Attachment B – Developed Land Loading Rates for PA Counties

Based on the above calculations, any BMPs will have to cumulatively reduce the sediment load by 10% (2,616.2 lbs/yr) and phosphorus by 5% (1.72 lbs/yr).

4. Summary of required pollutant reductions:

The cumulative pollutant reduction requirements are tabled below for convenient reference.

c. Table E.4.a: Summary of Required Pollutant Loading Reduction for all Watersheds.

	Phosphorous (lbs/year)	Sediment Loading (lbs/year)
Neshaminy Creek South #1 TMDL		564.9
Neshaminy Creek South #3 TMDL		442.6
Sum of required TMDL Reductions		1,010.5
Neshaminy Creek PRP	7.79	10,103.7
Mill Creek, Magnolia Lake and Silver Lake PRP	1.72	2,616.2

F. ANALYSIS OF TMDL OBJECTIVES

The impairment of the Neshaminy Creek is sediment. A minimum 10% short-term reduction and a minimum 30% (Neshaminy Creek South #1 and 36% (Neshaminy Creek South #3) long-term reductions are required. The Plan presents the minimum reduction in loading for sediment as pounds per year (lbs/yr).

This pollutant reduction plan focused on the long-term reduction goals and utilized the long-term goals in TMDL Pollutant Reduction calculations presented in section E above.

G. SELECT BMPS TO ACHIEVE REQUIRED REDUCTIONS IN POLLUTANT LOADING

Penndel Borough PRP and TMDL Planning approved by the Pennsylvania Department of Environmental Protection on July 23, 2019 proposed construction and implementation of the following BMPs to meet minimum load reductions:

- For Neshaminy Creek:
 - Hydrodynamic Structure
 - Street Sweeping
 - Bioretention/Rain Garden
- For Mill Creek, Magnolia Lake & Silver Lake (Tributaries to Delaware River):
 - Hydrodynamic Structure

On approval of the 2019 Plan, Penndel sought funding through a Growing Greener Grant for the construction of the BMP with the highest calculated load reduction, the Hydrodynamic Structure in the Neshaminy Creek watershed. Penndel Borough was awarded a Growing Greener Grant in 2021 for the installation of a hydrodynamic inlet per the approved PRP & TMDL plans.

Following grant approval, the Penndel Borough Engineer started preparation of design and specifications for the Hydrodynamic Structure. The approved 2019 Addendums had selected large watershed treatment areas and utilized removal rates provided by the manufacturer of the proposed CDS Hydrodynamic Inlet. The Borough Engineer was informed that the CDS removal rates and treatment areas promoted by the manufacturer were no longer accepted by the Department. Using DEP's guidance, and the flow rate and volume determinations for these BMPs in the Chesapeake Bay (CPB) Expert Panel Report (Recommendations of the Expert Panel to Define Removal Rates for New State Stormwater Performance Standards, last revised January 20, 2015), it was determined that the hydrodynamic structure previously proposed does not provide the proposed load reductions assumed in the 2019 Addendums; thus, alternative BMPs needed to be evaluated.

The Penndel Borough Engineer then evaluated alternate BMP options including tree plantings, rain gardens, porous paving, sand filters and stream restoration projects within the Borough. For various reasons, these were determined not to be viable options to meet requirements. Reasons included but were not limited to lack of property owned or controlled by the Borough, general build-out of Borough parcels, and proximity of existing structures to existing waterways in the Borough.

The possibility of stream restoration on an UNT to the Neshaminy Creek located on a property owned by Penndel Borough and located in Middletown Township was then explored. In 2024, Penndel contracted Land Studies to evaluate the stream and prepare a stream restoration feasibility study. The study determined that the 1,300 linear feet stream channel on this property is a very good candidate for stream restoration to meet pollution reduction requirements as well as provide ecological uplift within the watershed. Penndel Borough could restore a portion of this stream to meet sediment load reduction requirements.

Such a project also presents an opportunity for collaboration with other municipalities. The waterway is owned by Penndel Borough, located within Middletown Township, and within 400 feet of the municipal boundary of Hulmeville Borough. It accepts runoff from portions of all three municipalities.

The Department has acknowledged the limited opportunities available to a small and built-out Borough to address pollutant reduction, and suggested the Borough apply one substantial project toward sediment reduction requirements for both watersheds. This update proposes use of stream bank stabilization, street sweeping and storm drain cleaning BMPs to achieve required Pollutant Reductions;

1. Stream Bank Stabilization

An existing waterway is located between Neshaminy Street and the Neshaminy Creek on Penndel Borough property addressed as 300 Neshaminy Street. The waterway accepts runoff from portions of Penndel Borough, Middletown Township and a small portion of Hulmeville Borough. Cooperation among the three municipal governments is strongly recommended to achieve maximum value from a stream restoration project.

