WEST BRADFORD TOWNSHIP

"Between the Brandywines"

West Bradford Township Christina Basin MS4 TMDL Plan

Prepared for:

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West Bradford Township Christina Basin MS4 TMDL Plan
Executive Summary

Per the US EPA TMDL Reports for the Christina River Basin (2006), West Bradford Township has been assigned a pollution load reduction requirement for:

- Suspended Solids (Sediment)
- Nitrogen
- Phosphorus

Per Section F of the PA DEP NPDES Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) Individual Permit application, West Bradford Township is required to prepare an *MS4 TMDL Plan for Discharges to Impaired Waters with a TMDL*.

The Township has two TMDL Subbasins (B06 and B14) located within the Townships regulated MS4 area.

- **B06 TMDL Subbasin**
  - Location: Western end of the Township
  - Watershed: West Branch of the Brandywine Creek
  - Total Area within West Bradford Township: 786.95-acres
  - Subbasin Area within regulated MS4 Area: 786.95-acres
  - Waste Load Allocations for Sediment, Nitrogen, and Phosphorous

- **B14 TMDL Subbasin**
  - Location: Southeast quadrant of the Township
  - Watershed: East Branch of the Brandywine Creek
  - Total Area within West Bradford Township: 1,190-acres
  - Subbasin Area within regulated MS4 Area: 61.98-acres (5.2% of Total Area)
  - Waste Load Allocation for Sediment only

For both TMDL Subbasins, the Modified Christina Basin MapShed Model (Modified CMS) has been used to calculate the current pollutant load reduction requirements for Sediment, Nitrogen, and Phosphorous, if applicable. The following is a step-by-step summary of this calculation method, per the "Key Outcomes of CCWRA/PADEP Communications Regarding Christina Basin TMDL & PRP Calculations Process" document, provided by the Christina Watersheds Municipal Partnership (CWMP), dated May 5, 2017.

Modified Christina Basin MapShed Model

1. Calculate Revised 1995 and 2012 TMDL Baseline Loads

The EPA TMDL Reports were prepared based upon 1996 Land Use information. Since this time, the township has experience significant development growth. The land use has changed from primarily agricultural land to residential land. Based upon these changes, West Bradford Township has reviewed with PA DEP the concept of re-analyzing the subbasins to determine revised TMDL Baseline Loads. The MapShed computer software

program has been used to tabulate the land use areas. MapShed is a GIS-based watershed modeling tool developed by researchers at Penn State for the Pennsylvania Department of Environmental Protection (PaDEP). The analysis was completed utilizing the Chester County Water Resource Authority (CCWRA) MapShed model for the Christina Basin (developed by the CCWRA with support from the model developer Dr. Barry Evans of Penn State University and Stroud Water Research). The following table represents the revised land use for the B06 and B14 subbasins in West Bradford Township, for the years 1995 and 2012.

TMDL Subbasin - Land Use Analysis 1995									
Subbasin	Cropland	Forest	Disturbed	Turfgrass	Open Land	HD Mixed	LD Residential	Water	Total
	(acres)								
B06	381	203	0	0	17	2	183	0	786
B14 (after parsing)	8.92	17.21	0	0	0	0	5.13	0	31.26

TMDL Subbasin - Land Use Analysis 2012									
Subbasin	Cropland	Forest	Disturbed	Turfgrass	Open Land	HD Mixed	LD Residential	Water	Total
	(acres)								
B06	163	203	79	15	0	5	319	2	786
B14 (after parsing)	5.68	15.42	0	0	0	0	10.16	0	31.26

The next step is to determine the land use loading rates for each of the categories in the table above. CCWRA has provided a "Christina Basin Land Use Loading Rates Calculation Tool", dated May 5, 2017, with corrected publication date May 12, 2017. The land use loading rates provided in the calculation tools are for the years 1995 and 2012, as shown in the following table:

Annual Land Use Loading Rates									
Land Use Year	Pollutant	Cropland	Forest	Disturbed	Turfgrass	Open Land	HD Mixed	LD Residential	Water
		Sediment (lb/yr/acre)							
1995	Sediment	1,727.47	136.22	n/a	n/a	296.97	2,492.67	730.55	n/a
	Nitrogen	6.98	0.15	n/a	n/a	1.15	6.81	1.69	n/a
	Phosphorus	1.81	0.03	n/a	n/a	0.16	1.02	0.27	n/a
2012	Sediment	1,818.62	174.45	228.93	202.10	n/a	2,184.96	686.92	158.47
	Nitrogen	7.27	0.17	0.26	0.78	n/a	7.87	1.66	0.32
	Phosphorus	1.91	0.05	0.10	0.43	n/a	1.09	0.26	0.04

Revised TMDL Baseline Loads for each land use year are then calculated by multiplying the Land Use Areas times the corresponding Land Use Loading Rates. Units are to be converted

to replicate those used in the 1996 EPA TMDL Report. The following table indicates the Revised 1995 TMDL Baseline Loads and the 2012 Baseline Loads for each pollutant:

Revised TMDL Baseline Loads			
Subbasin	Pollutant	Revised 1995 TMDL Baseline Loads	2012 TMDL Baseline Loads
B06	Sediment (ton/yr)	414.77	291.67
	Nitrogen (kg/day)	3.77	2.26
	Phosphorus (kg/day)	0.93	0.53
B14	Sediment (ton/yr)	10.75	10.00

2. Calculate Existing 2022 Load

To complete the analysis of the existing conditions, West Bradford Township has evaluated the stormwater management Best Management Practices (BMPs) that have been installed within the Subbasins since 2003. Subbasin B06 includes existing BMPs, while Subbasin B14 does not include any existing BMPs installed since 2003. Existing BMPs , within Subbasin B06, include infiltration facilities, surface and subsurface. BMP pollutant reduction has been calculated using the "Christina Basin Urban BMP Load Reduction Calculation Tool", dated May 3, 2017. The completed calculation tool is provided later in the report. The following table summarizes the pollutant reduction achieved by the existing BMPs within subbasin B06:

Existing BMP Pollutant Reduction – Subbasin B06	
Pollutant	Total Existing BMP Reduction
Sediment (ton/yr)	145.10
Nitrogen (kg/day)	0.36
Phosphorus (kg/day)	0.09

After the analyses of the change in land use and pollutant reduction provided by existing BMPs, an Existing 2022 Load may be calculated. The Existing 2022 Load is equal to the 2012 TMDL Baseline Load minus the Existing BMP Reduction. The following table indicates the Existing 2017 Load for the two (2) subbasins:

Existing 2022 Load				
Subbasin	Pollutant	2012 Load	Existing BMP Reduction	Existing 2022 Load
B06	Sediment (ton/yr)	291.67	145.10	146.57
	Nitrogen (kg/day)	2.26	0.36	1.90
	Phosphorus (kg/day)	0.53	0.09	0.44
B14	Sediment (ton/yr)	10.00	0	10.00

3. Calculate Required TMDL Load Reduction

The percent (%) required reduction for each pollutant has been established in the 2006 EPA TMDL Report. The % required reduction will be used in conjunction with the Revised 1995 TMDL Baseline Load to achieve a Revised Required TMDL Load Reduction for the allocated pollutants in the two (2) subbasins. See the following table:

Revised Required TMDL Load Reductions				
Subbasin	Pollutant	Revised 1995 TMDL Baseline Load	% Required Reduction	Revised Required TMDL Load Reduction
B06	Sediment (ton/yr)	414.77	57.1%	236.83
	Nitrogen (kg/day)	3.77	30.0%	1.13
	Phosphorus (kg/day)	0.93	29.9%	0.28
B14	Sediment (ton/yr)	10.75	57.1%	6.14

4. Calculate Remaining TMDL Load Reduction Required

The Remaining TMDL Load Reduction Required is now determined by considering the change in land use and existing BMP pollutant reductions. The following formula is used for the calculation:

Remaining TMDL Load Reduction =
Required TMDL Load Reduction – (Revised 1995 TMDL Baseline Load – Existing 2022 Load)

This Remaining TMDL Load Reduction Required will need to be addressed thru the candidate BMPs. See the following table for the tabulation:

Remaining TMDL Load Reduction					
Subbasin	Pollutant	Required TMDL Load Reduction	Revised 1995 TMDL Baseline Load	Existing 2022 Load	Remaining TMDL Load Reduction
B06	Sediment (ton/yr)	236.83	414.77	146.57	**0**
	Nitrogen (kg/day)	1.13	3.77	1.90	**0**
	Phosphorus (kg/day)	0.28	0.93	0.44	**0**
B14	Sediment (ton/yr)	6.14	10.75	10.00	**5.39**

As indicated in the above table, the Subbasin B06 load reduction requirements have been met by the land use changes and existing BMP reductions. Subbasin B14 has a Sediment load reduction to be achieved with candidate BMPs, while the nutrients do not have a waste load allocation.

5. Calculate Minimum Load Reduction Required for the First 5-year Permit Period

A 10% reduction of the Existing 2022 Load must be achieved during the first 5-year permit period. The minimum load reduction for the Subbasin B14 Sediment Pollutant is as follows:

Sediment Existing 2022 Load = 10.00 ton/yr
0.10 x 10.00 = **1.00 ton/yr**

Proposed Best Management Practices (BMPs) Analysis

West Bradford Township has developed a preliminary strategy to implement an additional BMP within the B14 Watershed that will address the Sediment pollutant load reduction based upon the above referenced analysis. The BMP is streambank stabilization. This proposed BMP is a candidate BMP that the Township believes may be the best option to address the required Sediment pollutant load reduction. The BMP is located on private property and coordination / approval from the property owner, will be required. If the approval is not received, alternate BMPs will be investigated.

The Christina Basin Urban BMP Load Reduction Calculation Tool has been used to determine the Sediment pollutant reduction by the candidate BMP, streambank stabilization. The calculation tool is provided later in this report. A summary of the proposed BMP and the Sediment pollutant reduction is as follows:

Candidate BMP Pollutant Reduction for Sediment (TS)			
TMDL Subbasin B14	Stream Restoration Length (ft)	TS Load Reduction (ton/yr)	Permit Cycle 1 (2022-2027)
Streambank Stabilization 1 (Telegraph Rd)	100	5.75	5.75
	Candidate BMP TS Reduction	5.75	5.75
		>	>
	Required TS Reduction	5.39	1.00

As noted above, the full Sediment reduction requirement will be achieved by implementation of the candidate BMP. Also, the minimum load reduction required for the first 5-year permit period will be met for sediment.

Proposed BMP Operation and Maintenance (O&M) Requirements

Post construction operation and maintenance of the candidate BMP (streambank stabilization) is the responsibility of West Bradford Township.

CONCLUSION

Based upon the analysis utilizing the Modified Christina Basin MapShed Model, considering a change in land use between 1995 and 2012, as well as pollutant reductions provided by existing BMPs, the Township is required to reduce the pollutant load for Sediment within the B14 subbasin. The change in land use and existing BMPs that have been implemented since the 2006 TMDL Report have addressed the waste load allocations within the B06 subbasin. There were no Nitrogen and Phosphorus waste load allocations for the B14 subbasin.

This TMDL Plan will serve West Bradford Township as a roadmap to significantly improve the water quality within the B14 TMDL Subbasin. The Township is committed to providing the funding for this plan.

MS4 TMDL PLAN TABLE OF CONTENTS

SECTION A - INTRODUCTION

This MS4 TMDL Plan is submitted in accordance with the requirements of *Individual Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s)*. This MS4 TMDL Plan has been prepared and will be implemented as part of the Christina Basin TMDL Implementation Plan (C-TIP), and addresses all requirements of the Christina Basin stormwater TMDLs (as listed in Subsection C.I), applicable to West Bradford Township. West Bradford Township is a participating member of the C-TIP Partnership as indicated in Appendix A.

This MS4 TMDL Plan for West Bradford Township is based on, and consistent with all applicable Christina Basin TMDLs. This MS4 TMDL Plan is organized to follow and respond to the instructions presented in the *Individual Permit* instruction package. MS4 TMDL Design Details will be developed by West Bradford Township, and will be submitted to DEP within one year of the date of the approval of coverage under the Municipalityôs new MS4 permit.

This MS4 TMDL Plan has been developed after significant coordination with both EPA and PADEP over more than a three year period. A letter from PADEP, included for reference as Appendix B, provides support for the approach taken in this MS4 TMDL Plan, and more specifically, offers concurrence with the general concept for revising the Christina Basin TMDL MS4 Allocations. This MS4 TMDL Plan is based on several analyses of the data and results published in the Christina Basin stormwater TMDL Reports and current conditions that have been previously reviewed by PADEP.

This MS4 TMDL Plan includes the following:

SECTION B - KEY DEFINITIONS

I. Definitions from PAG-13 (3/2012), "Authorization to Discharge" (pages 6, 7, 8):

Municipal Separate Storm Sewer: A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains), which is all of the following:

- Owned or operated by a state, city, town, borough, township, county, district, association or other public body (created under state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater or other wastes,
- Designed or used for collecting or conveying stormwater,
- Not a combined sewer, and
- Not part of a Publicly Owned Treatment Works as defined at 40 CFR § 122.2.

Outfall: A ñPoint Sourceò as defined by 40 CFR § 122.2 is the point where an MS4 discharges stormwater to other surface waters of this Commonwealth. This does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream and are used to convey waters of the Commonwealth (40 CFR § 122.26(b)(9)).

Regulated Small MS4: Any small MS4 that is covered by the federal Phase II stormwater program, either through automatic nationwide designation under 40 CFR § 122.32(a)(1) (via the Urbanized Area criteria) or by designation on a case-by-case basis by DEP pursuant to 40 CFR § 122.32(a)(2). ñRegulated small MS4sò are a subset of ñsmall MS4sò.

Storm Sewershed: The catchment area that drains into the storm sewer system based on the surface topography in the area served by the storm sewer.

Urbanized Area (UA): Land area comprising one or more places (central place(s)) and the adjacent densely settled surrounding area (urban fringe) that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile, as defined by the United States Bureau of the Census and as determined by the latest available decennial census. The UA outlines the extent of automatically regulated areas.

II. Definitions Used in this MS4 TMDL Plan:

(The terms listed below are capitalized throughout the text.)

Adjusted TMDL Allocations: MS4 Baseline Loads, MS4 Allocations (Waste Load Allocations), or Load Reductions that have been recalculated to more accurately represent the pollutant loads received and discharged by the regulated MS4, and covered by the MS4 permit, as recommended in the TMDL Reports. Adjustment methods are described in Subsection C.VII.b.

Load Reduction: The required pollutant load reduction; difference between the TMDL MS4 Baseline Load and the MS4 Allocation (Waste Load Allocation).

MS4 Allocation: Used herein to refer to EPAôs ñMS4 Allocation, EPAôs ñMS4 Load Allocationò, as used in the TMDL Reports, and which appear to be used by EPA as synonyms for ñWaste Load Allocationò (WLA).

MS4 TMDL Implementation Area: All areas that are within the Municipalityôs boundaries and within a TMDL Watershed that are:

a. Located where the target pollutant load reductions are quantifiable at the impaired stream segment that receives stormwater discharges from the Municipalityôs regulated small MS4; and
b. Within the Urbanized Area; or
c. Outside the Urbanized Area and in accordance with PADEPôs forthcoming credit, trading, and offset policies.

This is the maximum geographic area within which the MS4 Municipality can install new TMDL control measures or can identify previously installed control measures (2003-2012) that can be counted toward achieving the Municipalityôs required pollutant Load Reduction.

Regulated Storm Sewershed: All land area that drains to the Regulated Small MS4 that is both within the Urbanized Area and within the Municipal boundary.

TMDL Storm Sewershed: All Regulated Storm Sewershed areas and portions of the Regulated Small MS4 that are within a TMDL Subbasin. This represents the land area that generates the pollutant load received and discharged by the Regulated Small MS4 and which can be used to ñadjustò EPAôs MS4 Baseline Loads, MS4 Allocations, and required pollutant Load Reductions.

TMDL Subbasin: Any ñsubbasinò delineated in either EPA Christina Basin TMDL Report and for which either TMDL Report lists WLAs for TSS, TN and/or TP.

TMDL Watershed: The watershed in which the TMDL Subbasin is located; Either Brandywine Creek, Red Clay Creek, or White Clay Creek watershed.

SECTION C - REQUIRED INFORMATION

I. Title of TMDL(s) that affect West Bradford Township:

The following TMDLs have been established for various portions of the watersheds in the Christina Basin, PA. Those that are and are not applicable to West Bradford Township are indicated below:

a. *Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin, Pennsylvania, Delaware, and Maryland*. September 2006. U.S. Environmental Protection Agency, Philadelphia, PA (herein referred to as Bacteria/Sediment TMDL Report). This TMDL Report presents TMDLs for sediment and bacteria.

☒ Applicable, West Bradford Township is listed with a WLA in the above Report

☐ Not Applicable, West Bradford Township is **NOT** listed with a WLA in the above Report.

b. *Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen Under High-Flow Conditions, Christina River Basin, Pennsylvania, Delaware, and Maryland*. September 2006. U.S. Environmental Protection Agency, Philadelphia, PA (herein referred to as the Nutrient/Low DO TMDL Report). This TMDL Report presents TMDLs for Total Nitrogen and Total Phosphorus.

☒ Applicable, West Bradford Township is listed with a WLA in the above Report

☐ Not Applicable,West Bradford Township is **NOT** listed with a WLA in the above Report.

c. *Total Maximum Daily Loads, Polychlorinated Biphenyls (PCBs) and Chlordane, West Branch Brandywine Creek, Chester County, Pennsylvania*. March 9, 2001. Pennsylvania Department of Environmental Protection, Harrisburg, PA (herein referred to as the Brandywine Creek PCB/Chlordane TMDL Report). This TMDL Report presents a TMDL only for PCB.

☒ Not Applicable, West Bradford Township is **NOT** listed with a WLA in the above Report.

d. *Total Maximum Daily Load for the Red Clay Creek Basin Chester County, Pennsylvania.* April 7, 2007. U.S. Environmental Protection Agency, Philadelphia, PA (herein referred to as the Red Clay Creek PCB TMDL Report). This TMDL Report presents TMDLs for PCB.

☒ Not Applicable, West Bradford Township is **NOT** listed with a WLA in the above Report.

Further details about the applicability of the above TMDLs are provided in Subsection C.III.

II. Watershed Name(s) and Hydrologic Unit Code (HUC):

Following are the list of watershed names and the eight-digit HUC for the areas that are addressed in the Christina Basin TMDL Reports. Only watersheds that are checked below discharge through the West Bradford Township Regulated Small MS4 to water bodies with TMDLs:

Brandywine-Christina Watershed, HUC #02040205, including:

- ☒ Brandywine Creek Watershed (PA)
- ☐ Red Clay Creek Watershed (PA)
- ☐ White Clay Creek Watershed (PA)

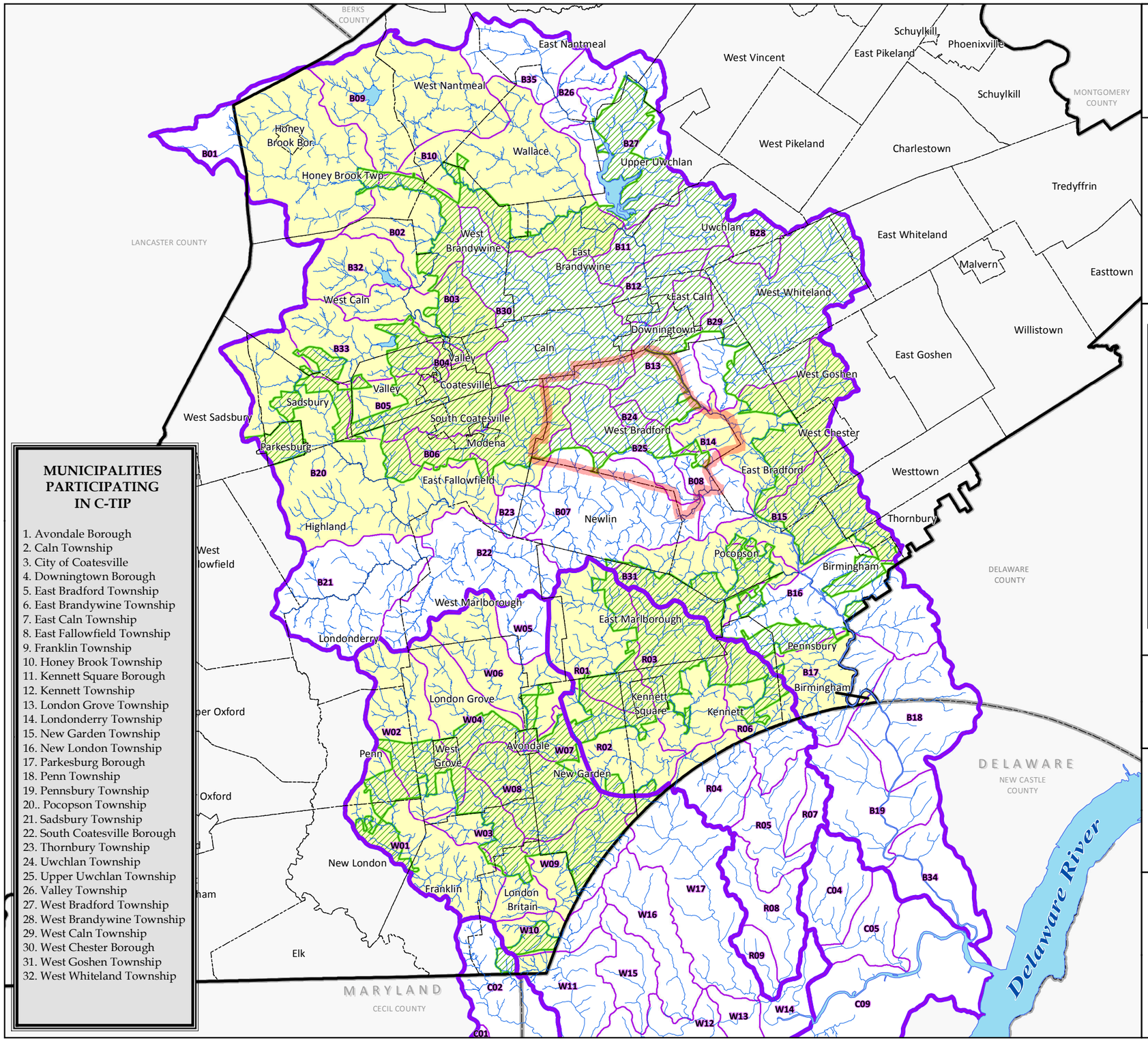
These watersheds are referred to herein as the TMDL Watersheds (see ñKey Definitionsò, above). Figure 1 presents the Christina Basin, the TMDL Watersheds and the subbasins used in the TMDL Reports (herein referred to as the TMDL Subbasins - see ñKey Definitionsò), as well as municipal boundaries, streams and Urbanized Area boundaries.

Figure 1. Christina Basin and its TMDL Watersheds, TMDL Subbasins and Municipalities

Figure 1. Christina Basin and its TMDL Watersheds, TMDL Subbasins and Municipalities

September 26, 2012 (Revised)

Chester County Water Resources Authority

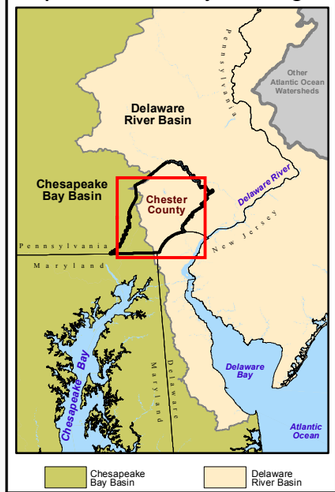


MUNICIPALITIES PARTICIPATING IN C-TIP

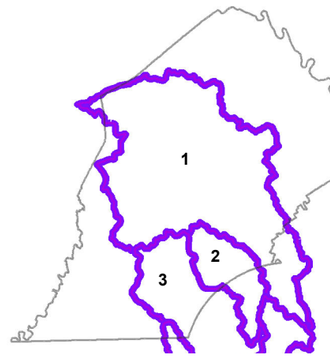
1. Avondale Borough
2. Caln Township
3. City of Coatesville
4. Downingtown Borough
5. East Bradford Township
6. East Brandywine Township
7. East Caln Township
8. East Fallowfield Township
9. Franklin Township
10. Honey Brook Township
11. Kennett Square Borough
12. Kennett Township
13. London Grove Township
14. Londonderry Township
15. New Garden Township
16. New London Township
17. Parkesburg Borough
18. Penn Township
19. Pennsbury Township
20.. Pocopson Township
21. Sadsbury Township
22. South Coatesville Borough
23. Thornbury Township
24. Uwchlan Township
25. Upper Uwchlan Township
26. Valley Township
27. West Bradford Township
28. West Brandywine Township
29. West Caln Township
30. West Chester Borough
31. West Goshen Township
32. West Whiteland Township

- Christina Basin Watersheds
- Christina Basin HSPF Subbasins (As presented in the Christina Basin EPA TMDL Reports)
- TMDL Subbasins (Listed with at least 1 WLA)
- Urbanized Area (Christina Basin)- 2000 Census
- Chester County Boundary
- Municipalities
- Water Bodies
- Streams

Map Location and Major Drainages



Christina Basin TMDL Watersheds



1. Brandywine Creek watershed
2. Red Clay Creek watershed
3. White Clay Creek watershed

Chester County Water Resources Authority
CHESTER COUNTY ~ PENNSYLVANIA

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DATA SOURCES:
Administrative Boundaries, Watersheds, Streams - Chester County

Census 2000 Urbanized Areas (UA) subset of "Urban Areas 2000" - U.S. Department of Commerce; Bureau of the Census; Geography Division.

HSPF Subbasin Delineation – GIS files provided by USGS Exton, PA Office – June, 2009.

III. List of Pollutants and Waste Load Allocations (WLAs) Assigned to Each MS4 Covered by the NOI:

This NOI is for West Bradford Township.

a. *Pollutants Assigned:*

The following TMDL pollutants (as presented in the applicable TMDL Reports listed in Subsection C.I.) **are** applicable to West Bradford Township because a Waste Load Allocation has been listed for West Bradford Township, and *their* implementation is addressed in this West Bradford Township MS4 TMDL Plan:

- ☒ Total Suspended Solids (Sediment)
- ☒ Total Nitrogen
- ☒ Total Phosphorus

Table 1 lists the pollutants (total suspended solids, total nitrogen and total phosphorous) and WLAs presented in the Bacteria/Sediment TMDL Report and the Nutrient/Low DO TMDL Report for West Bradford Township and for all other municipalities listed in the TMDL Report(s). The TMDL Report(s) present these WLAs as ñMS4 Load Allocationò (for Total Suspended Solids (TSS) referred to in the TMDL Report and herein as sediment), and ñMS4 Allocationò (for total nitrogen (TN), and total phosphorus (TP), referred to herein as nitrogen and phosphorus, respectively), and these terms and numbers are presented in Table 1 exactly as presented in the TMDL Reports.

Table 1. Brandywine-Christina Watershed (HUC # 02040205)
EPA TMDL MS4 Baseline Pollutant Loadings, MS4 Allocations, and Reductions

Table 1. Brandywine-Christina Watershed (HUC # 02040205)
EPA TMDL MS4 Baseline Pollutant Loadings, MS4 Allocations, and Reductions

MUNICIPALITIES LISTED IN TMDL REPORTS Brandywine Creek Watershed	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
	Baseline MS4 Load[1b.]	MS4 Load Allocation[1b.]	MS4 Load Reduction [1e.]	% Reduction[1b.]	MS4 Baseline Load[2g.]	MS4 Allocation[2a.]	MS4 Load Reduction[2m.]	% Reduction [2m.]	MS4 Baseline Load [2j.]	MS4 Allocation [2d.]	MS4 Load Reduction[2m.]	% Reduction [2m.]
BIRMINGHAM TWP	310.81	130.35	180.46	58.06%								
COATESVILLE CITY	231.29	86.06	145.23	65.52%	16.08	10.86	5.22	32.46%	3.015	2.031	0.984	32.64%
EAST BRADFORD TWP	1185.00	467.17	717.83	60.58%								
EAST BRANDYWINE TWP					54.19	44.44	9.75	17.99%	0.826	0.677	0.149	18.04%
EAST FALLOWFIELD TWP	803.23	426.42	376.81	46.91%	110.54	75.74	34.80	31.48%	22.365	15.348	7.017	31.37%
EAST MARLBOROUGH TWP	366.70	139.44	227.26	61.98%								
HIGHLAND TWP	384.80	238.86	145.94	37.93%								
HONEY BROOK BORO	20.58	13.23	7.35	35.70%	9.61	5.76	3.85	40.06%	0.184	0.11	0.074	40.22%
HONEY BROOK TWP	813.84	558.76	255.08	31.34%	421.64	279.02	142.62	33.83%	7.599	4.956	2.643	34.78%
KENNETT TWP					2.38	2.22	0.16	6.72%	0.213	0.198	0.015	7.04%
MODENA BORO	27.96	12.46	15.50	55.43%	4.80	3.25	1.55	32.29%	0.966	0.656	0.31	32.09%
NEWLIN TWP	144.18	59.59	84.59	58.67%	6.53	4.57	1.96	30.02%	1.337	0.936	0.401	29.99%
PARKESBURG BORO	52.11	32.35	19.76	37.93%								
PENNSBURY TWP	113.98	43.48	70.50	61.85%	47.00	43.71	3.29	7.00%	4.206	3.911	0.295	7.01%
POCOPSON TWP	821.21	320.79	500.42	60.94%								
SADSBURY TWP	289.73	172.13	117.60	40.59%	3.05	2.26	0.79	25.90%	0.329	0.205	0.124	37.69%
THORNBURY TWP	82.17	34.46	47.71	58.06%								
UPPER UWCHLAN TWP					10.92	8.96	1.96	17.95%	0.166	0.137	0.029	17.47%
VALLEY TWP	485.14	164.64	320.50	66.06%	57.57	43.75	13.82	24.01%	6.941	4.726	2.215	31.91%
WALLACE TWP	21.74	17.41	4.33	19.92%	126.53	103.76	22.77	18.00%	1.929	1.582	0.347	17.99%
WEST BRADFORD TWP	283.22	121.6	161.62	57.07%	17.25	12.08	5.17	29.97%	3.532	2.473	1.059	29.98%
WEST BRANDYWINE TWP					136.01	104.78	31.23	22.96%	9.63	8.344	1.286	13.35%
WEST CALN TWP	68.28	43.07	25.21	36.92%	183.72	149.26	34.46	18.76%	9.95	8.649	1.301	13.08%
WEST GOSHEN TWP	461.32	180.51	280.81	60.87%								

Red Clay Creek Watershed	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
	Baseline MS4 Load[1c.]	MS4 Load Allocation[1c.]	MS4 Load Reduction [1e.]	% Reduction[1c.]	MS4 Baseline Load [2h.]	MS4 Allocation[2b.]	MS4 Load Reduction[2m.]	% Reduction [2m.]	MS4 Baseline Load [2k.]	MS4 Allocation[2e.]	MS4 Load Reduction[2m.]	% Reduction [2m.]
EAST MARLBOROUGH TWP	8791.41	4,193.24	4598.17	52.30%	137.13	68.56	68.57	50.00%	2.742	1.372	1.37	49.96%
KENNETT SQUARE BORO	840.10	405.41	434.69	51.74%	13.26	6.63	6.63	50.00%	0.452	0.151	0.301	66.59%
KENNETT TWP	6751.63	3,312.06	3439.57	50.94%	157.97	97.83	60.14	38.07%	21.517	3.731	17.786	82.66%
NEW GARDEN TWP	4709.65	2,118.72	2590.93	55.01%	77.03	38.52	38.51	49.99%	27.708	2.87	24.838	89.64%
PENNSBURY TWP					4.32	4.32	0.00	0.00%	0.082	0.082	0.00	0.00%

White Clay Creek Watershed	Sediment (tons/year)				Total Nitrogen (kg/day)				Total Phosphorus (kg/day)			
	Baseline MS4 Load[1d.]	MS4 Load Allocation[1d.]	MS4 Load Reduction [1e.]	% Reduction[1d.]	MS4 Baseline Load [2i.]	MS4 Allocation[2c.]	MS4 Load Reduction[2m.]	% Reduction [2m.]	MS4 Baseline Load [2l.]	MS4 Allocation[2f.]	MS4 Load Reduction[2m.]	% Reduction [2m.]
AVONDALE BORO	463.65	140.02	323.63	69.80%	9.16	4.58	4.58	50.00%	0.322	0.135	0.187	58.07%
FRANKLIN TWP	4220.43	2,305.87	1914.56	45.36%	122.01	61.01	61	50.00%	15.219	5.557	9.662	63.49%
KENNETT TWP					2.17	2.17	0.00	0.00%	0.055	0.055	0	0.00%
LONDON BRITAIN TWP	2634.66	1,620.44	1014.22	38.50%	96.47	49.9	46.57	48.27%	15.732	7.333	8.399	53.39%
LONDON GROVE TWP	13616.33	4,842.81	8773.52	64.43%	262.76	128.47	134.29	51.11%	25.875	7.965	17.91	69.22%
NEW GARDEN TWP	6746.50	2,986.66	3759.84	55.73%	167.06	83.83	83.23	49.82%	41.916	13.374	28.542	68.09%
NEW LONDON TWP	1913.97	1,008.60	905.37	47.30%	53.56	26.61	26.95	50.32%	0.65	0.292	0.358	55.08%
PENN TWP	3584.76	1,410.29	2174.47	60.66%	71.23	33.36	37.87	53.17%	0.798	0.359	0.439	55.01%
WEST GROVE BORO	562.29	192.63	369.66	65.74%	9.24	4.36	4.88	52.81%	0.112	0.05	0.062	55.36%

(1) U.S. EPA Region III. 8 April 2005. Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin Watershed Pennsylvania, Delaware, and Maryland. Philadelphia, PA.

(2) U.S. EPA Region III. 26 September 2006. Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen under High-flow Conditions: Christina River Basin Watershed, Pennsylvania, Delaware, and Maryland. Philadelphia, PA.

a. Table 4.2 Fecal coliform TMDL allocations for MS4 municipalities. p 4-5

b. Table 4.8 Sediment allocations for towns in Brandywine Creek Watershed. p 4-16

c. Table 4.9 Sediment allocations for towns in Red Clay Creek Watershed. p 4-16

d. Table 4.10 Preliminary sediment allocations for towns in White Clay Creek Watershed. p 4-16

e. Calculated by CCWRA using Tables listed in 1a.-1d. listed above. MS4 Reduction = (Baseline MS4 Load) - (MS4 Load Allocation)

Municipalities that are not currently regulated under the NPDES MS4 program, and thus not required to implement TMDLs

a. Appendix C -Table C-5b. Total nitrogen MS4 allocations for Brandywine Creek watershed (kg/day) p. C-6

b. Appendix C. Table C-7b. Total nitrogen MS4 allocations for Red Clay Creek watershed (kg/day) p. C-9

c. Appendix C. Table C-9b. Total nitrogen MS4 allocations for White Clay Creek watershed (kg/day) p. C-11

d. Appendix C. Table C-6b. Total phosphorus MS4 allocations for Brandywine Creek watershed (kg/day) p.C-8

e. Appendix C. Table C-8b. Total phosphorus MS4 allocations for Red Clay Creek watershed (kg/day) p. C-10

f. Appendix C. Table C-10b. Total phosphorus MS4 allocations for White Clay Creek watershed (kg/day) p. C-13

g. Appendix C -Table C-5a. Total nitrogen MS4 baseline loads for Brandywine Creek watershed (kg/day) p. C-5

h. Appendix C. Table C-7a. Total nitrogen MS4 baseline loads for Red Clay Creek watershed (kg/day) p. C-8

i. Appendix C. Table C-9a. Total nitrogen MS4 baseline loads for White Clay Creek watershed (kg/day) p. C-10

j. Appendix C. Table C-6a. Total phosphorus MS4 baseline loads for Brandywine Creek watershed (kg/day) p.C-7

k. Appendix C. Table C-8a. Total phosphorus MS4 baseline loads for Red Clay Creek watershed (kg/day) p. C-9

l. Appendix C. Table C-10a. Total phosphorus MS4 baseline loads for White Clay Creek watershed (kg/day) p. C-12

m. Calculated by CCWRA using Tables listed in 2a.-2l. listed above. MS4 Reduction = (MS4 Baseline Load) - (MS4 Allocation); %Reduction = (MS4 Load Reduction) / (MS4 Baseline Load)

b. *Pollutants Not Applicable:*

The following TMDL pollutants (as listed in the TMDL Reports listed in Subsection C.I.) are **NOT** applicable to West Bradford Township, as indicated and explained below*:*

☐ **Sediment (Total Suspended Solids)** ï There is NO WLA listed for West Bradford Township. Therefore, implementation of the Sediment TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☐ **Total Nitrogen -** There is NO WLA listed for West Bradford Township. Therefore, implementation of the Total Nitrogen TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☐ **Total Phosphorus -** There is NO WLA listed for West Bradford Township. Therefore, implementation of the Total Phosphorus TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☒ **Bacteria** ï West Bradford Township is:

☒ **a)** not listed with a WLA for bacteria. Therefore, implementation of the Bacteria TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☐ **b)** is listed with a WLA for bacteria, however, based on the PADEP letter dated March 21, 2012 (Appendix B) and best information available[1] at the time of preparation of this MS4 TMDL Plan there are no streams designated as impaired by bacteria attributed to stormwater runoff located within or downstream of West Bradford Township, or within the Christina Basin, PA. Therefore, implementation of the Bacteria TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☒ **PCB/Chlordane (Brandywine Creek)** ï

☒ **a)** There are no Municipal WLAs listed in the Brandywine Creek PCB/Chlordane TMDL Report. This TMDL applies only to 5.6 miles of the West Branch Brandywine Creek in East Fallowfield, West Bradford, and Newlin Townships, the City of Coatesville, and Modena Borough. As quoted in the TMDL Report: ñ*Pennsylvania found no permitted point sources contributing to the load of either chlordane or PCBs to the West Branch Brandywine Creek"* and ñé *the WLA was assigned a value of 0*ò. Therefore, implementation of the Brandywine Creek PCB/Chlordane TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☐ **b)** West Bradford Township has no land area in the Brandywine Creek Watershed. Therefore, implementation of the Brandywine Creek

[1] *2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report."* Undated, Pennsylvania Department of Environmental Protection. Office of Water Management, Bureau of Water Supply & Wastewater Management, Water Quality Assessment and Standards Division.

