

East Donegal Township Pollutant Reduction Plan

DRAFT - July 2017



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Table of Contents

Introduction.....	1
A. Public Participation – <i>to be completed following Public Comment Period</i>.....	1
B. Map.....	1
B.1 Mapping of Planning Areas.....	2
C. Pollutants of Concern	5
D. Existing Load for Pollutants of Concern	6
D.1 Unnamed Tributaries to the Susquehanna River Existing Load.....	8
D.2 Chiques Creek Watershed Existing Load	10
D.3 Donegal Creek Watershed Existing Load.....	11
D.4 East Donegal Township’s Total Aggregated Existing Load	12
E. BMPs Selected to Achieve the Minimum Required Reductions in Pollutant Loading....	12
E.2. Funding Mechanism Identification.....	15
F. Responsible Parties for Operation and Maintenance (O&M) of BMPs	15
G. Works Cited	17

Table of Appendices

Appendix A – Public Participation: Item A1) Public Notice; Item A2) Written Public Comments; Item A3) Record of Consideration of Written Public Comments

Appendix B – Map B1. East Donegal Township Land Use Types and Planning Areas;
Map B2. East Donegal Township MS4 PRP Map

Appendix C – Summary of MapShed Runs and MapShed Inputs and Results

Appendix D – Proposed BMP Load Reduction Calculations

Introduction

This pollutant reduction plan (PRP) was developed for East Donegal Township as a requirement of Permit PAG#133612 for their municipal separate storm sewer system (MS4). The PRP outlines the actions the Township will take to address pollutant loads to the waterbodies within the MS4 that drain to the Chesapeake Bay/impaired waters within the MS4. These actions include public participation, mapping of outfalls and other discharges, pollutant load calculations, best management practices (BMPs) selection, identification of potential funding sources and partners, and operations and maintenance (O&M) activities.

A. Public Participation – *to be completed following Public Comment Period*

Public participation is an essential part of the PRP because it enhances buy-in from landowners that may have an impact on pollutant discharges, can uncover missing elements or errors in calculations, and builds cooperative partnerships among the municipality and other entities.

A copy of the draft PRP was released via public notice on MONTH, DAY, YEAR to the following media outlets: _____. The notice ran for # days. A copy of the public notice is included as Item A-1. The public was given 30 days to provide commentary on the contents of the PRP. A copy of all written public comments is included as Item A-2. East Donegal Township held a public meeting on MONTH, DAY, YEAR to receive verbal commentary on the contents of the PRP. A copy of the comments and the record of consideration is included as Item A-3. East Donegal Township used the public comments to update the draft PRP in the following ways: _____.

B. Map

East Donegal Township is located entirely within the Chesapeake Bay Basin. The Chiques Creek watershed comprises approximately 10 percent of the Township (1,557 acres). The Donegal Creek watershed and its tributaries account for approximately 42 percent of East Donegal Township (6,383 acres). The Donegal Creek confluences with the Chiques Creek just before the discharge to the Susquehanna River. The Unnamed Tributaries (UNTs) to the Susquehanna River cover approximately 47 percent of East Donegal Township (7,146 acres) watershed drainage. There is less than 1 percent of the Conoy Creek watershed within East Donegal Township; however, there are no urban areas or MS4 infrastructure in or draining to that area. