POLLUTION REDUCTION PLAN

BEDMINSTER TOWNSHIP

BUCKS COUNTY, PA

Prepared by:

C. ROBERT WYNN ASSOCIATES, INC.

MUNICIPAL ENGINEERING SERVICES

211 West Broad Street • Quakertown • PA • 18951

(215) 536·7336 • FAX (215) 536·5361

March 4, 2020

Introduction

Bedminster Township is located in Bucks County and consists of approximately 31.24 square miles of area which is tributary to the East Branch Perkiomen Creek and Tohickon Creek. The portions of East Branch Perkiomen Creek and Tohickon Creek within the Township have various PA Code Chapter 93 use designations; ranging from TSF (trout stocked fishery), CWF (cold water fishery) and WWF (warm water fishery). Portions of the Township are located within the Philadelphia (NE) Urbanized Area/Urbanized Area 12 as referenced by PADEP with Municipal Separate Storm Sewer Systems (MS4s) located in Urban Areas of the Tohickon Creek Watershed (Deep Run sub-watershed) and are impaired with nutrients/siltation. (Refer Table 1.)

The Township owns and maintains MS4s which require NPDES Permit be obtained to allow discharge of stormwater runoff to the Waters of the Commonwealth of Pennsylvania. This Pollution Reduction Plan is required as part of the National Pollutant Discharge Elimination System (NPDES) MS4 permit application to the Pennsylvania Department of Environmental Protection (PADEP) for the stormwater discharge to the surface waters impaired for sediment.

The purpose of the Pollution Reduction Plan (PRP) is to improve water quality discharging to surface waters which are listed as impaired by sediment and/or nutrients by establishing existing sediment pollutant loading, reducing the sediment loading by existing BMP to determine net sediment loading, and providing options for Best Management Practices (BMPs) to reduce the sediment load by 10% within five years following PADEP approval of coverage under the NPDES permit

POLLUTION REDUCTION PLAN
BEDMINSTER TOWNSHIP

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APPENDICES

A. Public Participation

- A copy of the draft PRP was made available for review on _____, 2020. A copy of the public notice will be included as Appendix I.
- The public was given 30 days to provide written comments on the contents of the PRP Plan. Update at appropriate time.
- The Township used the public comments to update the draft PRP in the following ways: Update at appropriate time.
- The Township held a public meeting on _____, 2020 to review and authorize adoption of the PRP.

B. Map

The attached maps (e.g. Appendix A, Appendix D) identifies land uses and impervious/pervious surfaces and the storm sewershed boundary associated with each MS4 outfall that discharges to PRP waters, and identifies the storm sewershed drainage area. In addition, Appendix A and Appendix G identifies the proposed location(s) of structural BMP(s) that will be implemented to achieve required pollutant load reductions.

The Township reviewed and prepared the MS4 storm sewer map to include the following:

- Updated tax map parcels.
- Streets.
- Urban Area based on the 2010 census.
- Watersheds and subwatersheds.
- Streams and watercourses based on PADEP GIS data.
- Storm sewer, inlets, manholes, and endwalls.
- Location of all MS4s
- Outfalls and observation points.
- Storm sewersheds based upon LIDAR topography.
- Storm sewershed drainage areas.
- Distance from the outfall (or observation point) to surface water.
- Basin ownership.
- Outfall IDs.
- Basin IDs.

The following GIS mapping was utilized for analysis and development of the Township's PRP.

1. Storm Sewer – existing base map showing the municipal storm sewer system with outfall locations, streams and drainage channels and field inspection.

2. Topography – contour information was provided by LIDAR shapefile information downloaded from Pennsylvania Spatial Data Access (PASDA) website.

3. Storm Drainage Areas – drainage areas to each MS4 outfall were evaluated by the Township Engineer's office using the MS4 mapping, contours, development plans, and field observation.

4. Impairment Area – after the drainage areas were outlined, a storm sewershed boundary was delineated. This boundary shows which areas of the Township drain to and have impact on the impaired streams within the Urban areas.

5. Impervious Area – Impervious surface areas were generated from 2015 DVRPC Land Use Data. Additional information was added based on aerial imagery for more recent projects.

6. Parsing – Urban Areas outside of the MS4s were "parsed" from the planning area. As indicated on mapping, areas that bypass the municipal MS4 system were also parsed. Where land area was removed from the planning area, BMPs implemented on that area were not be used as credit toward meeting the MS4's pollutant loading reduction requirements.

C. Pollutants of Concern:

The Township is required to identify the pollutants of concern for each storm sewershed or the overall PRP planning area. PADEP's MS4 Requirements Table identified that all watersheds within the Township are listed as impaired on the PADEP MS4 Requirements Table. The streams are impaired due to sediment. The terms "sediment", "siltation", and "suspended solids" all refer to inorganic solids.

The table below shows each of the impaired waters receiving discharges from the Township, and the pollutant(s) that are of concern to that stream.

Table 1: PADEP MS4 Requirements Table (last revised 11/18/19)

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
BEDMINSTER TOWNSHIP		No		Delaware River		Mercury (5)
				Deep Run	Appendix E-Nutrients, Siltation (5)	

D. Determine Existing Load for Pollutant(s) of Concern:

There are several possible methods to estimating the existing load, ranging from simplistic to complex. The method used in this report to estimate existing loading is the Simplified Method. This method determines the percent of impervious and pervious surface within the urbanized area of the storm sewershed and calculates the existing loading by multiplying those land areas (acres) by pollutant loading rates (lbs. /acre/yr.). This method does not take into consideration the different types of land uses within the storm sewershed.

Appendix C – Identifies a summary pf PRP calculations based on using the simplified method.

Appendix D – Consists of a map which identifies impervious surfaces and summary for each planning area.

Appendix E – Consists of a spreadsheet which identifies base sediment loading calculations within the Bedminster Township MS4 PRP planning area. The spreadsheet also summarizes the sediment removal completed by existing BMPs (refer Appendix F), which is used to determine the overall existing sediment load for Bedminster Township MS4 facilities, within each HUC watershed. The spreadsheet further indicates the PRP sediment reduction requirements within each HUC watershed, which is 10% of the existing sediment loading.

Appendix F- Consists of a spreadsheet which identifies existing basins within the Bedminster Township MS4 PRP planning area.

Appendix G – Provides supplemental information identifying locations of BMPs to achieve sediment removal as required by the PRP.

PRP Parsing Procedures/Calculations

When the identified amount of pollution load required to be reduced was determined, areas within the Township to be studied for BMP improvements could be identified. The proposed implementation of BMPs or land use changes must be within the storm sewershed that will result in meeting the minimum required reductions. For example, a BMP can not be installed within the Tohickon Creek Watershed with the pollution reduction amounts used to satisfy reductions required in the East Branch Perkiomen planning area.

BMPs must be implemented within five (5) years of PADEP's approval date for coverage under the PAG-13 General Permit. The BMPs may be located on public or private property. BMPs will be installed by the Township (or by others), to achieve the required pollutant lonad reduction.

During the five (5) year permit, the Township may take credit for BMPs that are under one acre (for example single family dwelling construction) and are not being used to meet minimum regulatory requirements, such as a Chapter 102 NPDES permit for construction activities. However, in cases where there is a Chapter 102 NPDES permit, the Township may only take credit for stormwater BMPs that exceed minimum requirements. To take credit for the additional pollution reduction provided by a BMP, the Township must demonstrate that the BMP exceeds its regulatory requirements. The credit may only include those additional reductions that result from exceeding the regulatory requirements.

E. Select BMPs To Achieve the Minimum Required Reductions in Pollutant Load.

PRP Sediment Load Reduction Options

Objective: Reduce Sediment Load by **35,346 lbs./yr.** within Lower Tohickon Creek (All planning areas drain to Lower Tohickon Creek) Subwatershed as calculated in Appendix E spreadsheet.

Item 1 (Requires permission/easement on private property)

Install outlet orifice control on Basin 041-01 to increase basin TSS removal efficiency from 10% to 60% (Additional 50% TSS Removal Efficiency).

Sediment Reduction Calculation

Based on a drainage area of 23.55 AC (21.65% Impervious and 78.35% Pervious Urbanized Land) and a 50% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.2165 x 23.55(AC) x 1,839 lbs./AC/yr. + .7835 x 23.55(AC) x 264.96 lbs./AC/yr.) X 0.50 TSS efficiency = **7,133 lbs./yr. removal.**

Estimated Construction Cost: $12,000 to $16,000.

Item 2 (Requires permission/easement on private property)

Install outlet orifice control on Basin 044-01 to increase basin TSS removal efficiency from 10% to 60% (Additional 50% TSS Removal Efficiency).

Sediment Reduction Calculation

Based on a drainage area of 11.64 AC (31.06% Impervious and 68.94% Pervious Urbanized Land) and a 50% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.3106 x 11.64(AC) x 1,839 lbs./AC/yr. + .6894 x 11.64(AC) x 264.96 lbs./AC/yr.) X 0.50 TSS efficiency = **4,387 lbs./yr. removal**

Estimated Construction Cost: $12,000 to $16,000.

Item 3 – (Requires permission/easement on private property)

Install outlet orifice control on Basin 049-01 to increase basin TSS removal efficiency from 10% to 60% (Additional 50% TSS Removal Efficiency).

Sediment Reduction Calculation

Based on a drainage area of 25.37 AC (26.73% Impervious and 73.27% Pervious Urbanized Land) and a 50% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.2673 x 25.37(AC) x 1,839 lbs./AC/yr. + .7327 x 25.37(AC) x 264.96 lbs./AC/yr.) X 0.50 TSS efficiency = **8,698 lbs./yr. removal**

Estimated Construction Cost: $12,000 to $16,000.

Item 4 – (Requires permission/easement on private property)

Install outlet orifice control on Basin 050-01 to increase basin TSS removal efficiency from 10% to 60% (Additional 50% TSS Removal Efficiency).

Sediment Reduction Calculation

Based on a drainage area of 11 AC (19.31% Impervious and 80.69% Pervious Urbanized Land) and a 50% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.1931 x 11(AC) x 1,839 lbs./AC/yr. + .8069 x 11(AC) x 264.96 lbs./AC/yr.) X 0.50 TSS efficiency = **3,129 lbs./yr. removal**

Estimated Construction Cost: $12,000 to $16,000.

Item 5 – (Requires permission/easement on private property)

Install a level spreader and vegetated filter strip for runoff reduction (22.4% TSS Removal Increase) downgradient of Basin 015-01 outlet structure. The basin has a 60% efficiency rating, therefore the level spreader and vegetated filter strip could only improve the remaining 40% of the basin by 56%. 56% of 40% equates to a 22.4% decrease in sediment.

Sediment Reduction Calculation

Based on a drainage area of 55.37 AC (29.28% Impervious and 70.72% Pervious Urbanized Land) and a 22.4% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.2928 x 55.37(AC) x 1,839 lbs./AC/yr. + .7072 x 55.37(AC) x 264.96 lbs./AC/yr.) X 0.224 TSS efficiency = **9,002 lbs./yr. removal**

Estimated Construction Cost: $36,000 to $42,000.

Item 6 – (Requires permission/easement on private property)

Install a level spreader and vegetated filter strip for runoff reduction (22.4% TSS Removal Increase) downgradient of Basin 012-02 outlet structure. The basin has a 60% efficiency rating, therefore the level spreader and vegetated filter strip could only improve the remaining 40% of the basin by 56%. 56% of 40% equates to a 22.4% decrease in sediment.

Sediment Reduction Calculation

Based on a drainage area of 42.77 AC (17.98% Impervious and 82.02% Pervious Urbanized Land) and a 22.4% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.1798 x 42.77(AC) x 1,839 lbs./AC/yr. + .8202 x 42.77(AC) x 264.96 lbs./AC/yr.) X 0.224 TSS efficiency = **5,250 lbs./yr. removal**

Estimated Construction Cost: $36,000 to $42,000.

Item 7 – (Requires permission/easement on private property)

Install a level spreader and vegetated filter strip for runoff reduction (22.4% TSS Removal Increase) downgradient of Basin 032-01 outlet structure. The basin has a 60% efficiency rating, therefore the level spreader and vegetated filter strip could only improve the remaining 40% of the basin by 56%. 56% of 40% equates to a 22.4% decrease in sediment.

Sediment Reduction Calculation

Based on a drainage area of 33.76 AC (36.74% Impervious and 63.26% Pervious Urbanized Land) and a 22.4% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.3674 x 33.76(AC) x 1,839 lbs./AC/yr. + .6326 x 33.76(AC) x 264.96 lbs./AC/yr.) X 0.224 TSS efficiency = **6,377 lbs./yr. removal**

Estimated Construction Cost: $36,000 to $42,000.

Item 8 – (Requires permission/easement on private property)

Install a level spreader and vegetated filter strip for runoff reduction (22.4% TSS Removal Increase) downgradient of Basin 017-01 outlet structure. The basin has a 60% efficiency rating, therefore the level spreader and vegetated filter strip could only improve the remaining 40% of the basin by 56%. 56% of 40% equates to a 22.4% decrease in sediment.

Sediment Reduction Calculation

Based on a drainage area of 18.8 AC (24.17% Impervious and 75.83% Pervious Urbanized Land) and a 22.4% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.2417 x 18.8(AC) x 1,839 lbs./AC/yr. + .7583 x 18.8(AC) x 264.96 lbs./AC/yr.) X 0.224 TSS efficiency = **2,718 lbs./yr. removal**

Estimated Construction Cost: $36,000 to $42,000.

Item 9 – (Requires permission/easement on private property)

Install a level spreader and vegetated filter strip for runoff reduction (22.4% TSS Removal Increase) downgradient of Basin 047-01 outlet structure. The basin has a 60% efficiency rating, therefore the level spreader and vegetated filter strip could only improve the remaining 40% of the basin by 56%. 56% of 40% equates to a 22.4% decrease in sediment.

Sediment Reduction Calculation

Based on a drainage area of 18.11 AC (45.53% Impervious and 54.47% Pervious Urbanized Land) and a 22.4% TSS Removal Increase. Sediment Loading Rate is 1,839 lbs./AC/yr. for Impervious Urbanized Area and is 264.96 lbs./AC/yr. for Pervious Urbanized Area.

(.4553 x 18.11(AC) x 1,839 lbs./AC/yr. + .5447 x 18.11(AC) x 264.96 lbs./AC/yr.) X 0.224 TSS efficiency = **3,982 lbs./yr. removal**

Estimated Construction Cost: $36,000 to $42,000.

Item 10 – (Requires permission/easement on private property)

Stream Restoration (44.88 lbs./ft./yr. TSS Removal) along impaired portion(s) of Lower Tohickon Creek. The location of stream restoration is shown on Kulp Farm/Bedminster Hunt West development parcels TMP# 1-011-025 and 1-011-029. This office verified de-stabilized stream channels and accessibility of property on which this portion of stream is located.

Sediment Reduction Calculation

Based on a minimum stream restoration length of 100 feet and a TSS Removal of 44.88 lbs./ft./yr.

300 feet x 44.88 lbs./ft./yr. = **13,464 lbs./yr. removal**

Estimated Construction Cost: $90,000 to $110,000

Estimated costs are for construction only and does not include survey, engineering, plan preparation, bid specifications, permitting, inspection or legal costs.

PRP Compliance Summary

It is not feasible to reduce sediment loading within every individual planning area, so an analysis was completed based on HUC12 drainage sheds as permitted by the PADEP PRP Guideline Document. The spreadsheets used for determination of sediment loading and existing BMPs include the required breakdown of information by HUC drainage area.

The municipality may choose to complete items 1 thru 6, (e.g. 37,599 lb./yr. reduction) or alternately choose to complete items 1 thru 4, and 7-9 (e.g. 36,424 lb./yr. reduction) or alternately choose to complete items 1 thru 4, and 10 (e.g. 36,811 lb./yr.) to satisfy the sediment loading reduction requirement (e.g. 35,346 lb./yr.) within the Lower Tohickon Creek Watershed (HUC 12 020401050703). Other combinations of items are possible/acceptable; provided that the total sediment loading reduction is equal to or greater than 35,346 lb./yr. within the Lower Tohickon Creek Watershed.

Bedminster Township will comply with the total PRP reduction requirement upon satisfying the PRP sediment load reduction requirement in each HUC12 subwatershed.

Structural BMPs installed and implemented prior to development of this PRP were credited to reduce the Township's existing loading estimates. Street sweeping and other non-structural BMPs that may have been implemented in the past, were not credited. The Township may not reduce its obligations for achieving permit term pollutant load reductions through previously installed BMPs. Pollutant reduction credit was included in the form of reduced existing loading for structural BMPs that were installed prior to development of the PRP and have been continually operated and maintained.

Existing sediment pollution loading was calculated for the portion Township Urban Area (UA) draining to the impaired waters as of the date of the development of this plan. Structural BMPs with stormwater management basins constructed prior to the development of the PRP continue to be operated and maintained and were included in the calculations to reduce the existing loading. BMP effectiveness values contained within Appendix H PADEP BMP Effectiveness Values document (3800 – PM – BCW0100m) were utilized to determine pollutant load reductions.

Total sediment loading (within Lower Tohickon Creek Watershed) for all combined planning areas accounting for existing BMPs is 353,462 lbs./yr, requiring a PRP Reduction (10%) of 35,346 lbs/yr. (refer sediment loading spreadsheet – Appendix E).

F. Identify Funding Mechanism(s)

Proposed projects will be paid for by the general fund of Bedminster Township. Grant programs and/or partnerships with environmental groups or other entities will be explored to assist in the funding but may not be required to implement BMP projects.

G. Identify Responsible Parties for Operation and Maintenance

Once implemented, the BMPs must be maintained in order to continue producing the expected pollutant reductions. The Township must identify the Party responsible for ongoing O&M, O&M activities for each BMP, and frequency at which O&M activities will occur for each selected BMP, and each BMP revised pursuant to the PRP.

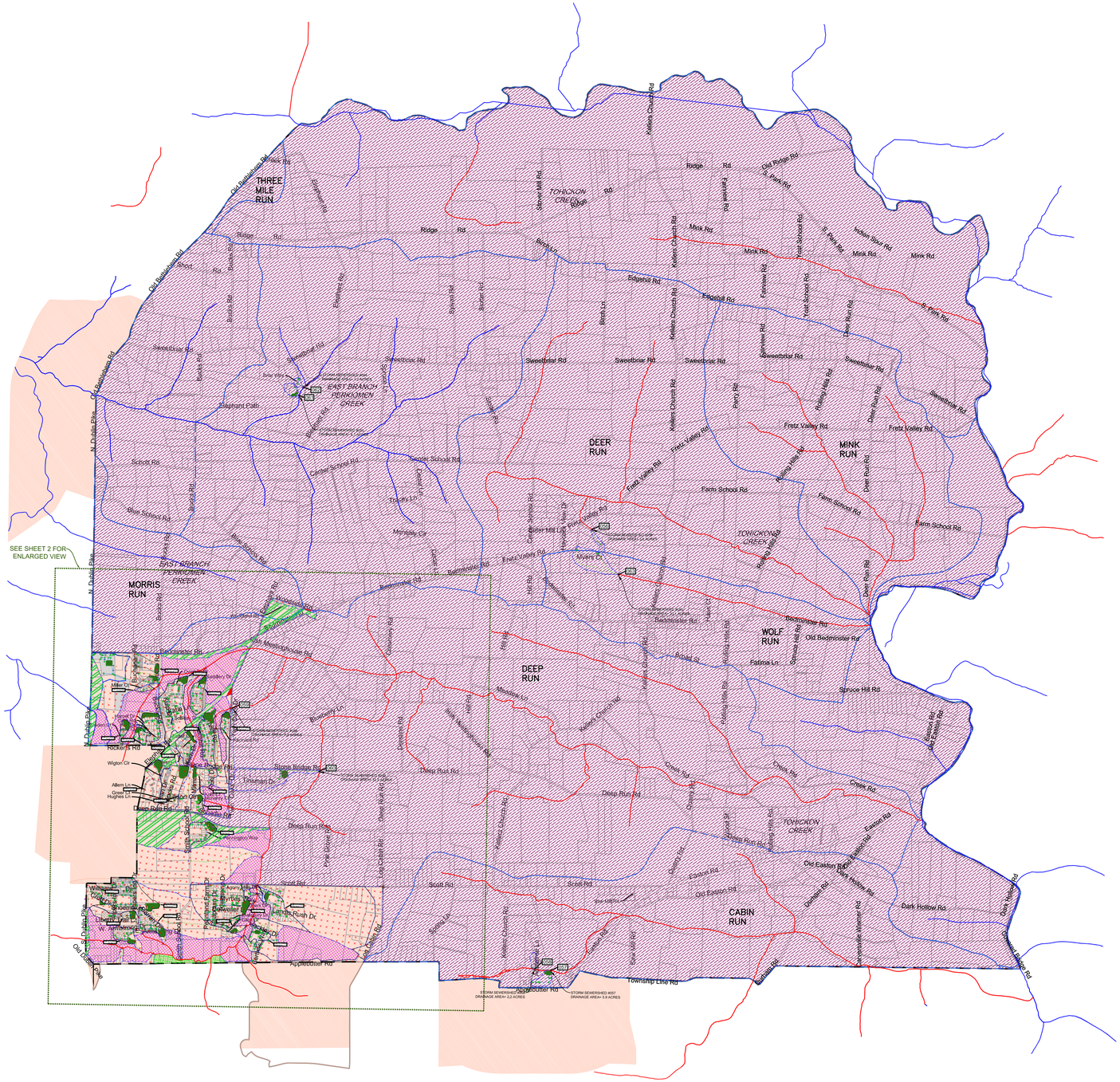
Existing BMP Basins are all privately owned and maintained (primarily by HOA entities). Refer to "Improvements/Comments column of Appendix-F Stormwater Basin Database for a summary of which basins are mowed basins and which basins are not mowed (e.g. constructed wetlands and wet ponds). Any trash is collected and disposed of properly prior to mowing. At the same time, basin outlet structures are inspected, and any accumulated debris is removed. The basins are to be inspected at least annually by the Township and any required maintenance concerns will be communicated to the owner(s). Maintenance items include removal of trash, removal of accumulated debris from the trash rack on the outlet structure, removal of non-native invasive plants, and periodic mowing.

Stream restoration BMPs, where proposed, will be monitored and maintained by the Township. Maintenance methods/frequency will be determined by the stabilization technique utilized at time of stream restoration design and prior to PADEP approval for BMP project commencement.

The Township will identify actual O&M activities in Annual MS4 Status Reports submitted under General Permit.

APPENDIX A

Storm Sewer Map



NOTES:

1. STREAM LOCATIONS AND IMPAIRMENT DESIGNATIONS ARE SHOWN BASED ON DATA PROVIDED BY PADEP AND HOSTED ON THE PASDA WEBSITE. STREAM LOCATIONS MAY NOT ACCURATELY REPRESENT PHYSICAL/FIELD CONDITIONS. THIS OFFICE HAS MODIFIED STREAM AND WATERSHED LOCATIONS TO THE MOST ACCURATE CONTOURS AVAILABLE.
2. STORM SEWERSHED AREAS ARE PARSED TO EXCLUDE AREA THAT BYPASSES BTMS4 SYSTEM AND AREAS THAT DO NOT DRAIN TO IMPAIRED WATERS OR WATERS WITHIN 5 MILES OF IMPAIRED WATERS.
3. AREAS PARSED DRAINING TO PENNDOT MS4 OR OTHER MUNICIPALITIES CONTAIN NO TOWNSHIP STREETS OR FACILITIES.
4. ALL STORM SEWERSHED OBSERVATION POINTS AND AREAS INSIDE THE URBANIZED AREA ARE SHOWN ON SHEET 2.

LEGEND:

- BMP Privately Maintained
- Parcels with Private Stormwater Facilities
- Urbanized Area
- Parcels
- Matchline
- TOHICKON CREEK — Watershed Designation
- DEER RUN — Subwatershed Designation
- Unimpaired Streams
- Impaired Streams
- Municipal Boundary
- Watersheds
- Subwatersheds
- Swale
- Storm Sewershed
- Planning Area

PARSING LEGEND:

- Non-Urbanized Drainage Area
- Parsed Area (Note #2)
- Parsed Area Flowing to PennDOT MS4 (Note #3)
- Parsed Area - Private Areas not containing Township MS4 Facilities
- Parsed Area - Sheet Flow From A Road Less than 300' From Stream

STORM STRUCTURES:

- Inlet
- Endwall
- Headwall
- Manhole
- Outlet Control Structure
- Outfall to Impaired Waters or Waters Within 5 Miles of Impaired Waters (PRP MS4)
- Outfall to Unimpaired Waters (Other MS4)
- 023 — Observation Point
- 12 — Stormwater BMP (Typ)
- Drainage Pipes
- 001-01 — Detention Basin

2,000 1,000 0 2,000 4,000 6,000

SCALE: 1" = 2,000'