PCB/Chlordane TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☒ **PCB (Red Clay Creek) –**

☐ **a)** There are no Municipal WLAs listed in the Red Clay Creek PCB TMDL Report. As quoted in the TMDL Report: ñ*According to PADEP, there are no known point sources of PCB to Red Clay and the East and West Branches of Red Clay Creek at this time*ò and ñé *the WLA was set to zero.*ò Therefore, implementation of the Red Clay Creek PCB TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

☒ **b)** West Bradford Township has no land area in the Red Clay Creek Watershed. Therefore, implementation of the Red Clay Creek PCB TMDL is not addressed in this West Bradford Township MS4 TMDL Plan.

IV. List of Municipalities Subject to the Same TMDL Pollutants (within HUC Watershed 02040205):

Table 1**,** presented in Subsection C.III, lists all Pennsylvania municipalities in the HUC 02040205 that are subject to the sediment, nitrogen and phosphorus TMDLs.

V. List of Counties Subject to the TMDL (within HUC Watershed 02040205):

There are no counties listed or referenced in any of the above referenced TMDL Reports and therefore there are no counties subject to any of the Christina TMDLs.

VI. Allocated Pollutant Loadings Established in Each Applicable TMDL:

Table 1, as presented in Subsection C.III, lists the EPA allocated pollutant loadings for West Bradford Township for each applicable TMDL pollutant addressed by the Christina Basin Bacteria/Sediment and Low DO/Nutrient TMDL Reports. The allocated pollutant loadings are presented within these TMDL Reports as ñMS4 Load Allocationò or ñMS4 Allocationò, and Table 1 presents the pollutant loadings and terminology exactly as presented in the TMDL Reports.

VII. Reduction in Pollutant Loads Necessary to Meet Each Applicable TMDL or WLA:

a. *EPA Pollutant Load Reductions:*

Table 1, as presented in Section C.III, lists the applicable pollutant Load Reductions required by the TMDL Reports. West Bradford Township is located within the Brandywine Creek Watershed. Table 1 indicates that pollutant Load Reductions are required by West Bradford Township for Sediment, Total Nitrogen, and Total Phosphorus.

i. **Sediment Reductions:** The pollutant Load Reductions for sediment (TSS) are presented within the Bacteria/Sediment TMDL Report as ñPercent Reductionò and are presented in Table 1 exactly as presented in the Bacteria/Sediment TMDL Report. Table 1 also includes Municipal sediment ñMS4 Load Reductionsò in tons per year, which were calculated for the C-TIP based on the following equation:

(MS4 Load Reduction) = (Baseline MS4 Load) - (MS4 Load Allocation)

where ñBaseline MS4 Loadò and ñMS4 Load Allocationò are taken from tables presented in the Sediment TMDL Report.

ii. **Nitrogen and Phosphorus Reductions:** The Nutrient/Low DO TMDL Report does not present pollutant Load Reductions by Municipality; they are presented only by Subbasin and only by ñpercentò. Table 1 presents TN (nitrogen) and TP (phosphorus) Load Reductions by Municipality and percent reductions that were calculated using the following equations:

(MS4 Load Reduction) = (MS4 Baseline Load) – (MS4 Allocation)
(Percent Reduction) = (MS4 Load Reduction) / (MS4 Baseline Load)

where ñMS4 Baseline Loadò and ñMS4 Load Allocationò are taken from tables presented in the Nutrient/Low DO TMDL Report.

b. *Adjusted MS4 Allocations and Required Load Reductions:*

West Bradford Township

☒ has adjusted their MS4 Allocation(s) and Load Reduction(s). See below.

☐ has NOT adjusted their MS4 Allocation(s) and Load Reduction(s) at this time and will adhere to Table 1 Load Reductions (Skip below and go to Part VIII).

i. **Justification for Adjusting MS4 Baseline, MS4 Allocations, and Reductions:**

The TMDL Reports explain that the EPA MS4 Allocation and required Load Reductions were calculated assuming the entire land area within the TMDL Subbasin in the Municipality drains to the MS4. However because the Urbanized Area boundary bisects many municipalities in the Christina Basin, and because

most Regulated MS4s cover only a portion of the Municipality, EPA acknowledges that the municipal allocations should be recalculated when MS4 mapping is available. This involves recalculating MS4 Baselines, MS4 Allocations, and pollutant Load Reductions.

The Bacteria /Sediment TMDL Report States:

"5.0 REASONABLE ASSURANCE AND IMPLEMENTATION

For purposes of this TMDL, WLAs were developed for each municipality holding MS4 permits. Distribution of loads was estimated using land use data within municipal boundaries and application of unit area loadings (lbs/acre/year) determined for subbasins defined in the HSPF model and used for TMDL development. As additional data are collected by PADEP regarding drainage areas of each storm sewer system in the basin, these WLAs can be refined to more detailed representation of WLAs for each stormwater permit and LAs for areas not bound by such permits. To do this, the drainage area of each storm sewer should be delineated so that the area and distributions of land use can be determined. The land use areas within the stormwater drainage areas can be multiplied by the unit area loadings reported herein to determine the WLA for each MS4 permit and to calculate the load reduction necessary to meet the TMDL. The remaining load in each respective township can then be assigned to LAs. Until such storm water drainage area data are available, the WLAs and required load reductions reported herein are applicable."

(Excerpt from *Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin Watershed Pennsylvania, Delaware, and Maryland. Philadelphia, PA*. April, 2005 (pg. 5-2).)

The Nutrient/Low DO TMDL Report States:

"5.0 REASONABLE ASSURANCE AND IMPLEMENTATION

For purposes of this TMDL, WLAs were developed for each municipality holding MS4 permits. Distribution of loads was estimated using land use data within municipal boundaries and application of unit area loadings (lbs/acre/year) determined for subbasins defined in the HSPF model and used for TMDL development. As additional data are collected by PADEP regarding drainage areas of each storm sewer system in the basin, these WLAs can be refined to more detailed representation of WLAs for each stormwater permit and LAs for areas not bound by such permits. To do this, the drainage area of each storm sewer should be delineated so that the area and distributions of land use can be determined. The remaining load in each respective township can then be assigned to LAs. Until such storm water drainage area data are available, the WLAs and required load reductions reported herein are applicable."

(Excerpt from *Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen Under High-Flow Conditions: Christina River Basin Watershed, Pennsylvania, Delaware, and Maryland. Philadelphia, PA*. September, 2006 (pg. 5-2).)

After extensive coordination with PADEP and analyses of available TMDL and GIS data, an approach was selected for adjusting MS4 Baselines, MS4 Allocations and required Load Reductions for the MS4 TMDL Plan that reflects the actual extent of Regulated MS4s, and their contributing drainage areas, as described in the following section.

ii. Adjustment Approach:

1. Adjustment Process:

The MS4 Baselines, MS4 Allocations and Load Reductions were adjusted using the following approach:

1) The TMDL Storm Sewershed or Urbanized Area was delineated for each TMDL Subbasin based on mapping of the MS4 system and topography, excluding any portions that are discharging to streams that are not currently listed by PADEP for stormwater related impairments; and

2) The delineated TMDL Storm Sewershed or Urbanized Area land area was then used to pro-rate the MS4 Baselines, MS4 Allocations, and Load Reduction requirements.

Methods used for adjusting MS4 Baselines, MS4 Allocations and Load Reductions are described in the following subsection. The overall process included the following steps:

- A base map for West Bradford Township was prepared using best available geographic data to include: political boundaries, streams and surface water bodies, TMDL Subbasin boundaries, TMDL Watershed boundaries, and the Urbanized Area.
- The West Bradford Township Regulated Small MS4 (as defined in ñKey Definitionsò) was mapped.
- The Regulated Storm Sewershed (as defined in ñKey Definitionsò) was delineated using best available topographic data (2-foot LiDAR contours).
- The TMDL Storm Sewershed area (as defined in ñKey Definitionsò) was delineated for each TMDL subbasin that is applicable to West Bradford Township.
    - The portions of the TMDL Storm Sewershed that do not drain to a stream currently listed as impaired by PADEP for stormwater related causes are subtracted from the TMDL Storm Sewershed area for each TMDL subbasin.
- The total land area within the Urbanized Area within each TMDL Subbasin was calculated and used in lieu of the TMDL Storm Sewershed area as a simplified method.

- The portions of the Urbanized Area that do not drain to a stream currently listed as impaired by PADEP for stormwater related causes are subtracted from the Urbanized Area land area for each TMDL subbasin.

- Adjusted MS4 Baselines, MS4 Allocations, and Load Reductions for each applicable TMDL pollutant were calculated by TMDL Subbasin using the methods and equations as presented below.

2. Delineation of TMDL Storm Sewershed:

The following method was used by West Bradford Township to delineate the TMDL Storm Sewershed. This methodology is consistent with the recommended approach described by EPA in the TMDL Reports and has been conditionally approved by PADEP in its letter dated March 21, 2012 (Appendix B):

☐ **Land Use Area Method** ï Within each applicable TMDL subbasin, the TMDL Storm Sewershed area is delineated based on 2008 LiDAR topography (2-foot contours), and the individual land use areas are determined using 2010 land use data. The Adjustment Equations are then applied to each land use type to recalculate the MS4 Baselines, MS4 Allocations and required Load Reductions for each category of land use within each TMDL Subbasin, for each applicable pollutant. The individual land use Baselines, MS4 Allocations and required Load Reductions are then summed by TMDL Subbasin, and then by TMDL Watershed. The TMDL Watershed totals become the adjusted MS4 Baseline, Allocation and required Load Reductions for each applicable pollutant.

☐ **Total Land Area Method** ï Within each applicable TMDL subbasin, the TMDL Storm Sewershed area is delineated based on 2008 LiDAR topography (2-foot contours). The Adjustment Equations are then applied to the total TMDL Storm Sewershed area for each TMDL Subbasin to recalculate the MS4 Baselines, MS4 Allocations, and Load Reductions for each applicable pollutant. The TMDL Subbasin totals are then summed by TMDL Watershed. The TMDL Watershed totals become the adjusted MS4 Baseline, Allocation and required Load Reductions for each applicable pollutant.

☐ **Urbanized Area Method** ï Within each applicable TMDL subbasin, the total land area within the Urbanized Area is determined using the Urbanized Areas currently depicted on the PADEP Stormwater webpage (2000 Census). The Adjustment Equations are then applied to the total land area within the Urbanized Area for each TMDL Subbasin to recalculate the MS4 Baselines, MS4 Allocations, and Load Reductions for each applicable pollutant. The TMDL Subbasin totals are then summed by TMDL Watershed. The TMDL Watershed totals become the adjusted MS4

Baseline, MS4 Allocation and required Load Reductions for each applicable pollutant.

☒ **Other Method –** Mapshed computer software developed by Penn State University was utilized to re-calculate the MS4 Baseline Loads and Load Reductions for Sediment, Total Nitrogen, and Total Phosphorus. The Land Use data incorporated into the Mapshed program was derived from a 2012 analysis. Results of the analysis are given later in the report.

iii. Recalculation of Required Load Reduction (Adjustment Equations):

Each method above results in a delineation of the land area(s) to be used to calculate the Adjusted MS4 Baselines, MS4 Allocations, and required Load Reductions (See ñKey Definitionsò) using the following Adjustment Equations:

$$\text{Adjustment Ratio} = \frac{\text{[illegible]}}{\text{[illegible]}}$$

Adjusted MS4 Baseline = Adjustment Ratio x (EPA MS4 Baseline)
Adjusted MS4 Allocation = Adjustment Ratio x (EPA MS4 Allocation)
Adjusted MS4 Load Reduction = (Adjusted MS4 Baseline) ï (Adjusted MS4 Allocation)

The adjustment calculations are provided in Appendix C:

- Appendix C.1 ï MS4 Worksheet for Calculating Adjusted MS4 Baseline Loads, MS4 Allocations, required Load Reductions and new Municipal LAs - Land Use Area method.
- Appendix C.2 ï MS4 Worksheet for Calculating Adjusted MS4 Baseline Loads, MS4 Allocations, required Load Reductions and new Municipal LAs - Total Land Area method.

iv. New Municipal Load Allocation (LA):

The portion of the EPA MS4 Allocation that was removed by the adjustment is now assigned as the Load Allocation (LA) for West Bradford Township. The total TMDL Allocation for West Bradford Township remains unchanged by the adjusted MS4 Allocation, and becomes: MS4 Allocation (WLA) + Municipal LA +MOS.

Table 2 presents the Adjusted MS4 Baselines, MS4 Allocations and adjusted Load Reductions for West Bradford Township. The new LA for West Bradford Township is also shown for each TMDL Watershed.

West Bradford MS4 - TMDL Subbasin B06

*Modified CMS Methodology

Table 2: Adjusted MS4 Baseline Loads and Required Reductions

Pollutant	Revised 1995 TMDL Baseline Loads	2006 TMDL Report % Required Reduction	Required TMDL Load Reduction	2012 TMDL Load	Existing BMP Load Reductions (Installed 1995 to 2012)	Revised 2012 TMDL Load=Existing 2022 Load	Remaining Required Load Reductions
Sediment	414.77 ton/yr	57.1%	236.83 ton/yr	291.67 ton/yr	145.10 ton/yr	146.57 ton/yr	0
Nitrogen	3.77 kg/day	30.0%	1.13 kg/day	2.26 kg/day	0.36 kg/day	1.90 kg/day	0
Phosphorus	0.93 kg/day	29.9%	0.28 kg/day	0.53 kg/day	0.09 kg/day	0.44 kg/day	0

- Determine Minimum Load Reduction Required to be Achieved Within This 5 Year Permit Period.

***Since the required TMDL load reductions for the B06 TMDL Subbasin have been met by the change in land use and existing BMP load reductions, there is no minimum load reduction requirement.**

West Bradford MS4 - TMDL Subbasin B14

*Modified CMS Methodology

Table 2: Adjusted MS4 Baseline Loads and Required Reductions

Pollutant	Revised 1995 TMDL Baseline Loads (after parsing)	2006 TMDL Report % Required Reduction	Required TMDL Load Reduction	2012 TMDL Load (after parsing)	Existing BMP Load Reductions (Installed 1995 to 2012)	Revised 2012 TMDL Load=Existing 2022 Load	Remaining Required Load Reductions
Sediment	10.75 ton/yr	57.1%	6.14 ton/yr	10.00 ton/yr	0.00 ton/yr	10.00 ton/yr	5.39 ton/yr

- Determine Minimum Load Reduction Required to be Achieved Within This 5 Year Permit Period.

Requirement is for the Minimum Reduction of 10% of the Revised 2012 TMDL Load

Revised 2012 TMDL Load for Sediment (TS) = 10.00 ton/yr

10% x 10.00 ton/yr = 1.00 ton/yr

Minimum TS Load Reduction Required to be Achieved Within This 5 Year Permit Period = **1.00 ton/yr**

VIII. Control Measures and BMPs Implemented to Meet the TMDL(s):

a. ***MS4 TMDL Implementation Area:***

The TMDL Implementation Area for placing TMDL BMPs/control measures consists of any location within a TMDL Subbasin that drains to a stream with a stormwater-related impairment, and within the Urbanized Area. Once PADEP credit, trading, and offset policies are in place, BMPs/control measures may be located outside the Urbanized Area, subject to those policies. The MS4 TMDL Implementation Area for West Bradford Township is based on the information above and the definition presented in ñKey Definitionsò.

b. ***Priorities for Implementation:***

Based on PADEP feedback from the letter dated March 21, 2012 (Appendix B), BMP/control measure selection has been prioritized within the Implementation Area in the following order:

- First on properties owned by the Municipality that will minimize the volume and rate of stormwater flow discharging from the Regulated Small MS4 and are within the TMDL watershed and the Urbanized Area;
- Second, on non-Municipal properties that will minimize the volume and rate of stormwater flow discharging from the Regulated Small MS4 and are within the TMDL watershed and Urbanized Area;
- Third, on non-Municipal properties within the Urbanized Area that are a source of sediment or nutrients; and
- Fourth, on any sources outside the Urbanized Area located within the TMDL watershed and targeted to maximize pollutant load reductions, and in accordance with DEPôs forthcoming applicable credit, trading, and offset policies.

West Bradford Township will formally establish its responsibilities associated with protecting the permanence of each BMP/control measure implemented for achieving the TMDL Load Reductions presented in this MS4 TMDL Plan, in order to sustain those water quality improvements into the long-term future. This includes establishing the necessary legal and administrative arrangements and instruments to insure that West Bradford Township can fulfill its responsibilities for access, and inspection, maintenance, and operation (O, M & I) of any constructed TMDL BMP/control measure, and protect each measure against future disturbance except as authorized by West Bradford Township. These responsibilities will be established and implemented for each BMP/control measure installation or retrofit for which a Load Reduction is counted by West Bradford Township toward its incremental and total TMDL targets.

c. ***Inventory of Previously Installed Pollutant Reduction Control Measures (March 10, 2003–December 31, 2015:***

West Bradford Township*:*

☒ *has previously installed pollutant reduction control measures to claim (2003-2012). See below.*

☐ *has NO previously installed pollutant reduction control measures to claim at this time (2003-2012). (Skip below and go to Subsection VIII.d).*

Table 3 provides an inventory of control measures implemented by West Bradford Township between March 10, 2003 and December 31, 2015 and the pollutant load reduction provided by each. Each control measure listed has been inspected by West Bradford Township to confirm it has been operated and maintained consistent with its original design. Locations of these control measures are shown in Figure 2 along with the Urbanized Area and stormwater impaired streams.

For each installed control measure included in Table 3, the Municipalityôs engineer has determined the pollutant load reduction achieved. This pollution reduction is only counted toward West Bradford Townshipôs first 5-year incremental target and total (cumulative) TMDL target. These control measures satisfy the following conditions as specified by PADEP in its letter dated March 21, 2012 (Appendix B) (the following is PADEP exact language):

1. *The municipality must demonstrate that the subject BMPs satisfy all applicable legal requirements.*
2. *The municipal actions must have occurred after the more recent of (a) March 10, 2003, (the date PCSM began to be implemented statewide) or (b) the completion date of the stream assessment for the applicable TMDL.*
3. *The municipality must demonstrate that actions taken by the municipality to reduce pollutant loads were voluntary and not required by any permit, order, or other enforceable mechanism, or by any state, federal or local law.*
4. *The municipality must demonstrate that any actions taken reduced pollutant loads from the status quo ante prior to the action.*
5. *Pollutant load reductions may not be claimed for open space or agricultural preservation; to count an action to reduce pollutant loads must be restorative, not preservative.*
6. *Net pollutant loading reductions must be calculated by netting the demonstrated pollutant load reductions of the applicable restoration BMPs installed after the applicable eligibility date against the increased pollutant loadings, if any, due to the addition of impervious surface and other development in and otherwise impacting the municipality during the timeframe in which credit for an applicable pollutant load reduction is sought.*
7. *Pollutant load reductions may be counted upon DEP's determination that all applicable legal requirements have been satisfied and there is a demonstrated quantifiable net decrease in applicable pollutant loadings in the municipality for the identified timeframe.*

Table 3. Previously Installed BMPs/Control Measures and Pollutant Reductions For West Bradford Township in Brandywine Creek Watershed

BMP/ control measure #	Date Installed	Description	BMP Category *	TMDL Subbasin	In Urbanized Area?	Pollutant(s) Treated	Removal Efficiency (for each)**	Estimated Pollutant Load Reduction**	Date of Last Inspection	Condition/ Performance of BMP at inspection
1	2004	Sycamore Ridge Infiltration Bed 1A	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.006 (kg/day) P: 0.0015 (kg/day) S: 2.69 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed. Minor debris is noticed in the inlets. The debris shall be removed from the inlets.
2	2004	Sycamore Ridge Infiltration Bed 1B	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.004 (kg/day) P: 0.0010 (kg/day) S: 1.82 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.
3	2004	Sycamore Ridge Infiltration Bed 2B	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.013 (kg/day) P: 0.0026 (kg/day) S: 3.49 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed. A small amount of soil was noticed in the inlet, and the BMP would benefit from having the inlet cleaned.
4	2004	Sycamore Ridge Infiltration Bed 3B	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus	67.7% 78.8% 84.9%	N: 0.011 (kg/day) P: 0.0027 (kg/day) S: 4.90 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.

						☒ Sediment				
5	2004	Sycamore Ridge Infiltration Bed 4B	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.012 (kg/day) P: 0.0030 (kg/day) S: 5.37 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.
6	2010	Dupont Phase 3 Basin 1A	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.061 (kg/day) P: 0.0155 (kg/day) S: 27.86 (tons/year)	7/30/2020	The stormwater BMP appears to operate as designed. There is sediment built up in the rip rap aprons. Leaves are built up in the inflow on the East side of the basin. The basin riser has large rocks inside of it. The sediment, leaves and rocks shall be removed.
7	2009	Dupont Phase 3 Basin 2 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.058 (kg/day) P: 0.0246 (kg/day) S: 15.43 (tons/year)	7/30/2020	The stormwater BMP appears to operate as designed. The rock apron for the inflow is over grown, and there is sediment in the rock. There are leaves clogging the inflow pipe. The sediment and leaves shall be removed.

8	2009	Dupont Phase 1 Basin 2 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.046 (kg/day) P: 0.0086 (kg/day) S: 21.22 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.
9	2009	Dupont Phase 4 Basin 2 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.044 (kg/day) P: 0.0076 (kg/day) S: 11.52 (tons/year)	7/30/2020	The stormwater BMP appears to operate as designed. There is silt covering one of the rip rap aprons for the swale. The silt shall be removed from the rip rap.
10	2006	Dupont Phase 4 Infiltration Basin 1	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.030 (kg/day) P: 0.0003 (kg/day) S: 13.76 (tons/year)	7/30/2020	The stormwater BMP appears to operate as designed. There is erosion along the swale.
11	2007	Bally Moor Basin 1 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.018 (kg/day) P: 0.0006 (kg/day) S: 8.13 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.
12	2007	Bally Moor Basin 2 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus	67.7% 78.8%	N: 0.002 (kg/day) P: 0.0011 (kg/day) S: 1.06	7/29/2020	The stormwater BMP appears to operate as designed.

						☒ Sediment	84.9%	(tons/year)		
13	2007	Bally Moor Basin 3 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.004 (kg/day) P: 0.0003 (kg/day) S: 2.05 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.
14	2007	Dupont Phase 1 Basin 1 (Infiltration)	☐ 1 ☐ 2 ☒ 3	B06	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	67.7% 78.8% 84.9%	N: 0.056 (kg/day) P: 0.0143 (kg/day) S: 25.81 (tons/year)	7/29/2020	The stormwater BMP appears to operate as designed.
			1 and 2	**Total Installed BMP/control measure Reduction** (sum of BMP/control measures categories 1 +2**)→				**N: 0 (kg/day) P: 0 (kg/day) S: 0 (tons/year)**		
			3	**Reductions achieved through Municipal Stormwater Ordinance Control Measure** (Sum of BMP/control measures category 3**)				**N: 0.36 (kg/day) P: 0.09 (kg/day) S: 145.10 (tons/year)**		
			Total Gross Reduction → (BMP/control measures + Stormwater Ordinance)					**N: 0.36 (kg/day)**		

		P: 0.09 (kg/day) **S: 145.10 (tons/year)**	
	Increased Pollutant loadings due to development, additional impervious surfaces, or other sources between March 10, 2003 and *[Date of Submission]* **Total Increase →**	**N: 0 (kg/day)** **P: 0 (kg/day)** **S: 0 (tons/year)**	
	TOTAL NET REDUCTION → *(Total Gross – Increase)* Counted towards meeting the TMDL	**N: 0.36 (kg/day)** **P: 0.09 (kg/day)** **S: 145.10 (tons/year)**	

*BMP/control measure Categories:

1) Voluntary retrofits/control measures ï non-structural or structural.
2) Voluntary increased control measures above the NPDES requirements installed as part of land development project.
3) Non-voluntary increased control measures required by the Municipal Stormwater Management Ordinance, which exceed NPDES requirements.

**All calculations and supporting documentation are provided in Appendix D.

Figure 2. West Bradford Township Locations of Previously Installed and Candidate BMPs/Control Measures

B06 TMDL SUBBASIN AREA/
MS4 REGULATED AREA
786.95 ACRES

B14 TMDL SUBBASIN AREA/
MS4 REGULATED AREA 61.98 ACRES
AFTER PARSING 31.26 ACRES

NOTE:
STORM SEWER DATA PROVIDED BY CHESTER COUNTY GEOGRAPHICAL INFORMATION SYSTEMS (GIS) SERVICES, DATED FEBRUARY AND APRIL OF 2015. DATA INCLUDES OUTFALLS, HEADWALLS, INLETS, MANHOLES, AND BASINS AS SHOWN.

B30 B13 B24 B25 B06 B14 B08

UA

UNT BEAVER CREEK
UNT WB BRANDYWINE CREEK
UNT EB BRANDYWINE CREEK
UNT BROAD RUN
UNT SAW MILL RUN
WB BRANDYWINE CREEK
EB BRANDYWINE CREEK

MARSHALLTON THORNDALE RD
GUTHRIEVILLE RD
GLENSIDE RD
ROMIG RD
SAW MILL RUN
SAWMILL RD
DOWNINGTOWN PIKE
BRADFORD AVE
BEAVER RD
MARTINSVILLE RD
WEST CHESTER RD
BROAD RUN
BEACON HILL RD
ROMANSVILLE RD
CHESTNUT LN
STRASBURG RD
LIONS RD
SHADYSIDE RD
TELEGRAPH RD
CENTER RD
NORTHBROOK RD
SUGAR BRIDGE RD

LEGEND

- MUNICIPAL BOUNDARY LINE
- PARCEL BOUNDARY
- EXISTING 10' CONTOUR
- URBANIZED AREA BOUNDARY
- TMDL SUBBASIN AREA BOUNDARY
- EXISTING STREAM
- 235 MS4 REGULATED OUTFALL
- T1 MS4 REGULATED TOWNSHIP ROAD OUTFALL
- 501 MS4 OBSERVATION POINT
- 253 EXISTING STORM SEWER OUTFALL
- 252 EXISTING STORM SEWER HEADWALL
- EXISTING STORM INLET
- EXISTING STORM MANHOLE
- EXISTING STORM PIPE
- EXISTING BASIN
- EXISTING BMP
- UA URBANIZED AREA
- B06 TMDL SUBBASIN IDENTIFICATION
- CANDIDATE BMP
- STORM SEWERSHED
- PARSED AREA

GRAPHIC SCALE 1"=1000'
1000 0 1000 2000

FIGURE 2

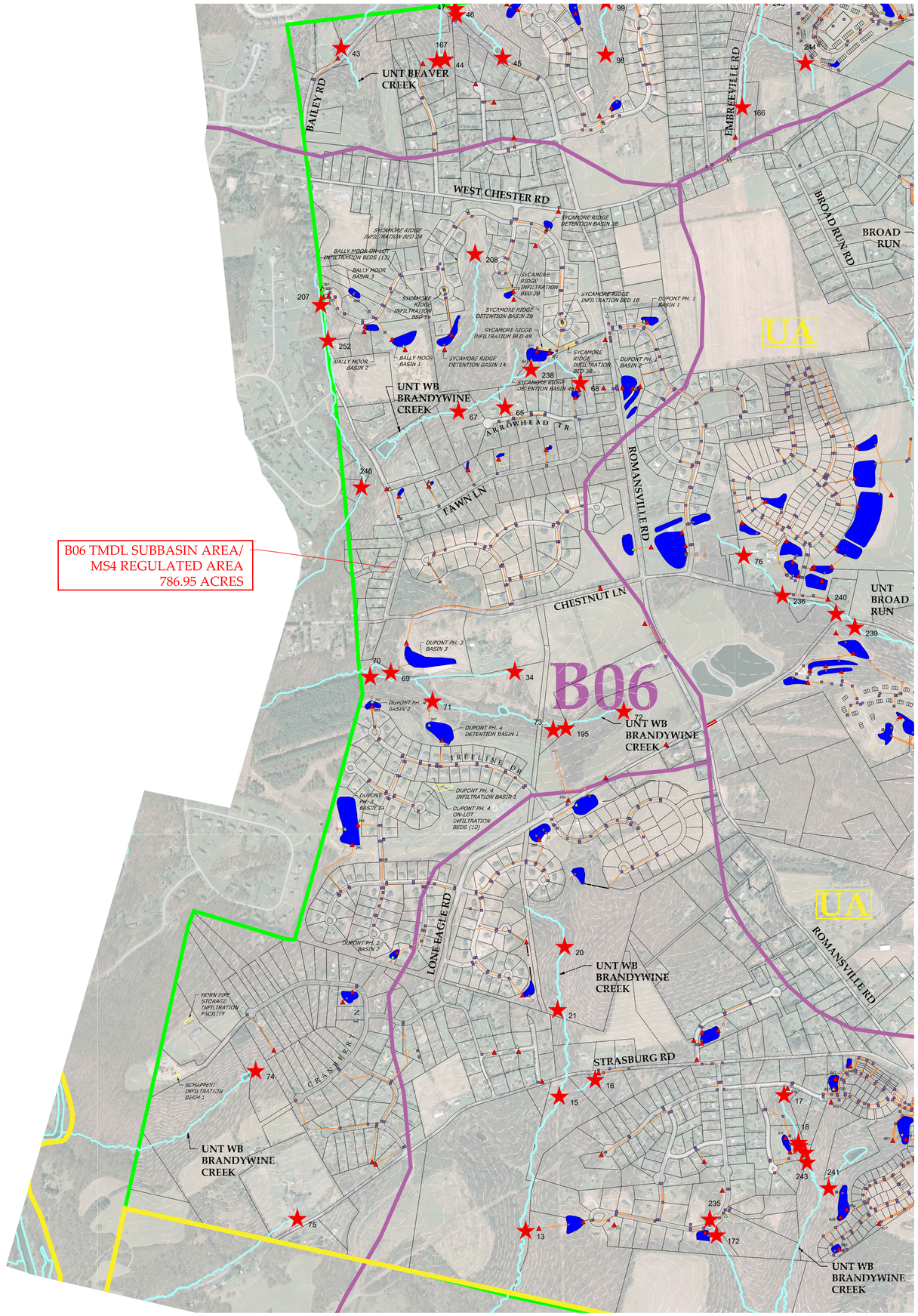
8-19-22	REV. PER TMDL PLAN REVIEW FROM PA DEP.
8-14-20	REV. PER TMDL PLAN REVIEW FROM PA DEP.
10-17-19	REV. PER TMDL PLAN REVIEW FROM PA DEP.
9-15-17	REV. PER TMDL PLAN SUBMITTAL TO PA DEP.
7-20-17	REV. PER TMDL SUBMITTAL.

TMDL PLAN
FOR
WEST BRADFORD TOWNSHIP
WEST BRADFORD TOWNSHIP CHESTER COUNTY, PA

Edward B. Walsh & Associates, Inc.
CIVIL ENGINEERS & SURVEYORS
Whiteland Business Park
855 Springdale Drive, Suite 202
Exton, Pennsylvania 19341
Phone: (610) 903-0060
Fax: (610) 903-0080

PROJECT	#2800-136
DATE	8/26/2015
SCALE	1"=1,000'
DRAWN	ASH
CHECKED	DHD
SHEET	1 OF 3

Plotted: 8/26/2015
File: F:\JB\2800-136\GIS MAP\WEST BRADFORD STORM SEWER MAP6.DWG



LEGEND

- MUNICIPAL BOUNDARY LINE
- PARCEL BOUNDARY
- EXISTING 10' CONTOUR
- URBANIZED AREA BOUNDARY
- TMDL SUBBASIN AREA BOUNDARY
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- EXISTING STORM PIPE
- EXISTING BASIN
- EXISTING BMP
- UA URBANIZED AREA
- B06 TMDL SUBBASIN IDENTIFICATION
- CANDIDATE BMP
- STORM SEWERSHED
- PARSED AREA

GRAPHIC SCALE 1"=500'

500 0 500 1000

NOTES

1. GEOGRAPHICAL INFORMATION SYSTEMS (GIS) SERVICES, DATED FEBRUARY AND APRIL OF 2015. DATA INCLUDES OUTFALLS, HEADWALLS, INLETS, MANHOLES, AND BASINS AS SHOWN.
2. PARSED AREAS INCLUDE:
   - WATERSHEDS WITH DIRECT DISCHARGE TO A STREAM.
   - AREAS DRAINING TO A PENNSYLVANIA STATE ROUTE.
3. THE PRP PLANNING AREA FOR WEST BRADFORD TOWNSHIP DOES NOT INCLUDE STORM SEWERSHED AREAS OUTSIDE OF THE TOWNSHIP BOUNDARY.

FIGURE 2

1	8-19-22 REV. PER TMDL PLAN REVIEW FROM PA DEP.
1	8-14-20 REV. PER TMDL PLAN REVIEW FROM PA DEP.
1	10-17-19 REV. PER TMDL PLAN REVIEW FROM PA DEP.
1	9-15-17 REV. PER TMDL PLAN SUBMITTAL TO PA DEP.
1	7-20-17 REV. PER TMDL SUBMITTAL.

TMDL PLAN
FOR
WEST BRADFORD TOWNSHIP

WEST BRADFORD TOWNSHIP — CHESTER COUNTY, PA

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CIVIL ENGINEERS & SURVEYORS
Whiteland Business Park
855 Springdale Drive, Suite 202
Exton, Pennsylvania 19341
Phone: (610) 903-0060
Fax: (610) 903-0080

PROJECT #2800-136
DATE: 8/26/2015
SCALE: 1"=500'
DRAWN: ASH
CHECKED: DHD
SHEET: 2 OF 3

Plotted: [illegible]
File: F:\JB\2800-136\GIS MAP\WEST BRADFORD STORM SEWER MAP6.DWG

B14

UNT EB BRANDYWINE CREEK

UNT EB BRANDYWINE CREEK

TELEGRAPH RD

UNT EB BRANDYWINE CREEK

UNT EB BRANDYWINE CREEK

MARSHALLTON THORNDALE RD

TELEGRAPH RD (T385)

SUGAR BRIDGE RD (S.R. 3059)

STRASBURG RD

STRASBURG RD

UNT WB BRANDYWINE CREEK

STREAMBANK STABILIZATION #1 (TELEGRAPH RD)

OUTFALL #T3 PLANNING AREA =0.77 AC

OUTFALL #T1 PLANNING AREA =5.69 AC

OUTFALL #T2 PLANNING AREA = 24.80 AC

263 426 263

262

260 426 260

261 474 473

430 428 429

436 435

T1

T2

T3

462 422 423

420 9 4214 4 32 32

557 555 556 554 552 573

183

154

234

B14 TMDL SUBBASIN AREA/
MS4 REGULATED AREA 61.98 ACRES
AFTER PARSING 31.26 ACRES

LEGEND

- MUNICIPAL BOUNDARY LINE
- PARCEL BOUNDARY
- EXISTING 10' CONTOUR
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- 253 EXISTING STORM SEWER OUTFALL
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- EXISTING STORM INLET
- EXISTING STORM MANHOLE
- EXISTING STORM PIPE
- EXISTING BASIN
- EXISTING BMP
- URBANIZED AREA
- B06 TMDL SUBBASIN IDENTIFICATION
- CANDIDATE BMP
- STORM SEWERSHED
- PARSED AREA

GRAPHIC SCALE 1"=300'

300 0 300 600 900

NOTES

1. GEOGRAPHICAL INFORMATION SYSTEMS (GIS) SERVICES, DATED FEBRUARY AND APRIL OF 2015. DATA INCLUDES OUTFALLS, HEADWALLS, INLETS, MANHOLES, AND BASINS AS SHOWN.
2. PARSED AREAS INCLUDE:
   - WATERSHEDS WITH DIRECT DISCHARGE TO A STREAM.
   - AREAS DRAINING TO A PENNSYLVANIA STATE ROUTE.
3. THE PRP PLANNING AREA FOR WEST BRADFORD TOWNSHIP DOES NOT INCLUDE STORM SEWERSHED AREAS OUTSIDE OF THE TOWNSHIP BOUNDARY.

FIGURE 2

1	8-19-22 REV. PER TMDL PLAN REVIEW FROM PA DEP.
2	8-14-20 REV. PER TMDL PLAN REVIEW FROM PA DEP.
3	10-17-19 REV. PER TMDL PLAN REVIEW FROM PA DEP.
4	9-15-17 REV. PER TMDL PLAN SUBMITTAL TO PA DEP.
5	7-20-17 REV. PER TMDL SUBMITTAL.

TMDL PLAN
FOR
WEST BRADFORD TOWNSHIP

WEST BRADFORD TOWNSHIP CHESTER COUNTY, PA

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Phone: (610) 903-0060
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PROJECT #2800-136
DATE: 8/26/2015
SCALE: 1"=300'
DRAWN: ASH
CHECKED: DHD
SHEET: 3 OF 3

Plotted: File: F:\JB\2800-136\GIS MAP\WEST BRADFORD STORM SEWER MAP6.DWG

The PADEP letter further states that ñé *any municipality that seeks to count pollutant load reductions made in the past can do so only if they satisfy all of the above factors to DEP's satisfaction.*ò

Projects listed in Table 3 include BMP/control measures that fall into three categories:

1. Voluntary BMPs/control measures or retrofits, either structural or non-structural, which were not completed as part of a land development project;

2. BMPs/control measures installed as part of (a) land development project(s) approved by the Municipality, which voluntarily exceeded the pollutant removal efficiency required by the NPDES construction permit (i.e., pollutant removal required by NPDES application worksheet of calculations and PA BMP Manual);

3. BMPs/control measures installed as part of (a) land development project(s) approved by the Municipality, which exceeded the pollutant removal efficiency required by the NPDES construction permit, as required by the Municipalityôs Stormwater Management Ordinance.