The waterway was evaluated by LandStudies, Inc. for a Stream Restoration Feasibility Study in 2024. The study noted this waterway exhibits obvious signs of horizontal and vertical degradation related to unstable channel dimensions and disassociation with an active floodplain. High erosion bank erosion rates were identified, as were channel cut-down, high mobilization of bed materials, and lateral migration of the channel which undercuts the roots of existing trees causing them to fall into the channel.

The study recommends stream restoration that, if implemented, could achieve pollutant reduction requirements and provide ecological uplift.

The Pennsylvania Department of Environmental Protection NPDES Stormwater Discharges from Small Municipal Separate Storm Sewer Systems BMP Effectiveness Values (Rev. 6/2018) document provides guidance on BMP effectiveness values. This chart yields the following effective reductions in pollutants for Stream Restoration: TP 0.068 lbs/ft/yr; Sediment 44.88 lbs/ft/yr.

i. Table G.1.a: Summary of Pollutant Loading Reduction by Stream Restoration

Stream Restoration Length, Linear Feet	TP Removal Rate lbs/ft/yr	Sediment Removal Rate lbs/ft/yr.	TP Removal lbs/yr	Sediment Removal lbs/yr
300	0.068	44.88	20.4	13,464
1,300	0.068	44.88	88.4	58,344

2. Street Sweeping

The Borough sweeps streets twice per calendar year, removing pollutants that would wash into the storm drain system.

Based on the frequency of sweeping, the projected removal rates from the CBP Expert Panel Report - Street and Storm Drain Cleaning Practice, are as follows:

a. [Table G.2.a: Summary of Pollutant Removal Rates by Street Sweeping.](#)

Removal Rates from Street Sweeping			
SCP	TN (%)	TP (%)	TSS [Sediment] (%)
SCP-6	0	1	2

Using the removal rates above, pollutant load reduction in the Neshaminy Creek Watershed from street sweeping during the permit period is summarized as follows:

b. [Table G.2.b: Summary of Pollutant Reduction by Street Sweeping.](#)

		Pollution Loading Rates			Pollutant Loading			Pollutant Load Reduction		
	Area (ac)	TN (lbs/ac/yr)	TP (lbs/ac/yr)	TSS [Sediment] (lbs/ac/yr)	TN	TP	TSS	TN (lbs/yr)	TP (lbs/yr)	TSS [Sediment] (lbs/yr)
NS#1	4.75	15.5	1.93	1,300	73.65	9.17	6,177	0	0.09	124
NS#3	11.84	15.5	1.93	1,300	183.6	22.86	15,398	0	0.23	308
MC	4.75	15.5	1.93	1,300	73.65	9.17	6177	0	0.09	124
Total	16.59	-	-	-	330.9	41.2	2,7752	0	0.41	556

In the 2019 approved PRP planning for the Mill Creek Watershed, street sweeping is projected to provide a sediment reduction of 123.54 lbs/year and a TP (total phosphorous) reduction of 0.09 lbs/year.

In the 2019 approved PRP planning for the Neshaminy Creek Watershed, street sweeping is projected to provide a sediment reduction of 431.51 lbs/year and a TP (total phosphorous) reduction of 0.32 lbs/year.

3. Storm Drain Cleaning / Solids Removal

In July 2023, using a vacuum truck, Penndel Borough removed 22 wet tons of catch basin sediments. Of the structures cleaned, 13.3% (2.93 tons) were in the Neshaminy Watershed, and 86.6% (19.05 tons) were in the Mill Creek Watershed.

The CBP Expert Panel Report - Street and Storm Drain Cleaning Practice identifies the mean nutrient enrichment factors to apply to dry weight mass of solids physically removed from storm drains:

a. Table G.3.a: Nutrient Removal by mass.

	Nutrient Enrichment Factor	
	TN (%)	TP (%)
BMP and Catch Basin Sediments	0.27	0.06

Using the removal rates above, pollutant load reduction from sewer solids removal during the prior permit period is summarized as follows:

b. Table G.3.b: Summary of Pollutant Reduction by Storm Drain Cleaning.

Watershed	Pollutant Load Reduction							
	Total Removal					Equiv. Annual		
	Wet Mass (tons)	Dry Mass ¹ (tons)	Dry Mass (lbs)	TN (lbs)	TP (lbs)	TSS ² (lbs/yr)	TN (lbs/yr)	TP (lbs/yr)
Neshaminy	2.93	2.051	4,102	11.08	2.46	820.40	2.22	0.49
Mill Creek	19.05	13.335	26,670	72.01	16.00	5,334.0	14.40	3.20

¹ Wet mass converted to dry mass using conversion factor of 0.7 per CBP Expert Panel Report

The above results demonstrate Penndel Borough can achieve significant Pollutant Load Reductions, particularly from the Mill Creek Watershed, by cleaning the storm sewer system at least once each permit cycle.

Penndel plans to contract with a vacuum truck contractor to remove and dispose of catch basin sediments once per every 5-year permit cycle. In advance of project bidding, Penndel will inspect the Borough's stormwater inlets to identify inlets with sediment accumulation that need to be cleaned. When the work is performed, Penndel will require the contractor to provide the wet mass of decanted sediments from the disposal site. The wet mass will be used to determine the load reductions achieved using the above calculations. The mass removed and the calculated reductions will be reported to DEP in the annual report.

4. Selected Combination of BMPs to meet requirements;

The proposed pollutant reductions computed above for various BMP's are tabled and summed below:

a. Table G.4.a: Summary of Calculated Pollutant Reduction for each Watersheds.

Computed Pollutant Load Reduction with BMP's								
Watershed	Stream Restoration*		Street Sweeping		Drain Cleaning		Totals	
	TP (lbs/yr)	TSS (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Neshaminy	20.4	13,464	0.32	432	0.49	820	21.2	14,716
Mill Creek			0.09	124	3.2	5,334	3.29	5,458

* Assuming 300 LF of restoration. Greater reductions are available if 1,300 LF of restoration is accomplished.

Required pollutant reductions are compared to proposed reductions computed below:

b. Table G.4.b: Summary of Required vs Proposed Pollutant Loading Reduction for all Watersheds.

Watershed	Required Reduction		Proposed Reduction	
	TP (lbs/yr)	TSS (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Neshaminy Creek South #1 TMDL		565		
Neshaminy Creek South #3 TMDL		443		
Sum of required TMDL Reductions		1,011		14,716
Neshaminy Creek PRP	7.79	10,104	21.2	14,716
Mill Creek, Magnolia Lake and Silver Lake PRP	1.72	2,616	3.29	5,458

The table above demonstrates the plan will provide sufficient reductions in total suspended solids and phosphorous to achieve permit requirements.

H. IDENTIFY FUNDING MECHANISM

1. Stream Restoration

The primary and most significant pollutant reduction BMP in this plan is stream restoration. LandStudies prepared a feasibility study for restoration of the existing waterway between Neshaminy Street and the Neshaminy Creek. The June 2024 study projected the following costs:

Restoration Length	Design and Permitting	Construction Administration	Construction	Total
1,300 LF	\$85,000 - \$105,000	\$15,000 - \$20,000	\$400,000- \$500,000	\$500,000- \$625,000
300 LF	\$75,000 - \$95,000	\$15,000 - \$20,000	\$250,000- \$300,000	\$340,000- \$415,000

The study explains the 300-foot length represents the minimum length needed to achieve required pollutant reductions. However, the 1,300-foot length provides the most reduction for the dollars spent and provides greater environmental benefits. The Borough is currently exploring a cooperative or multi-municipal project with Middletown Township and Hulmeville Borough to support the larger project and provide sediment and nutrient reduction credits for all three MS4 permittees.

This is a large project with substantial benefits, and also substantial costs. Grant funding will be needed to accomplish the stream restoration.

The Borough intends to pursue a Growing Greener grant in 2025 for design and permitting of the stream restoration. We note that design and permitting costs are similar regardless of project length. The grant includes a 5% match requirement. Penndel Borough is willing to fund the 5% match. If one or more other MS4 permittees agree to join Penndel on this project, the 5% match can be spread among the participating municipalities.

Once design and permitting are complete, the Borough or all cooperating MS4 Municipalities would submit in a future round of Growing Greener or other available grant program to fund and accomplish project construction.

If the proposed stream restoration BMP becomes a joint municipal project, Penndel will enter an intermunicipal joint project agreement with the partner municipalities. A copy of the executed agreement will be provided to DEP.

2. Street Sweeping

Street sweeping is included in the annual Borough budget. The Borough pays for street sweeping each year and will continue to do so.

3. Storm Drain Cleaning

In July 2023, Penndel Borough paid \$9,448.90 for storm drain cleaning. The Federal Government had provided funding under the American Rescue Plan Act (ARPA), and the Borough used a portion of that distribution to pay for storm sewer cleaning.

For the current permit cycle, another source of funding must be identified. The Borough must add storm sewer cleaning to its budget for one of the years during the current permit cycle. The Borough can concurrently pursue grant funding that may become available.

I. IDENTIFY RESPONSIBLE PARTIES FOR OPERATION AND MANAGEMENT OF BMPS

1. Stream Restoration

If Pennadel pursues and completes stream restoration as an individual MS4 permittee, the Borough must establish and pay for an annual inspection of the restored stream by a qualified professional. If the stream restoration is completed as a cooperative project among multiple permittees, an intermunicipal agreement must identify responsibility for annual inspection and cost sharing for necessary maintenance and repairs.

2. Street Sweeping

Borough officials schedule street sweeping as needed, commonly twice per year. The work is accomplished by either coordinating services from an adjacent municipality that has sweeping equipment or contracting with a vendor who can perform this work.

3. Storm Drain Cleaning

Storm drain cleaning is a specialty service that is contracted with a qualified vendor who has specialized equipment. This would be organized by Borough staff at the direction of Council.