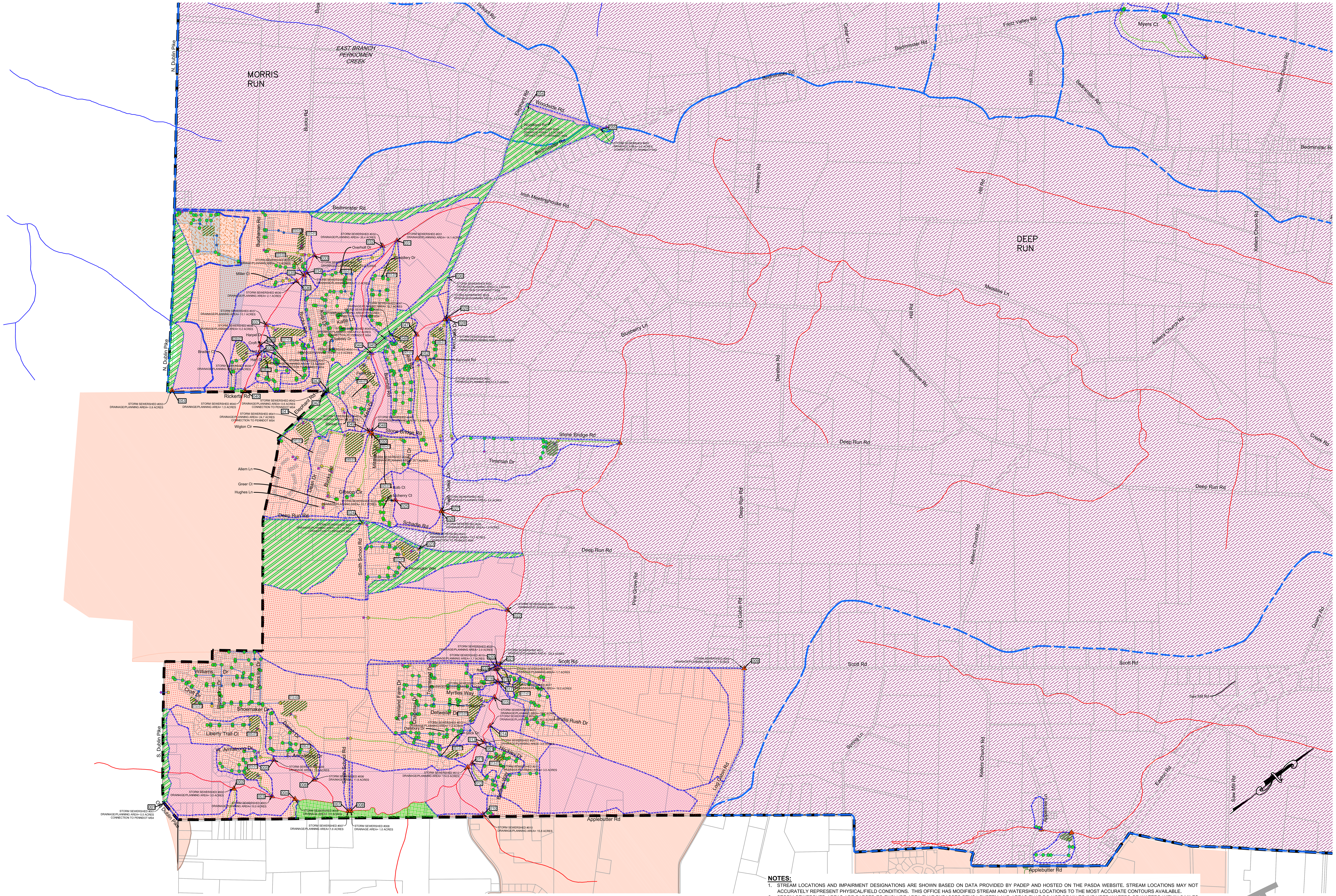
NO.	DATE	REVISIONS

BEDMINSTER TOWNSHIP STORM SEWER MAP

C. ROBERT WYNN ASSOCIATES, INC.
MUNICIPAL & CIVIL ENGINEERING
211 W. Broad Street, Quakertown, PA 18951 Phone 215-536-7336 Fax 215-536-5361

DRAWING NO. 1 OF 2

DWN BY KAD | CKD BY CJG | DATE: JULY 11, 2019 | SCALE 1"= 2000' | JOB NO.: 123-004



LEGEND:

BMP Privately Maintained
Parcels with Private Stormwater Facilities
Urbanized Area
Parcels
Matchline
TOHICKON CREEK — Watershed Designation
DEER RUN — Subwatershed Designation
Unimpaired Streams
Impaired Streams
Municipal Boundary
Watersheds
Subwatersheds
Swale
Storm Sewershed
Planning Area

PARSING LEGEND:

Non-Urbanized Drainage Area
Parsed Area (Note #2)
Parsed Area Flowing to PennDOT MS4 (Note #3)
Parsed Area - Private Areas not containing Township MS4 Facilities
Parsed Area - Sheet Flow From A Road Less than 300' From Stream

STORM STRUCTURES:

Inlet
Endwall
Headwall
Manhole
Outlet Control Structure
Outfall to Impaired Waters or Waters Within 5 Miles of Impaired Waters (PRP MS4)
Outfall to Unimpaired Waters (Other MS4)
023 Observation Point
12 Stormwater BMP (Typ)
Drainage Pipes
001-01 Detention Basin

NOTES:

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2. STORM SEWERSHED AREAS ARE PARSED TO EXCLUDE AREA THAT BYPASSES BTMS4 SYSTEM AND AREAS THAT DO NOT DRAIN TO IMPAIRED WATERS OR WATERS WITHIN 5 MILES OF IMPAIRED WATERS.
3. AREAS PARSED DRAINING TO PENNDOT MS4 OR OTHER MUNICIPALITIES CONTAIN NO TOWNSHIP STREETS OR FACILITIES
4. ALL STORM SEWERSHED OBSERVATION POINTS AND AREAS OUTSIDE THE URBANIZED AREA ARE SHOWN ON SHEET 1.

800 400 0 800 1,600 2,400

SCALE: 1" = 800'

NO.	DATE	REVISIONS

BEDMINSTER TOWNSHIP STORM SEWER MAP

C. ROBERT WYNN ASSOCIATES, INC.
MUNICIPAL & CIVIL ENGINEERING
211 W. Broad Street, Quakertown, PA 18951 Phone 215-536-7336 Fax 215-536-5361

DWN BY KAD | CKD BY CJG | DATE: JULY 11, 2019 | SCALE 1"= 800' | JOB NO.: 123-004

DRAWING NO. 2 OF 2

APPENDIX B

HUC 12 Stream Classification Spreadsheet

HUC12 Stream Classification Spreadsheet

MUNICIPALITY	WATERSHED	HUC12 #	PLANNING AREA ID
Bedminster Township	Lower Tohickon Creek	020401050703	001
Bedminster Township	Lower Tohickon Creek	020401050703	002
Bedminster Township	Lower Tohickon Creek	020401050703	003
Bedminster Township	Lower Tohickon Creek	020401050703	004
Bedminster Township	Lower Tohickon Creek	020401050703	005
Bedminster Township	Lower Tohickon Creek	020401050703	006
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Bedminster Township	Lower Tohickon Creek	020401050703	016
Bedminster Township	Lower Tohickon Creek	020401050703	017
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Bedminster Township	Lower Tohickon Creek	020401050703	031
Bedminster Township	Lower Tohickon Creek	020401050703	032
Bedminster Township	Lower Tohickon Creek	020401050703	033

Bedminster Township	Lower Tohickon Creek	020401050703	034
Bedminster Township	Lower Tohickon Creek	020401050703	035
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Bedminster Township	Lower Tohickon Creek	020401050703	048
Bedminster Township	Lower Tohickon Creek	020401050703	049
Bedminster Township	Lower Tohickon Creek	020401050703	050
Bedminster Township	Lower Tohickon Creek	020401050703	051
Bedminster Township	Lower Tohickon Creek	020401050703	052
Bedminster Township	Lower Tohickon Creek	020401050703	053

APPENDIX C

Pollution Reduction Plan
Technical Development Summary

PRP Technical Development Summary

Step 1. Map/delineate storm sewersheds draining to impaired surface water.

Step 2. Determine which storm sewersheds drain to MS4 regulated outfalls.

Step 3. Select loading rates.

Option 1. Chesapeake Bay Program.

Option 2. Literature or other scientifically valid sources.

Step 4. Determine area of storm sewersheds and % of each land use or land cover, based on your mapping.

Option 1. Simplified method.

Step 5. Parse out areas as described in the PRP Instructions, including areas which contribute flow into the system but have their own NPDES Stormwater Permit. Examples include PENNDOT roads and private property that discharges directly to surface waters without contributing flow into the MS4 system. The combined sewersheds, less any parsed-out areas, represents the "planning area," and is the area for which current loads will be calculated.

Step 6. Calculate Existing Load using Loading Rates and Land Area from previous steps.

Step 7. Evaluate and deduct existing structural BMP load reductions from Step 6 existing load to determine final existing load.

Step 8. Evaluate potential and types of new BMPs, considering drainage area to BMP, impairment, cost and funding mechanisms (total load reduction of BMP selection must meet load reduction requirements).

Basic Steps to Calculate Existing Load

1. Select loading rates
2. **Determine area of storm sewersheds and % of each land use or land cover, based on your mapping**
3. Calculate load using loading rates and land area from previous steps
4. Evaluate existing structural BMPs to reduce existing loading (optional)

Step 2: Determine Land Area

- Load = Land Use/ Cover Based Loading Rate X **Land Area**
- Land Area is typically mixed land use
- Need land use distribution within defined drainage area

Basic Steps to Calculate Existing Load

1. Select loading rates
2. Determine area of storm sewersheds and % of each land use or land cover, based on your mapping
3. **Calculate load using loading rates and land area from previous steps**
4. Evaluate existing structural BMPs to reduce existing loading (optional)

Option 1: DEP Simplified Method

Table of municipal distributions by land cover

County	Municipality Name	Municipality Type	Urban Area % Impervious	Urban Area % Pervious	Outside of Urban Area % Impervious	Outside of Urban Area % Pervious	Urban Area Acres
Adams	ABBOTSTOWN	BORO	30%	70%	28%	72%	321
Adams	BERWICK	TWP	15%	85%	7%	93%	372
Adams	BUTLER	TWP	41%	59%	3%	97%	45
Adams	CONWEGO	TWP	21%	79%	13%	87%	3,233
Adams	CUMBERLAND	TWP	18%	82%	6%	94%	1,677
Adams	GETTYSBURG	BORO	47%	53%	47%	53%	1,064
Adams	HAMILTON	TWP	9%	91%	4%	96%	422
Adams	MCSHERRYSTOWN	BORO	48%	52%	8%	52%	327

- Multiply calculated acreage by corresponding loading rate and sum
- Not appropriate for land use determinations at finer scales (e.g. individual sewershed, BMP treatment area)

Calculations were done in GIS to determine impervious percentages within each urbanized planning area.