Category 3 BMPs/control measures are considered to be the ñMunicipal Stormwater Ordinance Control Measureò, which is further discussed in the next subsection. For BMP/control measure categories 2 and 3, above, only the portion of pollutant load removal that is above and beyond the PADEP NPDES permit requirement is included in Table 3. For all BMPs/control measures, permanent protection, inspection, operation and maintenance provisions have been put into place. For each control measure listed in Table 3 justification for pollutant reduction credit, including calculations and information in support of items 1 through 7 above have been provided in Appendix D.

d. *Municipal Stormwater Ordinance Control Measure:*

The stormwater ordinance adopted by West Bradford Township in December, 2013 meets or exceeds the minimum standards required in the ñCounty-wide Act 167 Plan for Chester Countyò. West Bradford Townshipôs stormwater ordinance exceeds the minimum PADEP NPDES permit requirements for new construction for the following components related to water quality protection:

☐ Infiltration;
☐ Volume control;
☒ Minimum area of proposed impervious surface or proposed or earth disturbance to which ordinance standards apply;
☒ *Peak Rate Reduction Requirements for New Development:*
2-year post ≤ 1-year pre; 5-year post ≤ 2-year pre;
10-year post ≤ 2-year pre

West Bradford Township may document all future BMPs/control measures installed as part of new construction or redevelopment projects that meet the requirements of its Ordinance and achieve pollutant load reductions that exceed the minimum requirements of a PADEP NPDES permit for new construction. Only the portion of pollutant load removal that is above and beyond the PADEP NPDES permit requirement is counted towards the required TMDL pollutant Load Reductions and will be counted toward the TMDL implementation timeline and milestones for West Bradford Township (see Subsection 3.IX).

e. ***Proposed Control Measures to be Implemented:***

Table 4 and Figure 2 present the candidate BMPs/control measures to be implemented by West Bradford Township during this 5-year permit cycle. West Bradford Township is reviewing the opportunities to implement these or other BMP/control measures at locations where the water quality benefits will be maximized.

For each BMP/control measure listed in Table 4, justification for load reduction performance, including calculations and a brief analysis to explain and justify the selection of BMP/control measures proposed, have been provided in Appendix D. In subsequent permit cycles all BMPs/control measures implemented from Table 4 will be moved to Table 3, and counted towards the MS4 TMDL milestones.

The final list of selected BMP/control measures with the specific location and MS4 TMDL design details will be submitted to PADEP as West Bradford Townshipôs MS4 TMDL Plan ï Part II, no later than one year from the effective date of authorization of West Bradford Townshipôs MS4 permit renewal. All constructed or retrofitted BMP/control measures will be accompanied by the necessary legal and/or administrative arrangements and instruments to establish long term access and inspection, operation and maintenance responsibilities by West Bradford Township and permanent protection from disturbance or modification except as authorized by West Bradford Township.

Table 4. List of Candidate BMPs/Control Measures
Brandywine Creek Watershed - West Bradford Township

BMP/ control measure #	Description of BMP/Control Measure	BMP Category *	TMDL Subbasin	In Urbanized Area?	Pollutant(s) Treated	Removal Efficiency (for each)**	Estimated Pollutant Load Reduction*
1	Streambank Stabilization 1 (Telegraph Rd) 100 ft length along streambank	☒ 1 ☐ 2 ☐ 3	B14	☒ Yes ☐ No	☒ Nitrogen ☒ Phosphorus ☒ Sediment	0.192 (lbs/ft/yr) 0.174 (lbs/ft/yr) 115 (lbs/ft/yr)	0.02 (kg/day) 0.02 (kg/day) 5.75 (tons/yr)
		TOTAL ESTIMATED REDUCTION → Counted towards meeting the TMDL					**N=0.02 (kg/day) P=0.02 (kg/day) S=5.75 (tons/yr)**

*BMP Categories:

1) Retrofits/control measures ï non-structural or structural.
2) Increased control measures above the NPDES requirements installed as part of land development project.
3) Increased control measures required by the Municipal Stormwater Management Ordinance, which exceed NPDES requirements.

**All calculations and supporting documentation are provided in Appendix D.

IX. Analysis of Consistency of this Implementation Plan with WLAs and TMDLs:

a. ***Analysis of Consistency:***

As shown in Tables 1, 2, 3, and 4, Figures 1 and 2, and as described in the ñKey Definitionsò and Subsections C.I through C.VIII of this MS4 TMDL Plan, the implementation actions listed in Subsection C.VIII and this MS4 TMDL Plan are consistent with the requirements and assumptions of the applicable TMDL Reports listed in Subsection C.I.

b. ***Timeline and Milestones:***

In accordance with the expectations set forth in the PADEP TMDL Plan Instructions dated March, 2017, *West Bradford Township's* TMDL Plan Objectives are as follows:

- *Long-Term Reduction - plan for the reduction of pollutant load(s) to achieve the WLA(s) in the TMDL.*
- *Short-Term Reduction - plan for the short-term reduction of pollutant load(s) that will be achieved within the subsequent NPDES permit term (i.e., the 5-year permit term resulting from DEP's issuance of a permit in response to the receipt of the MS4's next submission of an individual permit application).*

c. ***Implementation Tracking:***

West Bradford Township will maintain a TMDL Implementation and Attainment Log, that will be an official tally of progress toward the incremental (by permit cycle) and total (cumulative) TMDL targets presented in this MS4 TMDL Plan. This log will document pollutant Load Reductions achieved from reductions achieved as new control measures are installed or retrofitted during each permit cycle, and reductions achieved through implementation of the West Bradford Township stormwater ordinance (Subsection C.VIII.d). The TMDL Implementation and Attainment Log will be included in each periodic municipal MS4 permit report to PADEP.

All pollutant reduction actions taken by the Municipality that satisfy the requirements specified in this MS4 TMDL Plan and by PADEP will be quantified and recorded in the TMDL Implementation and Attainment Log, and applied towards the Adjusted required pollutant Load Reductions (Table 2) (or EPA original MS4 reduction (Table 1), if no adjustment was made). Progress will be reported both numerically (mass/time) and as a percentage of the overall MS4 required Load Reduction.

d. ***Process for Evaluating and Updating MS4 TMDL Plan:***

West Bradford Township will review its progress on meeting milestones on a periodic basis, maintain inspections and records to evaluate control measures and will periodically evaluate this MS4 TMDL Plan for necessary modifications. Any modifications will be coordinated with PADEP prior to implementation. West Bradford Township will also continue participation in the C-TIP Partnership and work with the group to evaluate, and, as needed, revise the overall C-TIP approach to ensure timely progress toward the TMDL Watershed implementation targets.

e. ***BMP/Control measures Performance Evaluation and Reporting:***

BMP/control measures performance evaluation will consist of inspections conducted by West Bradford Township (or its designee) to ensure that the BMP/control measures constructed or retrofitted to meet the TMDL requirements continue to be maintained as designed. The Municipality will ensure that an appropriate technical expert will inspect the facility during construction and annually, and will report observations made. Any needs will be identified and reported, and will be scheduled for implementation. Inspection information will be maintained on file and summarized in municipal periodic MS4 permit reports.

f. ***TMDL Plan Funding:***

West Bradford Township is committed to funding the TMDL Plan.

X. Additional Information: (See Appendices)

SECTION D – References

2010 Pennsylvania Integrated Water Quality Monitoring and Assessment Report. Undated. Pennsylvania Department of Environmental Protection. Office of Water Management, Bureau of Water Supply & Wastewater Management, Water Quality Assessment and Standards Division, Harrisburg, PA.

Furlan, Ronald C. – PADEP. Letter dated March 21, 2012, re: Christina Basin Total Maximum Daily Load Implementation Plan (C-TIP) (2/13/2012).

Revisions to Total Maximum Daily Loads for Nutrient and Low Dissolved Oxygen Under High-Flow Conditions, Christina River Basin, Pennsylvania, Delaware, and Maryland. September 2006. U.S. Environmental Protection Agency, Philadelphia, PA.

Total Maximum Daily Loads for Bacteria and Sediment in the Christina River Basin, Pennsylvania, Delaware, and Maryland. September 2006. U.S. Environmental Protection Agency, Philadelphia, PA

Total Maximum Daily Load for the Red Clay Creek Basin Chester County, Pennsylvania. April 7, 2007. U.S. Environmental Protection Agency, Philadelphia, PA.

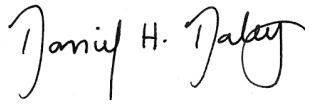
Total Maximum Daily Loads, Polychlorinated Biphenyls (PCBs) and Chlordane, West Branch Brandywine Creek, Chester County, Pennsylvania. March 9, 2001. Pennsylvania Department of Environmental Protection, Harrisburg, PA.

Christina Basin Land Use Loading Rates Calculation Tool. May 5, 2017. Chester County Water Resources Authority (CCWRA)

SIGNATURE AND SEAL BY PROFESSIONAL ENGINEER

Daniel H. Daley, P.E.

Name



Signature

054930-E

PA License Number

5/24/2022

Date

APPENDIX A –

MUNICIPALITIES PARTICIPATING IN C-TIP PARTNERSHIP

APPENDIX A

Brandywine Valley Association

This is a list of the Municipalities that are members of the CTIP partnership.

1. Avondale Borough
2. Caln Township
3. Coatesville
4. Downingtown Borough
5. East Bradford Township
6. East Brandywine Township
7. East Caln Township
8. East Fallowfield Township
9. Franklin Township
10. Honey Brook Township
11. Kennett Borough
12. Kennett Township
13. London Grove Township
14. Londonderry Township
15. New Garden Township
16. New London Township
17. Parkesburg Borough
18. Penn Township
19. Pennsbury Township
20. Pocopson Township
21. Sadsbury Township
22. South Coatesville
23. Thornbury Township
24. Upper Uwchlan Township
25. Uwchlan Township
26. Valley Township
27. West Bradford Township
28. West Brandywine Township
29. West Caln Township
30. West Chester Borough
31. West Goshen Township
32. West Whiteland Township

1760 Unionville-Wawaset Road, West Chester, PA 19382-6751
T: 610-793-1090 F: 610- 793-2813 E: water@bva-rcva.org
Web: www.brandywinewatershed.org

APPENDIX B –
PADEP LETTER DATED MARCH 21, 2012

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF POINT AND NON-POINT SOURCE MANAGEMENT

March 21, 2012

Ms. Jan Bowers
Chester County Water Resources Authority
601 Westtown Rd., Suite 270
West Chester, PA 19380-0990

Re: Christina River Total Maximum Daily Load Implementation Plan (C-TIP)(02/13/2012)

Dear Ms. Bowers:

This letter constitutes the Department of Environmental Protection's (DEP) response to the Chester County Water Resource Authority's (CCWRA) submittal of the February 13, 2012, C-TIP proposal and discussions held in Harrisburg on that date. DEP would like to thank you, along with other CCWRA staff, the CCWRA, the Chester County Board of Commissioners, the Chester County Conservation District, the Brandywine Valley Association, and others who have taken the time and initiative to develop the approach and vet it with the many Christina Basin municipalities in Chester County. This coordinated effort is critical to the preparation and implementation of measures to meaningfully address the complex and geographically large Christina Basin TMDLs for Sediment and Nutrients. We are also appreciative of the efforts expended to revise earlier versions of C-TIP in response to concerns raised in several discussions with our agency.

In sum, DEP generally concurs with your approach, in concept, as a viable way for Christina municipalities to make substantial progress in addressing applicable MS4 TMDL WLAs under PAG-13 or an MS4 Individual NPDES permit to improve this Commonwealth's waters. We believe that your conceptual approach is generally sound, and parts of it, such as the approach to the parsing of WLA load in a municipality, mimic ongoing efforts we have engaged in. Also, we concur with your analysis regarding the non-applicability of bacteria TMDLs to the municipalities due to the absence of bacteria § 303(d) listings in the Christina Basin. In addition, your implementation approach appears sound, as well, though we have specific concerns below that will need to be addressed.

Although we generally concur with your proposal, our concurrence is conditioned on CCWRA and the implementing municipalities addressing our comments on how C-TIP can and should be improved, and some caveats, as set forth in the following paragraphs.

DEP's general conceptual approval of the February 13, 2012, C-TIP approach is subject to these caveats:

1. ***Concurrence in Concept Only*** - The conceptual approval from DEP of the February 13, 2012, C-TIP proposal is expressly limited to only the concept that has been brought before DEP, not any particulars or specifics in the proposal, except as expressly noted in this letter.

2. ***Right to Change Position*** - DEP reserves the right to change its position regarding the C-TIP proposal should further information or analysis reveal technical or legal flaws in the concept, as proposed or implemented, or should other circumstances or factors arise meriting a change in position.

3. ***No Pre-Approval of Municipal MS4 TMDL Plans*** - DEP's conceptual approval of the February 13, 2012, C-TIP proposal does not constitute pre-approval of any municipal MS4 TMDL Plan. The MS4 TMDL Strategy portion of each Plan that each municipality must develop under PAG-13 must be submitted to DEP by September 14, 2012, and will be evaluated on its own merits. Similarly, the MS4 TMDL Design Details part of the Plan that each municipality must develop must be submitted to DEP within one year of approval of coverage by DEP. DEP will not approve a MS4 TMDL Plan for a municipality unless the agency conducts an evaluation of the proposed Plan and then makes a finding that the Plan satisfies all applicable conditions of the permit and federal, state and local law, including a timeline with milestones outlining what will be accomplished, both in the first permit term and ultimately, along with the ten elements required for a Plan on pages 16-17 of Part C of the PAG-13 Authorization to Discharge.

DEP's approval is further conditioned on CCWRA and the implementing municipalities addressing the following concerns to the satisfaction of DEP.

1. ***Timeline for Attaining Pollutant Reduction Goals*** – The C-TIP proposes a 25 year timeline to meet pollutant reduction targets. While this timeline is markedly better than the 40 year timeline set forth in the prior C-TIP proposal that was presented to DEP, it still falls short of the 15 year timeline recommended by EPA. As a condition of concurring with the C-TIP proposal, the timelines in the C-TIP need to be modified and implemented as follows.

DEP expects timeframes for pollutant reductions to be based on the pollutant load percentage reduction required for each regulated small MS4. Regulated small MS4s with applicable WLAs requiring reductions up to 50% should have a timeline no longer than 10 years. Where reductions of 50-85% are required in the WLA, the timeline should be no longer than 15 years. Regulated small MS4s subject to WLAs requiring reductions of 85% or greater should have a timeline no greater than 20 years. Operators of regulated small MS4s can seek a longer timeframe if they are able to provide a compelling justification in their MS4 TMDL Plan submittal, to DEP's satisfaction, demonstrating why a longer timeframe is necessary. Each MS4 TMDL Plan, including a request for an alternate timeline, will be evaluated on its merits.

2. ***Priorities for Municipal Pollutant Load Reductions*** – On page 4 of the C-TIP narrative, the C-TIP gives first priority to implementing measures on "municipal owned/operated pollutant sources." DEP supports the focus on these areas as a way to harvest "low-hanging fruit" pollutant

load reductions in the first permit term and thereafter. Moreover, DEP expects that C-TIP municipalities will prioritize the installation and implementation of BMPs on municipal owned sources and other sources claimed by the municipality to minimize the volume and rate of stormwater flow discharging from the regulated small MS4 to surface waters. DEP also expects that BMPs will be installed and implemented at locations on municipal owned sources within the watershed that are targeted to maximize pollutant load reductions. It is important that pollutant reduction opportunities be undertaken in an efficient manner given the challenges of eliminating impairments and the costs of installing and implementing measures to address these impairments.

As a condition of DEP's concurrence with C-TIP, DEP expects that the C-TIP be amended and implemented to reflect the above-stated priorities, unless the municipality is able to provide a compelling justification, to DEP's satisfaction, demonstrating why a different approach is preferable.

3. ***First Term Permit Reductions*** - The C-TIP proposal specifies a 5% reduction in pollutant load in the first MS4 TMDL permit cycle (ie, the cycle running from approximately 2013-2018), along with 20-25% reductions listed in the C-TIP for subsequent permit cycles. While we acknowledge that there will be startup issues in obtaining such reductions, 5% seems like a low reduction target for the first permit term. Municipalities should, as specified in the C-TIP, be tackling their "low hanging fruit" in the first permit cycle, such as runoff from municipal owned and operated facilities. DEP questions whether it is reasonable to "backload" reductions to later permit cycles when the low hanging fruit is targeted as a priority in the first permit term. Accordingly, DEP's concurrence in the C-TIP proposal is conditioned on the C-TIP indicating that an effort will be made so that at least 10-15% of pollutant load reductions are targeted to be achieved by the end of the first MS4 TMDL permit cycle unless a municipality provides compelling justification in its MS4 TMDL Plan, to DEP's satisfaction, demonstrating the rationale for why alternate load reduction percentages may be merited in the first and other permit terms. Such demonstration needs to be consistent with any demonstration made for an alternate timeline as set forth above.

4. ***Cause or Contribute Terminology*** – Throughout the C-TIP proposal there are references to the term "cause or contribute," or various iterations thereof. As we understand your use of the term, it is meant to address situations where the TMDL erroneously assigns a WLA to a municipality, such as the situation where a regulated small MS4 does not discharge stormwater from its outfalls (assuming they have been correctly identified) into the subbasin subject to the WLA. It could also apply to situations where an operator of a regulated small MS4 is not required under law to submit a MS4 TMDL Plan. We think your use of the term "cause or contribute" is better expressed in the phrase "the operator of the regulated small MS4 is not required to submit an MS4 TMDL Plan because the WLA is not applicable." The term "cause or contribute" is a term of art under the federal Clean Water Act that carries with it many permitting and water-quality based effluent limitations; implications that we believe unduly complicate what you are trying to do. If you choose to continue using the term "cause or contribute" you will need to provide a definition, together with an explanation and requisite justification explaining how, as the term is used in your proposal, a municipality would demonstrate that it does not "cause or contribute" to an existing impairment, including the justifications they would need to provide. This is a critical issue since the C-TIP proposal contains numerous "outs" excusing operators of

regulated small MS4s from preparing and executing MS4 TMDL Plans if they do not "cause or contribute."

In sum, DEP's concurrence is conditioned on the C-TIP proposal being amended in either of two ways. First, the proposal can be amended to delete any references to the term "cause or contribute" and replace them with terminology such as "the permittee is not required to submit an MS4 TMDL Plan because the WLA is not applicable," or some similar language, along with conforming revisions. A second alternative is to provide an explanation with requisite definitions and justifications explaining how, as the term is used in your proposal, a permittee would demonstrate that it does not "cause or contribute" to an existing impairment, including the justifications they would need to provide.