Option 1: DEP Simplified Method

Conewago Township, Adams County

Urban Area % Impervious	Urban Area % Pervious	Total UA Area (Acres)
21%	79%	3,233

3,233 acres * .21 = 679 acres impervious developed

3,233 acres – 679 acres = 2,554 acres pervious developed

Option 1: DEP Simplified Method

Impervious developed

679 acres x 1,398.77 lbs sediment/ac/yr = 949,242 lbs sediment/yr

Pervious developed +

2,554 acres x 207.67 lbs sediment/ac/yr = 530,389 lbs sediment/yr

Total Developed Load = 1,479,631 lbs sediment/yr

Step 4: Evaluate Existing BMPs

- MS4s may account for structural BMPs that are currently installed and maintained in existing load estimates
- Any existing structural BMPs must be identified in Section D of the PRP along with required information in order to claim credit
- Pollutant reduction calculations for existing BMPs will be discussed in BMP Selection session

Calculate Load to BMP

- Impervious area = 4,284 ac
- Pervious area = 10.781 ac
- Impervious sediment load:
  4.284 ac X 1,614.15 lb/ac/yr = 6,914.929 lb/yr
- Pervious sediment load:
  10.781 ac X 220.4 lb/ac/yr = 2,376.112 lb/yr
- Total sediment load:
  6,914.929 lb/yr + 2,376.112 = **9,291 lb/yr**

Determine sediment removal percentage from PA DEP form 3800-PM-BCW0100M (BMP effectiveness values) for each BMP. Refer to Basin Database Spreadsheet.

Existing Loading Summary

- Total Sediment Load without accounting for existing BMPs:

  362,118 lb/yr

- Sediment removed from the existing load calculations by BMPs:

  115,419 lb/yr

- Overall existing load for "Model Municipality"

  362,118 lb/yr – 115,419 = **246, 699 lb/yr**

Required Reductions

1. Existing load to locally impaired sewershed areas is 126, 698 lb/yr

- Required reduction from locally impaired waters

  126,698 lb/yr * .10 = <u>12,670 lb/yr</u>

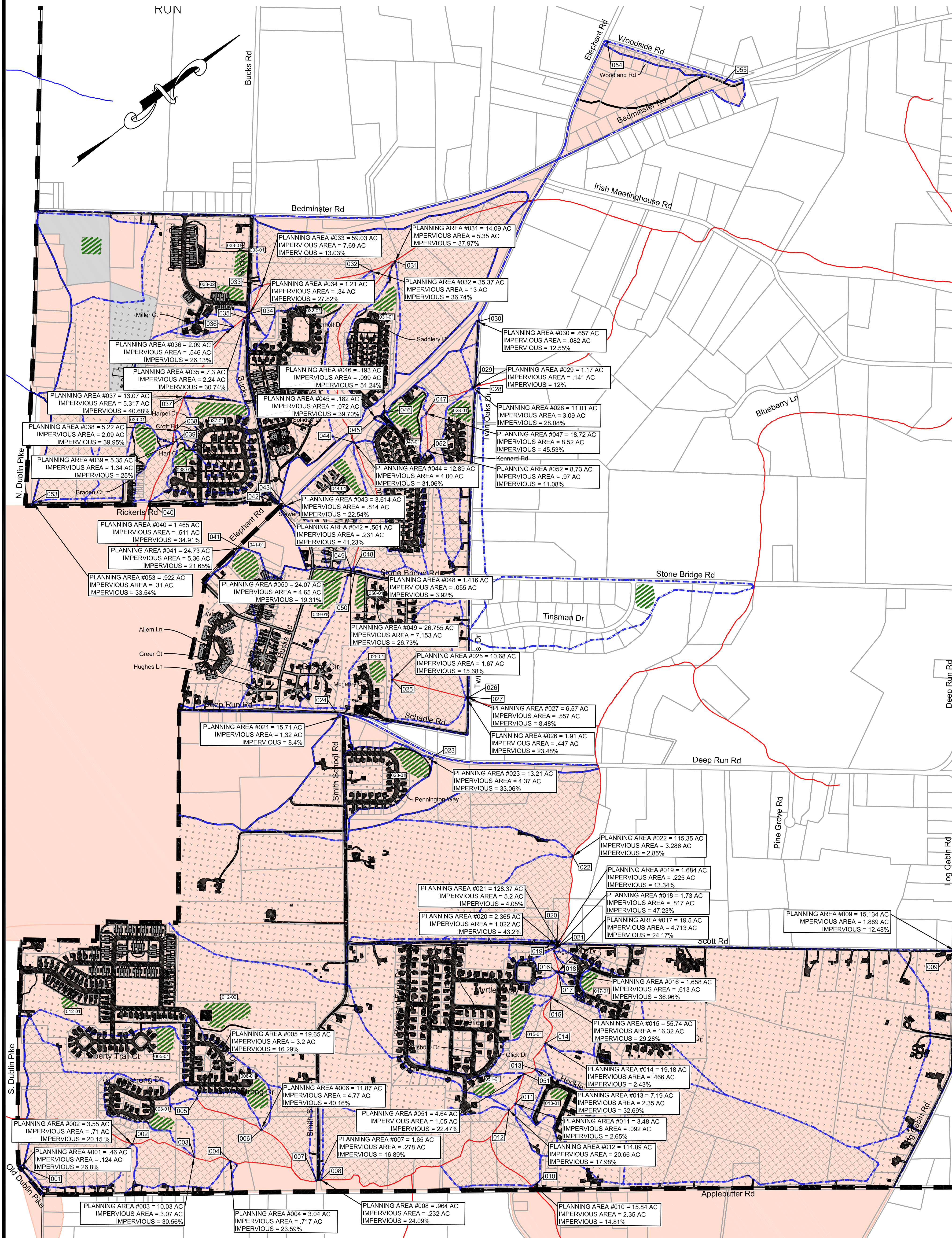
2. Existing load to Bay sewershed areas is 120,001 lb/yr

- Required reduction from Bay sewersheds are

  120,001 lb/yr * .10 = <u>12,000 lb/yr</u>

APPENDIX D

Impervious Surface Map


RUN
Bucks Rd
Elephant Rd
Woodside Rd
Woodland Rd
Bedminster Rd
Irish Meetinghouse Rd
Blueberry Ln
Miller Ct
Saddlery Dr
Harpel Dr
Croft Rd
Hart Dr
Hart Ct
Braden Ct
N. Dublin Pike
Rickerts Rd
Kennard Rd
Twin Oaks Dr
Stone Bridge Rd
Tinsman Dr
Allem Ln
Greer Ct
Hughes Ln
Mchenry Ct
Deep Run Rd
Schadle Rd
Smith School Rd
Pennington Way
Pine Grove Rd
Log Cabin Rd
Scott Rd
Myrtle Way
Glick Dr
S. Dublin Pike
Liberty Trail Ct
Old Dublin Pike
Applebutter Rd
PLANNING AREA #033 = 59.03 AC
IMPERVIOUS AREA = 7.69 AC
IMPERVIOUS = 13.03%
PLANNING AREA #031 = 14.09 AC
IMPERVIOUS AREA = 5.35 AC
IMPERVIOUS = 37.97%
PLANNING AREA #034 = 1.21 AC
IMPERVIOUS AREA = .34 AC
IMPERVIOUS = 27.82%
PLANNING AREA #032 = 35.37 AC
IMPERVIOUS AREA = 13 AC
IMPERVIOUS = 36.74%
PLANNING AREA #030 = .657 AC
IMPERVIOUS AREA = .082 AC
IMPERVIOUS = 12.55%
PLANNING AREA #036 = 2.09 AC
IMPERVIOUS AREA = .546 AC
IMPERVIOUS = 26.13%
PLANNING AREA #046 = .193 AC
IMPERVIOUS AREA = .099 AC
IMPERVIOUS = 51.24%
PLANNING AREA #029 = 1.17 AC
IMPERVIOUS AREA = .141 AC
IMPERVIOUS = 12%
PLANNING AREA #035 = 7.3 AC
IMPERVIOUS AREA = 2.24 AC
IMPERVIOUS = 30.74%
PLANNING AREA #037 = 13.07 AC
IMPERVIOUS AREA = 5.317 AC
IMPERVIOUS = 40.68%
PLANNING AREA #045 = .182 AC
IMPERVIOUS AREA = .072 AC
IMPERVIOUS = 39.70%
PLANNING AREA #028 = 11.01 AC
IMPERVIOUS AREA = 3.09 AC
IMPERVIOUS = 28.08%
PLANNING AREA #038 = 5.22 AC
IMPERVIOUS AREA = 2.09 AC
IMPERVIOUS = 39.95%
PLANNING AREA #047 = 18.72 AC
IMPERVIOUS AREA = 8.52 AC
IMPERVIOUS = 45.53%
PLANNING AREA #039 = 5.35 AC
IMPERVIOUS AREA = 1.34 AC
IMPERVIOUS = 25%
PLANNING AREA #044 = 12.89 AC
IMPERVIOUS AREA = 4.00 AC
IMPERVIOUS = 31.06%
PLANNING AREA #052 = 8.73 AC
IMPERVIOUS AREA = .97 AC
IMPERVIOUS = 11.08%
PLANNING AREA #043 = 3.614 AC
IMPERVIOUS AREA = .814 AC
IMPERVIOUS = 22.54%
PLANNING AREA #040 = 1.465 AC
IMPERVIOUS AREA = .511 AC
IMPERVIOUS = 34.91%
PLANNING AREA #042 = .561 AC
IMPERVIOUS AREA = .231 AC
IMPERVIOUS = 41.23%
PLANNING AREA #041 = 24.73 AC
IMPERVIOUS AREA = 5.36 AC
IMPERVIOUS = 21.65%
PLANNING AREA #053 = .922 AC
IMPERVIOUS AREA = .31 AC
IMPERVIOUS = 33.54%
PLANNING AREA #050 = 24.07 AC
IMPERVIOUS AREA = 4.65 AC
IMPERVIOUS = 19.31%
PLANNING AREA #048 = 1.416 AC
IMPERVIOUS AREA = .055 AC
IMPERVIOUS = 3.92%
PLANNING AREA #049 = 26.755 AC
IMPERVIOUS AREA = 7.153 AC
IMPERVIOUS = 26.73%
PLANNING AREA #025 = 10.68 AC
IMPERVIOUS AREA = 1.67 AC
IMPERVIOUS = 15.68%
PLANNING AREA #027 = 6.57 AC
IMPERVIOUS AREA = .557 AC
IMPERVIOUS = 8.48%
PLANNING AREA #024 = 15.71 AC
IMPERVIOUS AREA = 1.32 AC
IMPERVIOUS = 8.4%
PLANNING AREA #026 = 1.91 AC
IMPERVIOUS AREA = .447 AC
IMPERVIOUS = 23.48%
PLANNING AREA #023 = 13.21 AC
IMPERVIOUS AREA = 4.37 AC
IMPERVIOUS = 33.06%
PLANNING AREA #022 = 115.35 AC
IMPERVIOUS AREA = 3.286 AC
IMPERVIOUS = 2.85%
PLANNING AREA #019 = 1.684 AC
IMPERVIOUS AREA = .225 AC
IMPERVIOUS = 13.34%
PLANNING AREA #021 = 128.37 AC
IMPERVIOUS AREA = 5.2 AC
IMPERVIOUS = 4.05%
PLANNING AREA #018 = 1.73 AC
IMPERVIOUS AREA = .817 AC
IMPERVIOUS = 47.23%
PLANNING AREA #009 = 15.134 AC
IMPERVIOUS AREA = 1.889 AC
IMPERVIOUS = 12.48%
PLANNING AREA #020 = 2.365 AC
IMPERVIOUS AREA = 1.022 AC
IMPERVIOUS = 43.2%
PLANNING AREA #017 = 19.5 AC
IMPERVIOUS AREA = 4.713 AC
IMPERVIOUS = 24.17%
PLANNING AREA #016 = 1.658 AC
IMPERVIOUS AREA = .613 AC
IMPERVIOUS = 36.96%
PLANNING AREA #015 = 55.74 AC
IMPERVIOUS AREA = 16.32 AC
IMPERVIOUS = 29.28%
PLANNING AREA #005 = 19.65 AC
IMPERVIOUS AREA = 3.2 AC
IMPERVIOUS = 16.29%
PLANNING AREA #014 = 19.18 AC
IMPERVIOUS AREA = .466 AC
IMPERVIOUS = 2.43%
PLANNING AREA #006 = 11.87 AC
IMPERVIOUS AREA = 4.77 AC
IMPERVIOUS = 40.16%
PLANNING AREA #013 = 7.19 AC
IMPERVIOUS AREA = 2.35 AC
IMPERVIOUS = 32.69%
PLANNING AREA #051 = 4.64 AC
IMPERVIOUS AREA = 1.05 AC
IMPERVIOUS = 22.47%
PLANNING AREA #011 = 3.48 AC
IMPERVIOUS AREA = .092 AC
IMPERVIOUS = 2.65%
PLANNING AREA #002 = 3.55 AC
IMPERVIOUS AREA = .71 AC
IMPERVIOUS = 20.15 %
PLANNING AREA #007 = 1.65 AC
IMPERVIOUS AREA = .278 AC
IMPERVIOUS = 16.89%
PLANNING AREA #012 = 114.89 AC
IMPERVIOUS AREA = 20.66 AC
IMPERVIOUS = 17.98%
PLANNING AREA #001 = .46 AC
IMPERVIOUS AREA = .124 AC
IMPERVIOUS = 26.8%
PLANNING AREA #003 = 10.03 AC
IMPERVIOUS AREA = 3.07 AC
IMPERVIOUS = 30.56%
PLANNING AREA #004 = 3.04 AC
IMPERVIOUS AREA = .717 AC
IMPERVIOUS = 23.59%
PLANNING AREA #008 = .964 AC
IMPERVIOUS AREA = .232 AC
IMPERVIOUS = 24.09%
PLANNING AREA #010 = 15.84 AC
IMPERVIOUS AREA = 2.35 AC
IMPERVIOUS = 14.81%

NOTES:

1. STREAM LOCATIONS AND IMPAIRMENT DESIGNATIONS ARE SHOWN BASED ON DATA PROVIDED BY PADEP AND HOSTED ON THE PASDA WEBSITE. STREAM LOCATIONS MAY NOT ACCURATELY REPRESENT PHYSICAL/FIELD CONDITIONS. THIS OFFICE HAS MODIFIED STREAM AND WATERSHED LOCATIONS TO THE MOST ACCURATE CONTOURS AVAILABLE.
2. STORM SEWERSHED AREAS ARE PARSED TO EXCLUDE AREAS THAT BYPASS BTMS4 SYSTEM AND AREAS THAT DO NOT DRAIN TO IMPAIRED WATERS OR WATERS WITHIN 5 MILES OF IMPAIRED WATERS.
3. IMPERVIOUS AREA IS FROM 2015 DVRPC LAND USE DATA.

LEGEND:

- 023 Observation Point
- Unimpaired Streams
- Impaired Streams
- Watersheds
- DEER RUN Subwatershed Designation
- EAST BRANCH PERKIOMEN CREEK Watershed Designation
- Urbanized Area
- BMP Private
- Water Bodies
- Impervious Area
- Parcels
- Planning Area
- BT Boundary
- Parsed Area
- Storm Sewershed

1000 500 0 1000 2,000 3,000

SCALE: 1" = 1000'

NO.	DATE	REVISIONS

BEDMINSTER TOWNSHIP
IMPERVIOUS SURFACES MODELED WITHIN PLANNING AREAS

C. ROBERT WYNN ASSOCIATES, INC.
MUNICIPAL & CIVIL ENGINEERING
211 W. Broad Street, Quakertown, PA 18951 Phone 215-536-7336 Fax 215-536-5361