5. ***Eligible Past Pollutant Reductions*** – A question arises whether a municipality participating in the C-TIP will be able to count pollutant reductions the permittee made at some time after the assessment that resulted in the impairment listing for which a TMDL (and WLA) was prepared. In prior C-TIP correspondence between DEP and CCWRA (July 15, 2011), DEP set out the following prerequisites for a municipality seeking to count pollutant load reductions from past actions. Any pollutant reductions claimed by a municipality for past BMP implementations will be analyzed under these factors: (1) the municipality must demonstrate that the subject BMPs satisfy all applicable legal requirements; (2) the municipal actions must have occurred after the more recent of: (a) March 10, 2003, (the date PCSM began to be implemented statewide) or (b) the completion date of the stream assessment for the applicable TMDL; (3) the municipality must demonstrate that any actions taken by the municipality to reduce pollutant loads were voluntary and not required by any permit, order, or other enforceable mechanism, or by any state, federal or local law; (4) the municipality must demonstrate that any actions taken reduced pollutant loads from the *status quo ante* prior to the action; (5) pollutant load reductions may not be claimed for open space or agricultural preservation; to count an action to reduce pollutant loads must be restorative not preservative; (6) net pollutant loading reductions must be calculated by netting the demonstrated pollutant load reductions of the applicable restoration BMPs installed after the applicable eligibility date against the increased pollutant loadings, if any, due to the addition of impervious surface and other development in and otherwise impacting the municipality during the timeframe in which credit for an applicable pollutant load reduction is sought; and (7) pollutant load reductions may be counted upon DEP's determination that all applicable legal requirements have been satisfied and there is a demonstrated quantifiable net decrease in applicable pollutant loadings in the municipality for the identified timeframe.

DEP's concurrence in the C-TIP concept is conditioned such that any municipality that seeks to count pollutant load reductions made in the past can do so only if they satisfy all of the above factors to DEP's satisfaction.

6. ***Eligibility of Reductions Outside the Urbanized Area (UA)*** – A question arises whether pollutant reductions undertaken outside the UA by any entity can be counted by a municipality toward meeting a permittee's MS4's TMDL WLA obligations. In prior C-TIP correspondence between DEP and CCWRA (July 15, 2011), DEP set out the following prerequisites that a municipality must demonstrate, to DEP's satisfaction, to count reductions undertaken outside of

the UA toward meeting a permittee's MS4's TMDL WLA obligation: (1) the municipality must demonstrate that it satisfies all applicable legal requirements; (2) any load reductions outside the UA can only be counted if they are consistent with DEP's forthcoming applicable credit, trading and offset policies; (3) the performance of any BMPs must be substantiated to the satisfaction of DEP with appropriate analyses to satisfy the claimed pollutant load reduction; (4) the permittee must establish suitable authority (e.g. ownership and control) over the BMP facilities; (5) the facilities and BMPs cannot also be counted toward meeting some other party's TMDL obligations; and (6) the target pollutant load reductions must be quantifiable at the impaired stream segment that receives stormwater discharges from the municipality's regulated small MS4.

DEP's concurrence in the C-TIP concept is conditioned such that any municipality that seeks credits for pollutant load reductions undertaken outside the UA may do so only if they satisfy all of the above factors to DEP's satisfaction.

7. ***Offsets, Trading and Credits in MS4 TMDL Plans*** – As referenced above, any offset or credit sought by a municipality must be in accordance with DEP's applicable credit, trading and offset policies. As you are aware, DEP currently has an ongoing stakeholder group (in which you are a participant) that is discussing how offsets, trading and credits would be applied in a stormwater context. As such, municipalities that seek to include offsets and/or credits for pollutant load reductions in an MS4 TMDL Plan will need to ensure that such proposals conform with DEP's applicable credit, trading and offset policies as they evolve and are finalized and implemented.

8. ***Adjustment of Allocations After First Permit Cycle*** – The C-TIP proposal provides no explanation of how load reductions will be allocated by a municipality after the first MS4 TMDL permit cycle. DEP's concurrence in the C-TIP approach is conditioned on CCWRA providing language to DEP detailing how such load reductions will be re-allocated after the first MS4 TMDL permit cycle.

In closing, DEP thanks you again for your contributions toward planning, coordinating and implementing a program that has the tremendous potential to improve and protect Pennsylvania's water resources. We look forward to a continuing dialogue as PAG-13 implementation dates approach. If you have any questions about this letter, please contact me by e-mail at rfurlan@pa.gov or by telephone at 717.787.8184.

Sincerely,

Ronald C. Furlan, PE, Division Manager
Division of Planning and Permitting

APPENDIX C –

1. MS4 MAPSHED LAND USE AREAS FOR CALCULATING REVISED 1995 AND 2012 TMDL LOADS

2. EXISTING BMPs POLLUTANT REDUCTION

Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: Brandywine

Year: 1995

Source File: 1995BWnewrun_noatten-Summary_sum.csv

Section 2: Land Use Loading Rates Look-Up Table

TOTAL WATERSHED ANNUAL LOADS from Christina MapShed

ANNUAL LAND USE LOADING RATES (lbs/acre) based on land use, stream bank and farm animal sources

	Source	Area	Sediment	Total Nitrogen	Total Phosphorus	SEDIMENT: From Land Use	SEDIMENT: From Stream Banks (1)	SEDIMENT: TOTAL SEDIMENT LOADING RATE	NITROGEN: From Land Use	NITROGEN: From Stream Banks (1)	NITROGEN: From Farm Animals (2)	NITROGEN: TOTAL NITROGEN LOADING RATE	PHOSPHORUS: From Land Use	PHOSPHORUS: From Stream Banks (1)	PHOSPHORUS: From Farm Animals (2)	PHOSPHORUS: TOTAL PHOSPHORUS LOADING RATE	
	Units	*Acres*	*Tons*	*Pounds*	*Pounds*	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	
						Tons * 2000 lbs/ton acres of a land use		Sum of previous two sources	Tons * 2000 lbs/ton acres of a land use			Sum of previous three sources	Tons * 2000 lbs/ton acres of a land use			Sum of previous three sources	
MapShed Land Use Categories	Hay/Past	813.00	13.46	264.20	101.48	33.11	120.07	**153.18**	0.32	0.06	1.14	**1.52**	0.12	0.02	0.24	**0.38**	Hay/Past
	Cropland	72,626.60	58,370.09	419,585.40	112,649.40	1,607.40	120.07	**1,727.47**	5.78	0.06	1.14	**6.98**	1.55	0.02	0.24	**1.81**	Cropland
	Forest	57,545.80	464.62	4,956.67	842.85	16.15	120.07	**136.22**	0.09	0.06	n/a	**0.15**	0.01	0.02	n/a	**0.03**	Forest
	Wetland	59.30	0.04	14.46	0.82	1.35	120.07	**121.42**	0.24	0.06	n/a	**0.30**	0.01	0.02	n/a	**0.03**	Wetland
	Disturbed	462.10	10.32	58.25	21.36	44.67	120.07	**164.73**	0.13	0.06	n/a	**0.19**	0.05	0.02	n/a	**0.07**	Disturbed
	Turfgrass	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Turfgrass
	Open_Land	6,792.90	600.85	7,413.67	960.60	176.91	120.07	**296.97**	1.09	0.06	n/a	**1.15**	0.14	0.02	n/a	**0.16**	Open_Land
	Bare_Rock	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Bare_Rock
	Sandy_Areas	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Sandy_Areas
	Unpaved_Road	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Unpaved_Road
	Ld_Mixed	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Ld_Mixed
	Md_Mixed	3,158.00	425.79	17,255.78	1,893.59	269.66	1,472.12	**1,741.77**	5.46	0.74	n/a	**6.20**	0.60	0.27	n/a	**0.87**	Md_Mixed
	Hd_Mixed	1,411.00	185.47	8,036.66	877.97	262.89	2,229.78	**2,492.67**	5.70	1.11	n/a	**6.81**	0.62	0.40	n/a	**1.02**	Hd_Mixed
	Ld_Residential	35,889.50	1,065.80	48,433.19	5,222.00	59.39	671.16	**730.55**	1.35	0.34	n/a	**1.69**	0.15	0.12	n/a	**0.27**	Ld_Residential
	Md_Residential	2,226.40	299.72	12,065.36	1,327.67	269.24	1,472.12	**1,741.36**	5.42	0.74	n/a	**6.16**	0.60	0.27	n/a	**0.87**	Md_Residential
	Hd_Residential	1,327.00	176.60	7,302.41	807.07	266.16	2,229.78	**2,495.94**	5.50	1.11	n/a	**6.61**	0.61	0.40	n/a	**1.01**	Hd_Residential

	Source	Sediment	Total Nitrogen	Total Phosphorus
	Units	*Tons*	*Pounds*	*Pounds*
Addt'l Sources	Farm Animals		83,417.32	17,604.48
	Tile Drainage	0.00	0.00	0.00
	Stream Bank	27,362.21	27,361.54	9,852.45

Notes:

- Separate worksheets are used to calculate and apportion the loading rates from the **Stream Bank** source loads (for sediment, total nitrogen, and total phosphorus) from the Christina MapShed Output file into each land use category, using methodology provided from Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

- A separate worksheet is used to calculate and apportion the "Total Nitrogen" and "Total Phosphorus" loading rates from the **Farm Animals** source load from the Christina Basin MapShed Output file into the two agricultural land uses, Hay/Pasture and Cropland, based on area weighting. The methodology was provided by Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP). Additionally, since the **Farm Animals** source loads do not apply to other land use catergories, the values in those cells are "n/a".

Look-Up Table: Christina Basin MapShed Loading Rates

Watershed: Brandywine

Year: 2012

Source File: 2012BWnewrun_noatten-Summary_sum.csv

Section 2: Land Use Loading Rates Look-Up Table

TOTAL WATERSHED ANNUAL LOADS from Christina MapShed

ANNUAL LAND USE LOADING RATES (lbs/acre) based on land use, stream bank and farm animal sources

	Source	Area	Sediment	Total Nitrogen	Total Phosphorus	SEDIMENT: From Land Use	SEDIMENT: From Stream Banks (1)	SEDIMENT: TOTAL SEDIMENT LOADING RATE	NITROGEN: From Land Use	NITROGEN: From Stream Banks (1)	NITROGEN: From Farm Animals (2)	NITROGEN: TOTAL NITROGEN LOADING RATE	PHOSPHORUS: From Land Use	PHOSPHORUS: From Stream Banks (1)	PHOSPHORUS: From Farm Animals (2)	PHOSPHORUS: TOTAL PHOSPHORUS LOADING RATE	
	Units	*Acres*	*Tons*	*Pounds*	*Pounds*	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	lbs/acre	
						Tons * 2000 lbs/ton acres of a land use		Sum of previous two sources	Tons * 2000 lbs/ton acres of a land use			Sum of previous three sources	Tons * 2000 lbs/ton acres of a land use			Sum of previous three sources	
MapShed Land Use Categories	Hay/Past	160.60	2.33	50.46	19.44	29.02	156.04	**185.06**	0.31	0.08	1.31	**1.70**	0.12	0.03	0.27	**0.42**	Hay/Past
	Cropland	61,796.00	51,370.27	363,429.20	99,717.06	1,662.58	156.04	**1,818.62**	5.88	0.08	1.31	**7.27**	1.61	0.03	0.27	**1.91**	Cropland
	Forest	51,247.10	471.68	4,562.79	828.94	18.41	156.04	**174.45**	0.09	0.08	n/a	**0.17**	0.02	0.03	n/a	**0.05**	Forest
	Wetland	49.40	0.06	11.71	0.68	2.43	156.04	**158.47**	0.24	0.08	n/a	**0.32**	0.01	0.03	n/a	**0.04**	Wetland
	Disturbed	6,669.40	243.04	1,211.50	470.49	72.88	156.04	**228.93**	0.18	0.08	n/a	**0.26**	0.07	0.03	n/a	**0.10**	Disturbed
	Turfgrass	3,306.30	76.14	2,306.50	1,318.47	46.06	156.04	**202.10**	0.70	0.08	n/a	**0.78**	0.40	0.03	n/a	**0.43**	Turfgrass
	Open_Land	37.10	1.19	31.02	2.31	64.15	156.04	**220.20**	0.84	0.08	n/a	**0.92**	0.06	0.03	n/a	**0.09**	Open_Land
	Bare_Rock	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Bare_Rock
	Sandy_Areas	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Sandy_Areas
	Unpaved_Road	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	n/a	**0.00**	0.00	0.00	n/a	**0.00**	Unpaved_Road
	Ld_Mixed	4.90	0.13	6.44	0.68	53.06	627.59	**680.65**	1.31	0.31	n/a	**1.62**	0.14	0.11	n/a	**0.25**	Ld_Mixed
	Md_Mixed	2,364.80	286.12	16,005.45	1,714.38	241.98	1,306.52	**1,548.50**	6.77	0.65	n/a	**7.42**	0.72	0.23	n/a	**0.95**	Md_Mixed
	Hd_Mixed	8,152.00	962.81	56,261.29	6,014.97	236.21	1,948.75	**2,184.96**	6.90	0.97	n/a	**7.87**	0.74	0.35	n/a	**1.09**	Hd_Mixed
	Ld_Residential	44,948.40	1,333.45	60,586.86	6,532.62	59.33	627.59	**686.92**	1.35	0.31	n/a	**1.66**	0.15	0.11	n/a	**0.26**	Ld_Residential
	Md_Residential	2,915.80	351.61	19,672.29	2,112.86	241.18	1,306.52	**1,547.69**	6.75	0.65	n/a	**7.40**	0.72	0.23	n/a	**0.95**	Md_Residential
	Hd_Residential	405.30	47.44	2,725.33	291.98	234.10	1,948.75	**2,182.85**	6.72	0.97	n/a	**7.69**	0.72	0.35	n/a	**1.07**	Hd_Residential

Addt'l Sources	Source	Sediment	Total Nitrogen	Total Phosphorus
	Units	*Tons*	*Pounds*	*Pounds*
	Farm Animals		81,304.29	16,461.07
	Tile Drainage	0.00	0.00	0.00
	Stream Bank	35,511.21	35,509.81	12,758.14

Notes:

- Separate worksheets are used to calculate and apportion the loading rates from the **Stream Bank** source loads (for sediment, total nitrogen, and total phosphorus) from the Christina MapShed Output file into each land use category, using methodology provided from Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP).

- A separate worksheet is used to calculate and apportion the "Total Nitrogen" and "Total Phosphorus" loading rates from the **Farm Animals** source load from the Christina Basin MapShed Output file into the two agricultural land uses, Hay/Pasture and Cropland, based on area weighting. The methodology was provided by Dr. Barry Evans (Pennsylvania State University), the author of MapShed, and with concurrence from Mr. Bill Brown (PADEP). Additionally, since the **Farm Animals** source loads do not apply to other land use catergories, the values in those cells are "n/a".

Select input data file: C:\MapShed\Runfiles\CCWRA 1995 LAND USE_TMDL BASELINE\Output\1995R06NoBMPs-21_ua.csv

Watershed Totals | **Municipality Loads** | Regulated Loads | Unregulated Loads

View loads for municipality: West Bradford Twp (82544)

		Sediment		Nitrogen		Phosphorus	
Source	**Source Area (ac)**	**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	381	244182.90	640.90	2545.10	6.68	575.30	1.51
Forest	203	1441.30	7.10	20.30	0.10	4.10	0.02
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	17	991.10	58.30	18.70	1.10	2.20	0.13
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	2	60.00	30.00	5.40	2.69	0.50	0.24
LD Residential	183	1372.50	7.50	98.80	0.54	9.20	0.05
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				940.2		181.9	0.152
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		27472.80		43.7		13.8	0.114
Groundwater				10374.3		159.7	0.152
Point Sources				0.0		0.0	0.000
Septic Systems				1072.6		23.4	0.152
Totals	**786**	**275520.6**		**15119.1**		**970.1**	

Print | Export to JPEG | Exit

Select input data file: C:\MapShed\Runfiles\CCWRA 2012 LAND USE_CURRENT CONDITIONS\Output\2012B06wBMPs-21_ua

Watershed Totals | **Municipality Loads** | Regulated Loads | Unregulated Loads

View loads for municipality: West Bradford Twp (82544)

		Sediment		Nitrogen		Phosphorus	
Source	**Source Area (ac)**	**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	163	71589.60	439.20	870.40	5.34	184.20	1.13
Forest	203	1461.60	7.20	20.30	0.10	4.10	0.02
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	79	2472.70	31.30	19.00	0.24	6.30	0.08
Turfgrass	15	183.00	12.20	10.80	0.72	5.70	0.38
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	5	136.00	27.20	14.20	2.83	1.20	0.24
LD Residential	319	2233.00	7.00	169.10	0.53	16.00	0.05
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	2						**Source Weighting**
Farm Animals				809.9		155.0	0.152
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		45350.89		72.3		22.8	0.136
Groundwater				9953.8		154.5	0.152
Point Sources				0.0		0.0	0.000
Septic Systems				1072.6		23.4	0.152
Totals	**786**	**123426.8**		**13012.4**		**573.2**	

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West Bradford MS4 - TMDL Subbasin B06

Revised 1995 TMDL Baseline Load for Sediment (TS)

Land Use	Acreage	TS Loading Rate	Revised 1995 TMDL Baseline Load for TS
	(ac)	(lb/yr/ac)	(ton/yr)
Cropland	381	1,727.47	329.08
Forest	203	136.22	13.83
Open Land	17	296.97	2.52
HD Mixed	2	2,492.67	2.49
LD Residential	183	730.55	66.85
Total	**786**		**414.77**

Revised 2012 TMDL Load for Sediment (TS)

Land Use	Acreage	TS Loading Rate	2012 TMDL Load for TS
	(ac)	(lb/yr/ac)	(ton/yr)
Cropland	163	1,818.62	148.22
Forest	203	174.45	17.71
Disturbed	79	228.93	9.04
Turfgrass	15	202.10	1.52
HD Mixed	5	2,184.96	5.46
LD Residential	319	686.92	109.56
Water	2	158.47	0.16
Total	**786**		**291.67**

West Bradford MS4 - TMDL Subbasin B06

Revised 1995 TMDL Load for Nitrogen (TN)

Land Use	Acreage	TN Loading Rate	Revised 1995 TMDL Load for TN
	(ac)	(lb/yr/ac)	(kg/day)
Cropland	381	6.98	3.30
Forest	203	0.15	0.04
Open Land	17	1.15	0.02
HD Mixed	2	6.81	0.02
LD Residential	183	1.69	0.38
Total	**786**		**3.77**

2012 TMDL Load for Nitrogen (TN)

Land Use	Acreage	TN Loading Rate	2012 TMDL Load for TN
	(ac)	(lb/yr/ac)	(kg/day)
Cropland	163	7.27	1.47
Forest	203	0.17	0.04
Disturbed	79	0.26	0.03
Turfgrass	15	0.78	0.01
HD Mixed	5	7.87	0.05
LD Residential	319	1.66	0.66
Water	2	0.32	0.00
Total	**786**		**2.26**

West Bradford MS4 - TMDL Subbasin B06

Revised 1995 TMDL Load for Phosphorus (TP)

Land Use	Acreage	TP Loading Rate	Revised 1995 TMDL Baseline Load for TP
	(ac)	(lb/yr/ac)	(kg/day)
Cropland	381	1.81	0.86
Forest	203	0.03	0.01
Open Land	17	0.16	0.00
HD Mixed	2	1.02	0.00
LD Residential	183	0.27	0.06
Total	**786**		**0.93**

2012 TMDL Load for Phosphorus (TP)

Land Use	Acreage	TP Loading Rate	2012 TMDL Baseline Load for TP
	(ac)	(lb/yr/ac)	(kg/day)
Cropland	163	1.91	0.39
Forest	203	0.05	0.01
Disturbed	79	0.10	0.01
Turfgrass	15	0.43	0.01
HD Mixed	5	1.09	0.01
LD Residential	319	0.26	0.10
Water	2	0.04	0.00
Total	**786**		**0.53**

West Bradford MS4 - TMDL Subbasin B06

*Modified CMS Methodology

Table 2: Adjusted MS4 Baseline Loads and Required Reductions

Pollutant	Revised 1995 TMDL Baseline Loads	2006 TMDL Report % Required Reduction	Required TMDL Load Reduction	2012 TMDL Load	Existing BMP Load Reductions (Installed 1995 to 2012)	Revised 2012 TMDL Load=Existing 2022 Load	Remaining Required Load Reductions
Sediment	414.77 ton/yr	57.1%	236.83 ton/yr	291.67 ton/yr	145.10 ton/yr	146.57 ton/yr	0
Nitrogen	3.77 kg/day	30.0%	1.13 kg/day	2.26 kg/day	0.36 kg/day	1.90 kg/day	0
Phosphorus	0.93 kg/day	29.9%	0.28 kg/day	0.53 kg/day	0.09 kg/day	0.44 kg/day	0

- Determine Minimum Load Reduction Required to be Achieved Within This 5 Year Permit Period.