DWN BY EAS | CKD BY CJG | DATE: FEBRUARY 11, 2020 | SCALE 1"= 1000' | JOB NO.: 123-004 | DRAWING NO. 1 OF 1

DRAFT

APPENDIX E

Sediment Loading Spreadsheet within Planning Areas

Sediment Loading Spreadsheet within Planning Area

MUNICIPALITY	ACRES	PLShpArea (SF)	ImpShparea(SF)	%Impervious	%Pervious	Sediment Loading (lbs/yr)*	Obs#
Bedminster	20,066	20,164.8	5,403.2	26.80	73.20	318	001
Bedminster	20,066	154,483.5	31,134.3	20.15	79.85	2,064	002
Bedminster	20,066	436,988.2	133,543.6	30.56	69.44	7,484	003
Bedminster	20,066	132,288.0	31,212.9	23.59	76.41	1,932	004
Bedminster	20,066	855,899.9	139,403.5	16.29	83.71	10,244	005
Bedminster	20,066	516,875.9	207,593.3	40.16	59.84	10,645	006
Bedminster	20,066	71,719.6	12,115.2	16.89	83.11	874	007
Bedminster	20,066	41,980.5	10,114.3	24.09	75.91	621	008
Bedminster	20,066	659,222.9	82,277.6	12.48	87.52	6,983	009
Bedminster	20,066	689,847.9	102,149.7	14.81	85.19	7,888	010
Bedminster	20,066	151,583.3	4,018.2	2.65	97.35	1,067	011
Bedminster	20,066	5,004,448.6	899,850.3	17.98	82.02	62,955	012
Bedminster	20,066	313,158.7	102,380.0	32.69	67.31	5,604	013
Bedminster	20,066	835,458.1	20,284.1	2.43	97.57	5,815	014
Bedminster	20,066	2,427,816.9	710,814.8	29.28	70.72	40,455	015
Bedminster	20,066	72,227.1	26,694.5	36.96	63.04	1,404	016
Bedminster	20,066	849,342.0	205,283.0	24.17	75.83	12,584	017
Bedminster	20,066	75,377.8	35,598.2	47.23	52.77	1,745	018
Bedminster	20,066	73,346.2	9,783.5	13.34	86.66	800	019
Bedminster	20,066	103,038.4	44,512.2	43.20	56.80	2,235	020
Bedminster	20,066	5,591,597.2	226,636.8	4.05	95.95	42,195	021
Bedminster	20,066	5,024,828.6	143,143.7	2.85	97.15	35,739	022
Bedminster	20,066	575,237.1	190,173.6	33.06	66.94	10,371	023
Bedminster	20,066	684,386.1	57,500.3	8.40	91.60	6,240	024
Bedminster	20,066	465,124.9	72,930.0	15.68	84.32	5,465	025
Bedminster	20,066	82,976.6	19,485.2	23.48	76.52	1,209	026
Bedminster	20,066	286,178.3	24,280.3	8.48	91.52	2,618	027
Bedminster	20,066	479,550.2	134,646.1	28.08	71.92	7,783	028
Bedminster	20,066	51,116.2	6,135.6	12.00	88.00	533	029
Bedminster	20,066	28,627.0	3,593.4	12.55	87.45	304	030
Bedminster	20,066	613,614.3	233,005.2	37.97	62.03	12,151	031
Bedminster	20,066	1,540,854.0	566,171.8	36.74	63.26	29,829	032
Bedminster	20,066	2,571,458.9	335,001.8	13.03	86.97	27,749	033
Bedminster	20,066	52,534.8	14,615.7	27.82	72.18	848	034
Bedminster	20,066	317,850.9	97,707.7	30.74	69.26	5,464	035
Bedminster	20,066	90,986.5	23,773.0	26.13	73.87	1,413	036
Bedminster	20,066	569,430.4	231,616.1	40.68	59.32	11,834	037
Bedminster	20,066	227,378.7	90,834.1	39.95	60.05	4,665	038
Bedminster	20,066	233,104.1	58,283.7	25.00	75.00	3,524	039
Bedminster	20,066	63,823.6	22,278.4	34.91	65.09	1,193	040
Bedminster	20,066	1,077,155.4	233,248.4	21.65	78.35	14,979	041
Bedminster	20,066	24,427.2	10,070.4	41.23	58.77	513	042
Bedminster	20,066	157,426.5	35,478.7	22.54	77.46	2,240	043
Bedminster	20,066	561,579.0	174,425.9	31.06	68.94	9,719	044
Bedminster	20,066	7,944.7	3,154.2	39.70	60.30	162	045

Sediment Loading Spreadsheet within Planning Area

Bedminster	20,066	8,399.1	4,303.5	51.24	48.76	207	046
Bedminster	20,066	815,455.4	371,301.8	45.53	54.47	18,376	047
Bedminster	20,066	61,687.7	2,415.1	3.92	96.08	463	048
Bedminster	20,066	1,165,450.8	311,580.6	26.73	73.27	18,346	049
Bedminster	20,066	1,048,314.7	202,456.6	19.31	80.69	13,691	050
Bedminster	20,066	202,304.6	45,458.6	22.47	77.53	2,873	051
Bedminster	20,066	380,402.6	42,162.1	11.08	88.92	3,837	052
Bedminster	20,066	40,140.8	13,463.6	33.54	66.46	731	053
					Total Sediment Loading=	**480,977** (lbs/yr)	
					within HUC12 020401050703 (Lower Tohickon Creek)=	480,977 (lbs/yr)	100.00%

* Sediment Loading for Impervious Land within Urbanized Area is 1,839 lbs/AC/yr
* Sediment Loading for Pervious Land within Urbanized Area is 264.96 lbs/AC/yr

Total Sediment Loading w/o accounting for BMPs = 480,977 lbs/yr (240.49 tons/yr)

Sediment Loading Removed by Existing BMPs= 127,515 lbs/yr (63.76 tons/yr)
(Refer to sediment removal calculations on Stormwater Basin Database)
Removed within HUC12 020401050703 (Lower Tohickon Creek)= 127,515 (lbs/yr)

Overall Existing Sediment Load for Bedminster Township= 480,977 lbs/yr - 127,515 lbs/yr = 353,462 lbs/yr (176.73 tons/yr)
Within HUC12 020401050703 (Lower Tohickon Creek)= 480,977 lbs/yr- 127,515 lbs/yr= 353,462 lbs/yr

Total PRP Requirement Reduction (10%) = 353,462 * .10 = 35,346 lbs/yr (17.67 tons/yr)
Within HUC12 020401050703 (Lower Tohickon Creek)= 353,462 *.10= 35,346 lbs/yr