***Since the required TMDL load reductions for the B06 TMDL Subbasin have been met by the change in land use and existing BMP load reductions, there is no minimum load reduction requirement.**

TMDL Subbasin B14
Land Use Areas for Calculating Revised 1995 and 2012 TMDL Loads

1995 Land Use	
Forest	25.93
Cropland	17.14
Low-Density Residential	18.91
Total	61.98

2012 Land Use	
Forest	24.06
Cropland	12.61
Low-Density Residential	23.88
High Density Mixed-Urban	1.2
Water	0.23
Total	61.98

*Areas provided by the Chester County Water Resources Authority

West Bradford MS4 - TMDL Subbasin B14

Revised 1995 TMDL Baseline Load for Sediment (TS)

Land Use	Total Acreage	Storm Sewershed Planning Area (after parsing)	TS Loading Rate	Revised 1995 TMDL Baseline Load for TS (after parsing)
	(ac)	(ac)	(lb/yr/ac)	(ton/yr)
Cropland	17.14	8.92	1,727.47	7.70
Forest	25.93	17.21	136.22	1.17
LD Residential	18.91	5.13	730.55	1.87
Total	**61.98**	**31.26**		**10.75**

Revised 2012 TMDL Load for Sediment (TS)

Land Use	Acreage	Storm Sewershed Planning Area (after parsing)	TS Loading Rate	2012 TMDL Load for TS (after parsing)
	(ac)	(ac)	(lb/yr/ac)	(ton/yr)
Cropland	12.61	5.68	1,818.62	5.16
Forest	24.06	15.42	174.45	1.35
HD Mixed	1.2	0	2,184.96	0.00
LD Residential	23.88	10.16	686.92	3.49
Water	0.23	0	0	0.00
Total	**61.98**	**31.26**		**10.00**

West Bradford MS4 - TMDL Subbasin B14

*Modified CMS Methodology

Table 2: Adjusted MS4 Baseline Loads and Required Reductions

Pollutant	Revised 1995 TMDL Baseline Loads (after parsing)	2006 TMDL Report % Required Reduction	Required TMDL Load Reduction	2012 TMDL Load (after parsing)	Existing BMP Load Reductions (Installed 1995 to 2012)	Revised 2012 TMDL Load=Existing 2022 Load	Remaining Required Load Reductions
Sediment	10.75 ton/yr	57.1%	6.14 ton/yr	10.00 ton/yr	0.00 ton/yr	10.00 ton/yr	5.39 ton/yr

- Determine Minimum Load Reduction Required to be Achieved Within This 5 Year Permit Period.

Requirement is for the Minimum Reduction of 10% of the Revised 2012 TMDL Load

Revised 2012 TMDL Load for Sediment (TS) = 10.00 ton/yr

10% x 10.00 ton/yr = 1.00 ton/yr

Minimum TS Load Reduction Required to be Achieved Within This 5 Year Permit Period = **1.00 ton/yr**

Existing BMP Load Reduction Calculation Table

INSTRUCTIONS TO MUNICIPALITY: Each row in the table below should represent a different BMP drainage area. Choose the dominant land use draining to the

If a BMP has multiple land uses in the drainage area, these drainage areas should be represented on a subsequent row with the same BMP name. The treatment depth should be the same for a given BMP (even if it has multiple drainage areas).

If one of the drainage areas to the same BMP has NO impervious cover, use the Manual Override column to type in the treatment depth (in/imp. ac) of the primary drainage area containing impervious cover.

The examples below show the various options and should be deleted before tallying reductions. Notice one example demonstrates when a drainage area covers two land uses (see row 15 and 16).

MUNICIPALITY: TO ENTER BMP DATA IN THE ORANGE HIGHLIGHTED CELLS

Watershed: Brandywine Creek

Municipality: West Bradford Township

* See Instructions tab for what qualifies for stream restoration and street sweeping.

TMDL Subbasin B06

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
Sycamore Ridge Infiltration Bed 1A	RR	2004	Ld_Residential	2.88	3.25			0.43	2.50		2.50	15.0%	6,344.31	1.53	6.97	84.9%	78.8%	67.7%	5,386.20	2.69	1.20	4.72
Sycamore Ridge Infiltration Bed 1B	RR	2004	Ld_Residential	1.95	3.25			0.29	2.50		2.50	15.0%	4,295.63	1.03	4.72	84.9%	78.8%	67.7%	3,646.91	1.82	0.81	3.19
Sycamore Ridge Infiltration Bed 2B	RR	2004	Md_Residential	1.75	3.25			0.91	2.50		2.50	52.0%	8,231.35	2.66	15.72	84.9%	78.8%	67.7%	6,988.27	3.49	2.10	10.64
Sycamore Ridge Infiltration Bed 3B	RR	2004	Ld_Residential	5.24	3.25			0.79	2.50		2.50	15.0%	11,543.12	2.78	12.68	84.9%	78.8%	67.7%	9,799.89	4.90	2.19	8.58
Sycamore Ridge Infiltration Bed 4B	RR	2004	Ld_Residential	5.74	3.25			0.86	2.50		2.50	15.0%	12,644.56	3.04	13.89	84.9%	78.8%	67.7%	10,734.99	5.37	2.40	9.40
Dupont Phase 3 Basin 1A	RR	2010	Ld_Residential	29.79	3.25			4.47	2.50		2.50	15.0%	65,623.95	15.79	72.09	84.9%	78.8%	67.7%	55,713.50	27.86	12.44	48.81
Dupont Phase 3 Basin 2 (Infiltration)	RR	2009	Md_Residential	7.73	3.25			4.02	2.50		2.50	52.0%	36,359.07	11.75	69.42	84.9%	78.8%	67.7%	30,868.17	15.43	9.26	46.99
Dupont Phase 1 Basin 2 (Infiltration)	RR	2009	Ld_Residential	22.69	3.25			3.40	2.50		2.50	15.0%	49,983.46	12.03	54.91	84.9%	78.8%	67.7%	42,435.02	21.22	9.48	37.17
Dupont Phase 4 Basin 2 (Infiltration)	RR	2009	Md_Residential	5.77	3.25			3.00	2.50		2.50	52.0%	27,139.95	8.77	51.81	84.9%	78.8%	67.7%	23,041.31	11.52	6.91	35.08
Dupont Phase 4 Infiltration Basin 1	RR	2006	Ld_Residential	14.71	3.25			2.21	2.50		2.50	15.0%	32,404.44	7.80	35.60	84.9%	78.8%	67.7%	27,510.76	13.76	6.14	24.10
Bally Moor Basin 1 (Infiltration)	RR	2007	Ld_Residential	8.69	3.25			1.30	2.50		2.50	15.0%	19,143.07	4.61	21.03	84.9%	78.8%	67.7%	16,252.11	8.13	3.63	14.24
Bally Moor Basin 2 (Infiltration)	RR	2007	Ld_Residential	1.13	3.25			0.17	2.50		2.50	15.0%	2,489.26	0.60	2.73	84.9%	78.8%	67.7%	2,113.34	1.06	0.47	1.85
Bally Moor Basin 3 (Infiltration)	RR	2007	Ld_Residential	2.19	3.25			0.33	2.50		2.50	15.0%	4,824.32	1.16	5.30	84.9%	78.8%	67.7%	4,095.76	2.05	0.91	3.59
Dupont Phase 1 Basin 1 (Infiltration)	RR	2007	Ld_Residential	27.6	3.25			4.14	2.50		2.50	15.0%	60,799.63	14.63	66.79	84.9%	78.8%	67.7%	51,617.74	25.81	11.53	45.22
Total																			**290,203.96**	**145.10**	**69.48**	**293.59**
																					0.09 kg/day	**0.36 kg/day**

TMDL Subbasin B14

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified projects only	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no impervious area	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
n/a								0.00	#N/A		#N/A	0.0%	#N/A	#N/A	#N/A	100.0%	100.0%	100.0%	#N/A	#N/A	#N/A	#N/A
Total																			**0.00**	**0.00**	**0.00**	**0.00**

Existing Stormwater BMP:	**Sycamore Ridge Infiltration Bed 1A**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
Center of W. Stonington Drive Cul-de-sac	39° 58' 38" N	75° 45' 45" W	n/a

BMP Description:

Existing Land Use:	Open Space (Center of cul-de-sac)
Acreage:	0.05 ac +/-
Date Constructed:	Between 12/2002 & 6/2004
Description:	

30'x68'x5' Seepage Bed. Bed Top = 524, Bed Bottom = 519, Grate Top = 535.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

+ Some debris was noticed in the inlets, but it was not major

Daniel H. Daley, PE — Name & Signature

7/29/2020 — Date

Existing Stormwater BMP:	**Sycamore Ridge Infiltration Bed 1B**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
Center of East Stonington Drive Cul-de-sac	39° 58' 34" N	75° 45' 29" W	n/a

BMP Description:

Existing Land Use:	Open Space (Center of cul-de-sac)
Acreage:	0.50 ac +/-
Date Constructed:	Between 12/2002 & 6/2004
Description:	

68'x30'x5' Seepage Bed. Bed Top = 488, Bed Bottom = 483

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

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7/29/2020 — Date

Existing Stormwater BMP:	**Sycamore Ridge Infiltration Bed 2A**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
1471 W. Stonington Drive	39° 58' 41" N	75° 45' 43" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.02 ac +/-
Date Constructed:	Between 12/2002 & 6/2004
Description:	

64'x15'x5' Seepage Bed. Bed Top = 536, Bed Bottom = 531

O&M Activities / Frequencies

This existing infiltration BMP is not used for the TMDL Load Reduction calculations.

+

Daniel H. Daley, PE
Name & Signature

Date

Existing Stormwater BMP:	**Sycamore Ridge Infiltration Bed 2B**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
1467 Luna Drive	39° 58' 38" N	75° 45' 36" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.06 ac +/-
Date Constructed:	Between 12/2002 & 6/2004
Description:	

80'x30'x5' Seepage Bed. Bed Top = 513, Bed Bottom = 508.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

+ A small amount of soil was noticed in the inlet, and the BMP would benefit from having the inlet cleaned.

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7/29/2020 — Date

Existing Stormwater BMP:	**Sycamore Ridge Infiltration Bed 3B**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
Behind 1459 E. Stonington Drive	39° 58' 32" N	75° 45' 28" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.04 ac +/-
Date Constructed:	Between 12/2002 & 6/2004
Description:	

120'x15'x5' Seepage Bed, Bed Top = 458, Bed Bottom = 453

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

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7/29/2020 — Date

Existing Stormwater BMP:	**Sycamore Ridge Infiltration Bed 4B**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
1460 E. Stonington Drive	39° 58' 32" N	75° 45' 32" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	ac +/-
Date Constructed:	Between 12/2002 & 6/2004
Description:	

150'x18'x5' Seepage Bed, Bed Top = 455, Bed Bottom = 450

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

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7/29/2020 — Date

Existing Stormwater BMP:	**Dupont Phase 3 Basin 1A**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
1309 Jamestown Drive	39° 57' 21" N	75° 46' 00" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	2.18 ac +/-
Date Constructed:	Between 10/2008 & 4/2010
Description:	

This basin has two 36" CMP inflows with endwalls, and rip rap aprons. The outflow structure is an endwall with an orifice (size unknown) and an 18" RCP leading to a riser with a trash rack. An 18" RCP connects the riser to a level spreader.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

+ There is sediment built up in the rip rap aprons
+ Leaves are built up in the inflow on the East side of the basin
+ The basin riser has large rocks inside of it. (designed that way?)

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7/30/2020 — Date

Existing Stormwater BMP:	**Dupont Phase 3 Basin 2 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
1285 Claridge Court	39° 57' 27" N	75° 45' 54" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.17 ac +/-
Date Constructed:	October 20, 2009
Description:	

The inflows to this basin are an 18" CMP with an endwall, and a rock apron, and a swale with a rock apron. The outflow is a headwall with a 12" orifice, and an 18" RCP leading to a riser with a trash rack. The outflow pipe is an 18" RCP leading to a level spreader.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

+ The rock apron for the inflow is over grown, and there is sediment in the rock.
+ There are leaves clogging up the inflow pipe

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7/30/2020 — Date

Existing Stormwater BMP:	**Dupont Phase 3 Basin 3 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
South side of Chestnut Ln. between Oakwood Rd. and Stockton Rd.	39° 57' 58" N	75° 45' 50" W	n/a

BMP Description:	
Existing Land Use:	Residential Open Space
Acreage:	1.73 ac +/-
Date Constructed:	December 15, 2015
Description:	

O&M Activities / Frequencies

This existing infiltration BMP is not used for the TMDL Load Reduction calculations.

+

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Name & Signature

Date

Existing Stormwater BMP:	**Dupont Phase 1 Basin 2 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
East side of Romansville Rd. between Arrowhead Tr. And Alton Way	39° 58' 26" N	75° 45' 19" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.30 ac +/-
Date Constructed:	January 8, 2009
Description:	

Infiltration Basin with a 36" CMP inflow to an endwall & rip rap apron. The outlet structure is an inlet with 4" orifice & 30"x12" weir with an 18" CMP outlet.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

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7/29/2020 — Date

Existing Stormwater BMP:	**Dupont Phase 4 Basin 2 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
North of 1344 Treeline Dr.	39° 57' 54" N	75° 45' 56" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.23 ac +/-
Date Constructed:	March 4, 2009
Description:	

There are two swales with rip rap aprons that discharge to the basin. There is also an 18" CMP inflow with an endwall & rip rap apron. The outfall is an endwall with a 12" orifice, and an 18" RCP which drains to a stone level spreader.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

+ There is silt covering one of the rip rap aprons for the swale

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Existing Stormwater BMP:	**Dupont Phase 4 Infiltration Basin 1**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
1332 Treeline Drive	39° 57' 51" N	75° 45' 47" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	1.05 ac +/-
Date Constructed:	June 27, 2006
Description:	

The inflow to the basin is from a swale. There are three risers for the outflow, and a 24" CMP directing the outflow to another basin (Dupont Phase 4 Detention Basin 1)

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

+ There was erosion along the swale

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Name & Signature — Date

Existing Stormwater BMP:	**Dupont Phase 4 On-Lot Infiltration Beds (10)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
	_° _ ' _ " N	_° _ ' _ " W	n/a
BMP Description:			
Existing Land Use:			
Acreage:	ac +/-		
Date Constructed:	Between 12/2002 & 6/2004		
Description:			
O&M Activities / Frequencies			

This existing infiltration BMP is not used for the TMDL Load Reduction calculations.

+

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Name & Signature

Date

Existing Stormwater BMP:	**Bally Moor Basin 1 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
2066 Bally Moor Drive (side yard)	39° 58' 33" N	75° 45' 51" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.62 ac +/-
Date Constructed:	October 24, 2007
Description:	

The basin has a 135'x40'x2' stone seepage bed with perforated polyurethane distribution pipes, and a lawn inlet.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

Daniel H. Daley, PE — Name & Signature

7/29/2020 — Date

Existing Stormwater BMP:	**Bally Moor Basin 2 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
2066 Bally Moor Drive (front yard)	39° 58' 34" N	75° 45' 56" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.22 ac +/-
Date Constructed:	October 24, 2007
Description:	

The basin has a 120'x22'x2' stone seepage bed with perforated polyurethane distribution pipes, and a lawn inlet.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

Daniel H. Daley, PE — Name & Signature

7/29/2020 — Date

Existing Stormwater BMP:	**Bally Moor Basin 3 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
2063 Bally Moor Drive (Rear Yard)	39° 58' 38" N	75° 45' 58" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.20 ac +/-
Date Constructed:	October 24, 2007
Description:	

The basin has a 100'x20'x2' stone seepage bed with perforated polyurethane distribution pipes, and a lawn inlet.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

Daniel H. Daley, PE — Name & Signature

7/29/2020 — Date

Existing Stormwater BMP:	**Bally Moor On-Lot Infiltration Beds (13)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
	_° _ ' _ " N	_° _ ' _ " W	n/a
BMP Description:			
Existing Land Use:			
Acreage:	ac +/-		
Date Constructed:	May 30, 2007		
Description:			
O&M Activities / Frequencies			

This existing infiltration BMP is not used for the TMDL Load Reduction calculations.

+

Daniel H. Daley, PE
Name & Signature

Date

Existing Stormwater BMP:	**Shappert Infiltration Berm 1**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
	_° _ ' _ " N	_° _ ' _ " W	n/a
BMP Description:			
Existing Land Use:			
Acreage:	ac +/-		
Date Constructed:	Between 10/2008 & 4/2010		
Description:			
O&M Activities / Frequencies			

This existing infiltration BMP is not used for the TMDL Load Reduction calculations.

+

Daniel H. Daley, PE
Name & Signature

Date

Existing Stormwater BMP:	**Horn Pipe Storage Infiltration Facility**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
	39° 57' 21" N	75° 46' 23" W	n/a
BMP Description:			
Existing Land Use:			
Acreage:	ac +/-		
Date Constructed:	Between 10/2008 & 4/2010		
Description:			
O&M Activities / Frequencies			

This existing infiltration BMP is not used for the TMDL Load Reduction calculations.

+

Daniel H. Daley, PE
Name & Signature

Date

Existing Stormwater BMP:	**Dupont Phase 1 Basin 1 (Infiltration)**		
Location / Address	**Latitude**	**Longitude**	**PA DEP Permit Number**
North of 1489 Alton Way	39° 58' 34" N	75° 45' 17" W	n/a

BMP Description:

Existing Land Use:	Residential Open Space
Acreage:	0.28 ac +/-
Date Constructed:	August 29, 2007
Description:	

Basin with a 30" CMP inflow from an endwall. The outflow structure is an endwall with 12" orifice & 18" RCP leading to an m-top inlet with a trash rack.

O&M Activities / Frequencies

EBWA has inspected the stormwater BMP and certify that the that BMP appears to operate as designed, with the following notes:

N/A

Daniel H. Daley, PE — Name & Signature

7/29/2020 — Date

APPENDIX D –

BMP/CONTROL MEASURE DOCUMENTATION AND CALCULATIONS

Proposed BMP Load Reduction Calculation Table

INSTRUCTIONS TO MUNICIPALITY: Each row in the table below should represent a different BMP drainage area. Choose the dominant land use draining to the BMP.

If a BMP has multiple land uses in the drainage area, these drainage areas should be represented on a subsequent row with the same BMP name. The treatment depth should be the same for a given BMP (even if it has multiple drainage areas).

If one of the drainage areas to the same BMP has NO impervious cover, use the Manual Override column to type in the treatment depth (in/imp. ac) of the primary

The examples below show the various options and should be deleted before tallying reductions. Notice one example demonstrates when a drainage area covers two land uses (see row 15 and 16).

MUNICIPALITY: TO ENTER BMP DATA IN THE ORANGE HIGHLIGHTED CELLS

Watershed: Brandywine Creek

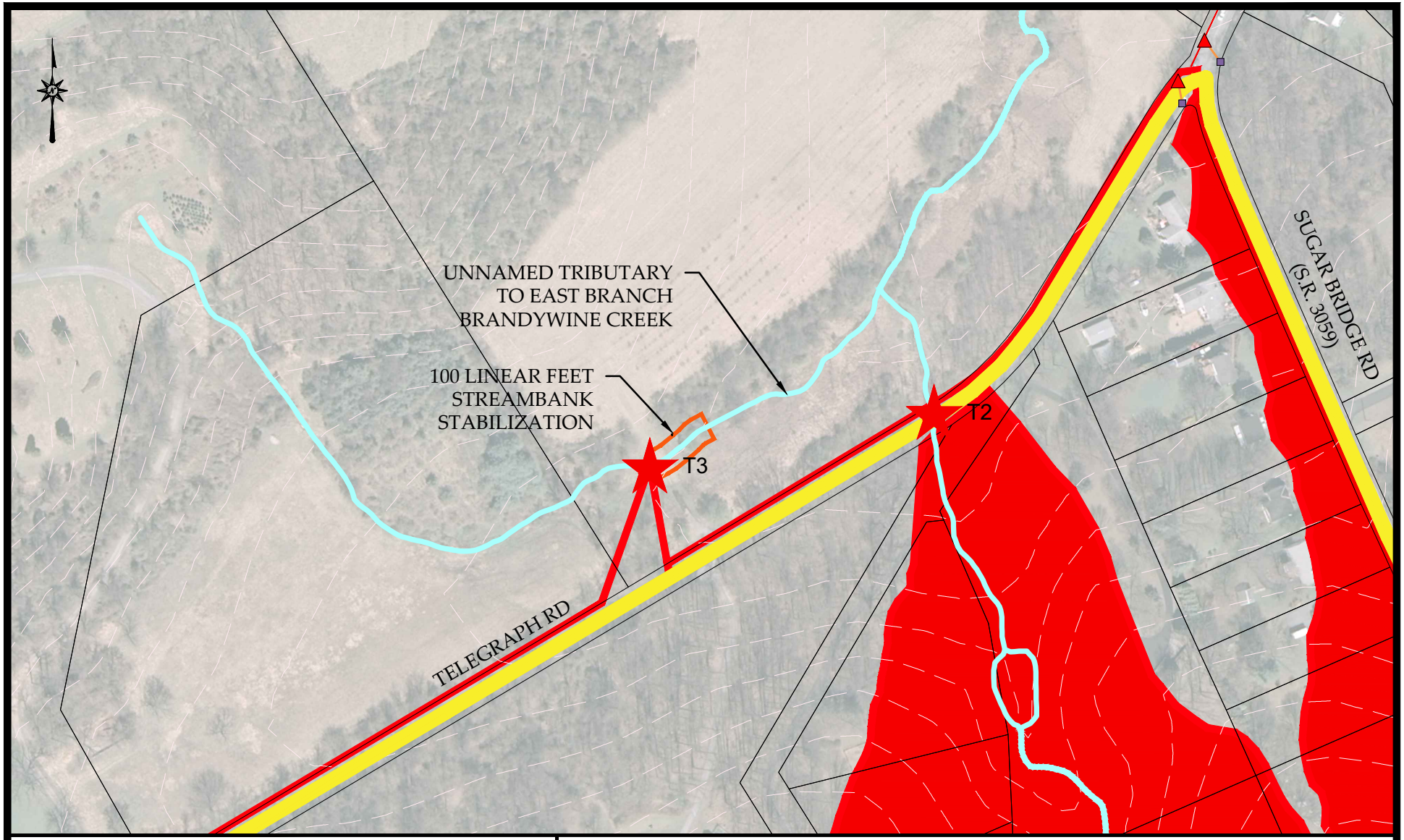
Municipality: West Bradford Township

TMDL Subbasin B06

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
n/a						1250		0.00	#N/A		#N/A	0.0%	#N/A	#N/A	#N/A	100.0%	100.0%	100.0%	#N/A	#N/A	#N/A	#N/A
Total																			**0.00**	**0.00**	**0.00**	**0.00**
																					0.00 kg/day	0.00 kg/day

TMDL Subbasin B14

Name	BMP Type	Year Installed	MapShed Land Cover of Drainage Area	Drainage Area (ac)	Treatment Depth (in)	Stream Restoration* Length (ft) - Qualified	Street Sweeping* Road Length Swept (ft) - Qualified projects only	Impervious Area (ac)	Treatment Depth (in/imp. ac)	Treatment Depth (in/imp. ac) Manual Override - use if no	Effective Treatment Depth (in/imp. ac)	Impervious (%)	TSS Load (lbs/yr)	TP Load (lbs/yr)	TN Load (lbs/yr)	TSS Reduction (%)	TP Reduction (%)	TN Reduction (%)	TSS Reduction (lbs/yr)	TSS Reduction (tons/yr)	TP Reduction (lbs/yr)	TN Reduction (lbs/yr)
Streambank Stabilization 1	Stream Restoration	2027				100		#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	0.0%	0.0%	0.0%	11,500.00	5.75	17.40	19.20
Total																			**11,500.00**	**5.75**	**17.40**	**19.20**
																					0.02 kg/day	0.02 kg/day



Edward B. Walsh & Associates, Inc.
CIVIL ENGINEERS & SURVEYORS
Whiteland Business Park
855 Springdale Drive, Suite 202
Exton, Pennsylvania 19341
Phone: (610) 903-0060
Fax: (610) 903-0080

CANDIDATE BMP
STREAMBANK STABILIZATION 1
(TELEGRAPH ROAD)

WEST BRADFORD TOWNSHIP — CHESTER COUNTY, PA.

Plotted: 5/25/2022	File: West Bradford Storm Sewer Map6.dwg	SCALE: 1"=200'	DATE: 5-25-2022	BY: ASH	SHEET 1 OF 1

APPENDIX E -

PROPOSED BMP OPERATION AND MAINTENANCE (O&M) REQUIREMENTS

Preliminary Proposed BMP Operation and Maintenance (O&M) Requirements*

Post construction operation and maintenance of the candidate BMP (streambank stabilization) is the responsibility of West Bradford Township. The following are required o&m activities to be performed.

1. Inspect the plantings at least once each year and immediately after major storm events. Repair or replace any damaged or missing vegetation. Repair work is to be done during periods of low stream flow.
2. Remove all logs, trees, driftwood, and other debris when they are causing or likely to cause detrimental bank erosion or structural failure of the project. Take into consideration the benefits to fish and other aquatic species habitat, fill and removal / stream alteration permit regulations, and water flow level / time of the year before performing any work.
3. Inspect for sloughing, erosion or damage to vegetative cover. Perform routine mowing and maintain a vigorous cover of desirable vegetation. Periodically remove undesirable trees, brush, and invasive species. Repair damage and seed or replant bare or failed vegetated areas as soon as possible.
4. Where possible, maintain a 25 feet wide herbaceous or woody buffer strip from the top of the bank.

*Final O&M requirements to be determined following final design of streambank stabilization project.

APPENDIX F –
PUBLIC PARTICIPATION

West Bradford Township TMDL Public Participation Summary – December 12, 2022

1. Plan Availability. A complete copy of the TMDL Plan was made available for public review.
    a. A hard copy was printed and left at the Township's front desk (in lobby) for public review.
    b. An electronic copy was posted to the Township website for public review. A copy of the notice on the Township website is attached.

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2. Public Participation.
    a. September 13, 2022 Board of Supervisors Meeting. At the September 13th meeting, D. Daley, P.E. (Township Engineer) gave a brief overview of the TMDL plan and the Board of Supervisors authorized the Township Manager to advertise for a 30-day public comment period for the TMDL plan.
    b. October 4, 2022 Website Notice. On October 4, 2022, the Township posted the TMDL along with a notice for public comment. The notice detailed the November 9, 2022 public meeting for the TMDL plan.
    c. October 6, 2022 TMDL Public Notice. On October 6, 2022, the Township placed a notice in the Daily Local (newspaper of general circulation in the area) that included a statement about the plan, were the plan can be reviewed, the length of time for public comment and the date of the public meeting regarding the plan.

---

3. Public Comment.
    a. Written Comments. The Township received the following written comments regarding the TMDL Plan.
        i. November 9, 2022 letter from the Delaware Riverkeeper Network (see attached). In summary, the letter recommends the Township should include prior candidate BMPs in the new TMDL Plan, or alternatively, make a firm commitment to complete individual candidate BMPs from the 2017 TMDL Plan to help with stormwater issues.

            Response. The Township acknowledged the recommendations from the Delaware Riverkeeper Network at the public meeting on November 9th. No action was taken to include the 2017 TMDL candidate BMPs into the current plan or set a commitment to complete candidate BMPs at this time.

        ii. November 3, 2022 email from John R. Merva, 2048 Arrowhead Trail, Coatesville, PA 19320 (see attached). The below comments (in italics) were received and the responses are noted below in **bold**:

            *1) **Stormwater problems on Arrowhead**. Township needs to address the ongoing stormwater issues on Arrowhead Trail caused by adjacent developments. Not just impacting homeowners on Arrowhead and discharging into a stream on the north side of the development, but also impacting the woodland area around Arrowhead that the Township has designated a class II woodland.*

Response. Mr. Merva has discussed the stormwater concerns on Arrowhead Trail with the Township and the Township has agreed to continue the review of the drainage concerns independent of the TMDL plan. The concerns are related to runoff discharges from the upslope Deer Crossing Development (approved in 1985). In 2019, West Bradford Township had one property owner complete maintenance work on an unmaintained stormwater basin. The Township is currently in the process of reviewing upslope stormwater management facilities. The Township has updated Mr. Merva regarding this progress and dialog is continuing.

*2) **Extend comment period**. Township only posted a notice on its web site regarding the TMDL Plan. No additional email notices or communications to inform residents of the new TMDL Plan were sent. The Township routinely sends email alerts to residents from the website and posts other items on social media, but no similar action was taken to alert residents to the proposed 2022 TMDL Plan. Suggest that the Township send email alerts regarding the TMDL plan and post notices on social media similar to other Township announcements, and then provide residents with at least an additional 30 days to provide comments.*

Response. During the Board of Supervisor's public meeting presentation, EBWA (Township Engineer) noted the requirements of the TMDL Plan comment period per the PA DEP TMDL Plan Instructions and noted that the Township has followed the requirements. In addition to the Public Notice requirements in a newspaper of general circulation, the notice was placed on the Township website, and noted during the September 13th BOS meeting.

*3) **Make meeting accessible**. Request that the Township make the November 9, 2022 meeting accessible via oom so residents can attend virtually and provide a video replay for any residents interested in viewing the meeting afterwards. Video access is a reasonable accommodation the Township should provide for residents to view and attend a public meeting.*

Response. This comment is not relevant to the TMDL plan and Township policy comment. No response necessary as part of this plan.

*4) **Post TMDL documents on an easy to find Township Page**. Proposed 2022 TMDL is not easy to locate on the Township web page and now buried behind other postings. The 201 TMDL is not posted to compare plans. The Township maintains a "stormwater updates" tab and these documents and a summary should be posted on this stormwater tab for residents.*

Response. The TMDL notice was posted on the Township home page under Township News (https://www.westbradford.org/home/news/west-

bradford-township) which is the appropriate location and used for other notifications. This website notice is above the requirements of the PA DEP TMDL Plan Instructions. Copies of the 2017 TMDL plan are available upon request to the Township.

In addition to the above, West Bradford Township had authorized the Township Engineer to answer questions from Mr. Merva about the TMDL plan. A virtual meeting was held on October 21, 2022 between D. Daley and J. Merva.

b. Verbal Comments. At the November 9, 2022 Board of Supervisors meeting, EBWA presented the TMDL Plan to the Board and the public. The presentation included a visual presentation of portions of the plans including the mapping from the TMDL plan. Attendees included the Board of Supervisors (3), various staff members (3), the Fire Department Chief, the general public (8) and the Township Engineer (total 16).

- The Board of Supervisors asked questions about the candidate BMP.
- John R. Merva, 2048 Arrowhead Trail asked general questions about the advertisement process, and the previous 2017 TMDL application / ability to have credit for work on Fawn Lane prior to the approval of the TMDL plan by PA DEP. EBWA answered the questions about the advertisement process and noted that if a BMP was installed on Fawn Lane to improve water quality, credit could have been taken for the TMDL in advance of the TMDL approval.

The meeting concluded with the BOS authorizing the submittal of the TMDL Plan to PA DEP for review.

21ST CENTURY media

MediaNews Group

PHILADELPHIA GROUP

AFFIDAVIT OF PUBLICATION

390 Eagleview Boulevard • Exton, PA 19341

WEST BRADFORD TOWNSHIP
1385 CAMPUS DR
DOWNINGTOWN, PA 19335
Attention:

STATE OF PENNSYLVANIA,

The undersigned Shelley L. Meenan, being duly sworn the he/she is the principal clerk of Daily Local News, Daily Local News Digital, published in Chester County for the dissemination of local or transmitted news and intelligence of a general character, which are duly qualified newspapers, and the annexed hereto is a copy of certain order, notice, publication or advertisement of:

WEST BRADFORD TOWNSHIP

Published in the following edition(s):

Daily Local News, Daily Local News Digital
10/06/22

WEST BRADFORD TOWNSHIP
TMDL PUBLIC NOTICE

West Bradford Township, Chester County has prepared a Total Maximum Daily Load (TMDL) Plan for the Christina Watershed as part of their National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Individual Permit for Stormwater Discharges.

The TMDL Plan is available for public review at the West Bradford Township Municipal Building, 1385 Campus Drive, Downingtown, PA 19335 during regularly business hours, and on the Township's website at www.westbradford.org. Written comments from the public will be accepted until November 9, 2022 and can be mailed to the Township or sent via electronic mail at westbradford@westbradford.org. The TMDL Plan will also be presented during the regularly scheduled Board of Supervisors public meeting scheduled for November 9, 2022 at 7:00 p.m. at the municipal office at which time verbal or written comments from any interested member of the public will also be accepted. The TMDL Plan was developed to meet the requirements of the NPDES MS4 Permit related to impaired surface waters within designated Urbanized Areas in the Township.
Justin Yaich, Township Manager
DLN 10/6; 1a

Sworn to the subscribed before me this 10/10/22.

Maureen Schmid

Notary Public, State of Pennsylvania
Acting in County of Montgomery

Commonwealth of Pennsylvania - Notary Seal
MAUREEN SCHMID, Notary Public
Montgomery County
My Commission Expires March 31, 2025
Commission Number 1248132

Advertisement Information

Client Id: 884416 **Ad Id:** 2385455 **PO:** **Sales Person:** 018303

WEST BRADFORD TOWNSHIP

POSTED ON: OCTOBER 4, 2022 - 1:18PM

West Bradford Township, Chester County has prepared a Total Maximum Daily Load (TMDL) Plan for the Christina Watershed as part of their National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Individual Permit for Stormwater Discharges.

The TMDL Plan is available for public review at the West Bradford Township Municipal Building, 1385 Campus Drive, Downingtown, PA 19335 during regularly business hours, and on the Township's website at www.west-bradford.org. Written comments from the public will be accepted until November 9, 2022 and can be mailed to the Township or sent via electronic mail at westbradford@westbradford.org. The TMDL Plan will also be presented during the regularly scheduled Board of Supervisors public meeting scheduled for November 9, 2022 at 7:00 p.m. at the municipal office at which time verbal or written comments from any interested member of the public will also be accepted. The TMDL Plan was developed to meet the requirements of the NPDES MS4 Permit related to impaired surface waters within designated Urbanized Areas in the Township.

Justin Yaich, Township Manager

Click here for the link to the TMDL Plan

November 9, 2022

Justin Yaich
Township Manager
West Bradford Township
1385 Campus Drive
Downingtown, PA 19335

Dear Mr. Yaich,

Regarding the proposed revision to the West Bradford Township September 15, 2017 MS4 TMDL Plan, the Delaware Riverkeeper Network recommends that the Township consider doing more to protect the Brandywine Creek Watershed. We have noted that the August 19, 2022 revision has deleted several candidate BMPs from the 2017 MS4 TMDL based on new or modified calculations since 2017. The Township should include these prior candidate BMPs in the new TMDL Plan and not delete prior control measure commitments.

Alternatively, if not included in the revised 2022 TMDL Plan, the Township should make a firm commitment to complete individual candidate BMPs from the 2017 TMDL Plan with specific time commitments where completion would reduce the sediment pollutants in the Township or help with stormwater issues already identified by the Township. Pennsylvania's constitution contains the strongest environmental rights amendment in the country. Article 1, Section 27 states that, "The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment." It is important that more than just the minimum should be done to protect the waterways of the Commonwealth. Thank you.

Sincerely,

Maya K. van Rossum
the Delaware Riverkeeper

Dan Daley

From: John Merva <jmerva@yahoo.com>
Sent: Thursday, November 03, 2022 7:07 AM
To: Justin Yaich
Cc: Dan Daley; Merva, John R.
Subject: TMDL Stormwater Plan Comments

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Justin,

The following are my initial comments on the 2022 Total Maximum Daily Load ("TMDL") Plan prior to the meeting scheduled for November 9, 2022. Please confirm receipt.

1) **Stormwater problems on Arrowhead**. Township needs to address the ongoing stormwater issues on Arrowhead Trail caused by adjacent developments. Not just impacting homeowners on Arrowhead and discharging into a stream on the north side of the development, but also impacting the woodland area around Arrowhead that the Township has designated a class II woodland.

2) **Extend comment period**. Township only posted a notice on its web site regarding the TMDL Plan. No additional email notices or communications to inform residents of the new TMDL Plan were sent. The Township routinely sends email alerts to residents from the website and posts other items on social media, but no similar action was taken to alert residents to the proposed 2022 TMDL Plan. Suggest that the Township send email alerts regarding the TMDL plan and post notices on social media similar to other Township announcements, and then provide residents with at least an additional 30 days to provide comments.

3) **Make meeting accessible**. Request that the Township make the November 9, 2022 meeting accessible via Zoom so residents can attend virtually and provide a video replay for any residents interested in viewing the meeting afterwards. Video access is a reasonable accommodation the Township should provide for residents to view and attend a public meeting.

4) **Post TMDL documents on an easy to find Township Page**. Proposed 2022 TMDL is not easy to locate on the Township web page and now buried behind other postings. The 2017 TMDL is not posted to compare plans. The Township maintains a "stormwater updates" tab and these documents and a summary should be posted on this stormwater tab for residents.

I may have more comments and questions prior to, or at the meeting, regarding the TMDL Plan.

Thank you.

John R. Merva

2048 Arrowhead Trail

Coatesville, PA 19320