APPENDIX F

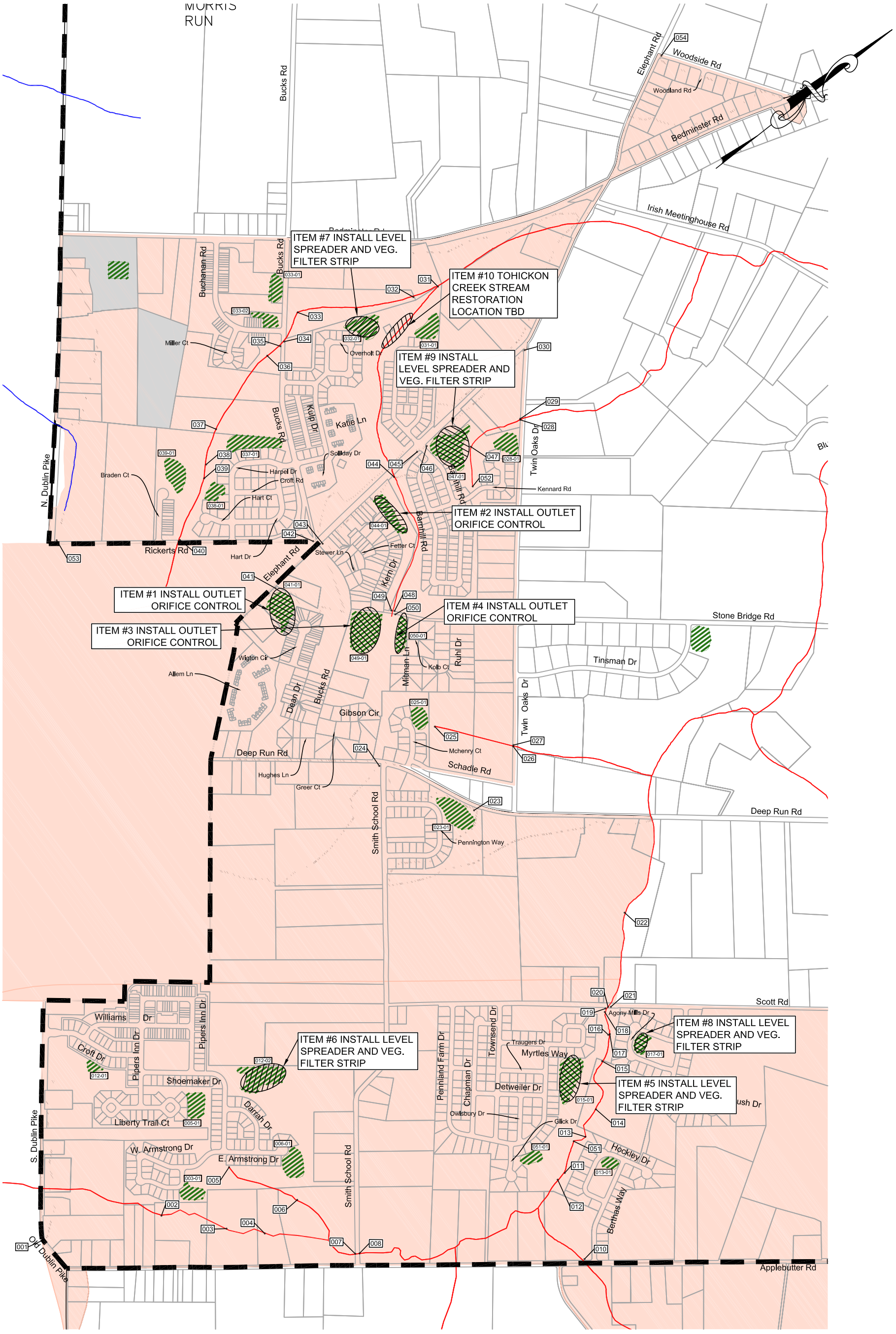
Stormwater Basin Database

Stormwater Basin Database within Planning Area

Basin ID	Maintained By	Description	Street/Access	Year (Appx.)	BMP Type	DWF*	Improvements/Comments	TSS %	Basin Drainage Area (AC)	Adj Factor	% Impervious	% Pervious	Sed. Removal (lbs/yr)	Latitude	Longitude
003-01	Private	Bedminster Square	W Armstrong Dr	2004	Wet Pond	Y	Wet pond with wetland plants	60%	8.17	1	30.56	69.44	3,655	N40° 22' 05"	W75° 11' 17"
005-01	Private	Bedminster Square	Liberty Trail Ct	2004	Wet Pond	Y	Wet pond with wetland plants	60%	8.29	1	16.29	83.71	2,592	N40° 22' 11"	W75° 11' 26"
006-01	Private	Bedminster Square	E Armstrong Dr	2004	Wet Pond	Y	Wet pond	60%	10.81	1	40.16	59.84	5,821	N40° 22' 15"	W75° 11' 11"
012-01	Private	Bedminster Square	Croft Dr	2004	Dry Extended Detention Basin	N	Dry basin, partially mowed	60%	9.18	0	17.98	82.02	0	N40° 22' 05"	W75° 11' 38"
012-02	Private	Bedminster Square	Shoemaker Dr	2004	Wet Pond	Y	Wet pond with wetland plants	60%	42.77	1	17.98	82.02	14,060	N40° 22' 18"	W75° 11' 23"
013-01	Private	Pennland Farm	Hockley Dr	2006	Dry Extended Detention Basin	N	Dry basin, partially mowed	60%	6.27	1	32.69	67.31	2,931	N40° 22' 41"	W75° 10' 44"
015-01	Private	Pennland Farm	Myrtles Way	2006	Dry Extended Detention Basin	N	Dry basin, partially mowed	60%	55.37	1	29.28	70.72	24,113	N40° 22' 43"	W75° 10' 57"
017-01	Private	Pennland Farm	Angony Mills Dr	2006	Dry Extended Detention Basin	N	Dry basin, partially mowed	60%	18.80	1	24.17	75.83	7,280	N40° 22' 52"	W75° 10' 55"
023-01	Private	Wickham Place	Pennington Way	2002	Wetland	Y	Constructed Wetland	60%	12.87	1	33.06	66.94	6,065	N40° 22' 51"	W75° 11' 35"
025-01	Private	Linwood Rice (Telvil)	McHenry Ct	2016	Wet Pond	Y	Wet Pond	60%	8.34	1	15.68	84.32	2,562	N40° 22' 54"	W75° 11' 48"
028-01	Private	Bedminster Hunt	Kennard Rd	2004	Dry Extended Detention Basin	N	Dry basin, mowed	60%	10.34	1	28.08	71.92	4,388	N40° 23' 19"	W75° 12' 10"
031-01	Private	Bedminster Hunt West (Kulp Farm)	Saddlery Dr	2015	Dry Extended Detention Basin	N	Dry basin, mowed	60%	10.93	1	37.97	62.03	5,656	N40° 23' 21"	W75° 12' 29"
032-01	Private	Bedminster Hunt West (Kulp Farm)	Overholt Dr	2015	Dry Extended Detention Basin	N	Dry basin, mowed	60%	33.76	1	36.74	63.26	17,081	N40° 23' 15"	W75° 12' 35"
033-01	Private	Cliffside Manor	Bucks Rd	2015	Dry Extended Detention Basin	N	Dry basin, mowed	60%	10.01	1	13.03	86.97	2,823	N40° 23' 10"	W75° 12' 46"
033-02	Private	Cliffside Manor	Buchanan Rd	2015	Dry Extended Detention Basin	N	Dry basin, mowed	60%	3.67	1	13.03	86.97	1,034	N40° 23' 08"	W75° 12' 44"
037-01	Private	Bedminster Crossing	Harpel Dr	2015	Wetland	Y	Constructed Wetland	60%	11.91	1	40.68	59.32	6,467	N40° 22' 59"	W75° 12' 32"
038-01	Private	Bedminster Crossing	Hart Ct	2015	Wetland	Y	Constructed Wetland	60%	4.86	1	39.95	60.05	2,604	N40° 22' 52"	W75° 12' 30"
039-01	Private	Bedminster Crossing	Braden Ct	2015	Wetland	Y	Constructed Wetland	60%	4.92	1	25.00	75.00	1,918	N40° 22' 50"	W75° 12' 35"
041-01	Private	Stone Bridge	Wigton Cir	1980	Dry Detention Basin	N	Dry basin, mowed	10%	23.55	1	21.65	78.35	1,427	N40° 22' 50"	W75° 12' 12"
044-01	Private	Stone Bridge	Kern Dr	1980	Dry Detention Basin	N	Dry basin, mowed	10%	11.64	1	31.06	68.94	878	N40° 23' 05"	W75° 12' 13"
047-01	Private	Bedminster Hunt	Barnhill Rd	2004	Wet Pond	Y	Wet pond with wetland plants	60%	18.11	1	45.53	54.47	10,665	N40° 23' 15"	W75° 12' 15"
049-01	Private	Stone Bridge	Bucks Rd	1980	Dry Detention Basin	N	Dry basin, mowed	10%	25.37	1	26.73	73.27	1,740	N40° 22' 55"	W75° 12' 02"
050-01	Private	Stone Bridge	Mitman Ln	1980	Dry Detention Basin	N	Dry basin, mowed	10%	11.00	1	19.31	80.69	626	N40° 22' 58"	W75° 11' 59"
051-01	Private	Pennland Farm	Glick Dr	2006	Dry Extended Detention Basin	N	Dry basin, partially mowed	60%	3.04	1	22.47	77.53	1,130	N40° 22' 35"	W75° 10' 52"
	* DWF - Dry Weather Flow									**Sediment Removal for BMP's (lbs/yr)=**			127,515		
								Removed within HUC12 020401050703 (Lower Tohickon Creek)=					127,515		

APPENDIX G

Pollution Reduction Plan Location Map



LEGEND:

- PRP Locations
- 023 Observation Point
- Unimpaired Streams
- Impaired Streams
- Watersheds
- Subwatersheds
- DEER RUN Subwatershed Designation
- TOHICKON CREEK Watershed Designation
- Urbanized Area
- BMP Private

NOTES:

1. STREAM LOCATIONS AND IMPAIRMENT DESIGNATIONS ARE SHOWN BASED ON DATA PROVIDED BY PADEP AND HOSTED ON THE PASDA WEBSITE. STREAM LOCATIONS MAY NOT ACCURATELY REPRESENT PHYSICAL/FIELD CONDITIONS. THIS OFFICE HAS MODIFIED STREAM AND WATERSHED LOCATIONS TO THE MOST ACCURATE CONTOURS AVAILABLE.

1000 500 0 1000 2,000 3,000

SCALE: 1" = 1000'

NO.	DATE	REVISIONS
1	3-24-20	ADD PRP ITEM

BEDMINSTER TOWNSHIP
POLLUTION REDUCTION PLAN LOCATIONS

C. ROBERT WYNN ASSOCIATES, INC.
MUNICIPAL & CIVIL ENGINEERING
211 W. Broad Street, Quakertown, PA 18951 Phone 215-536-7336 Fax 215-536-5361

DRAWING NO. 1 OF 1

DWN BY EAS | CKD BY CJG | DATE: FEBRUARY 11, 2020 | SCALE 1"= 1000' | JOB NO.: 123-004

DRAFT

APPENDIX H

PADEP BMP Effectiveness Values Table

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

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

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

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

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

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

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

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Storm Sewer System Solids Removal	0.0027 for sediment, 0.0111 for organic matter	0.0006 for sediment, 0.0012 for organic matter	1 – TN and TP concentrations	This BMP (also referred to as "Storm Drain Cleaning") involves the collection or capture and proper disposal of solid material within the storm system to prevent discharge to surface waters. Examples include catch basins, stormwater inlet filter bags, end of pipe or outlet solids removal systems and related practices. Credit is authorized for this BMP only when proper maintenance practices are observed (i.e., inspection and removal of solids as recommended by the system manufacturer or other available guidelines). The entity using this BMP for pollutant removal credits must demonstrate that they have developed and are implementing a standard operating procedure for tracking the material removed from the sewer system. Locating such BMPs should consider the potential for backups onto roadways or other areas that can produce safety hazards. To determine pollutant reductions for this BMP, these steps must be taken: 1) Measure the weight of solid/organic material collected (lbs). Sum the total weight of material collected for an annual period. Note – do not include refuse, debris and floatables in the determination of total mass collected. 2) Convert the annual wet weight captured into annual dry weight (lbs) by using site-specific measurements (i.e., dry a sample of the wet material to find its weight) or by using default factors of 0.7 (material that is predominantly wet sediment) or 0.2 (material that is predominantly wet organic matter, e.g., leaf litter). 3) Multiply the annual dry weight of material collected by default or site-specific pollutant concentration factors. The default concentrations are shown in the BMP Effectiveness Values columns. Alternatively, the material may be sampled (at least annually) to determine site-specific pollutant concentrations. DEP will allow up to 50% of total pollutant reduction requirements to be met through this BMP. The drainage area treated by this BMP may be no greater than 0.5 acre unless it can be demonstrated that the specific system proposed is capable of treating stormwater from larger drainage areas. For planning purposes, the sediment removal efficiency specified by the manufacturer may be assumed, but no higher than 80%.

APPENDIX I

Proof of Publication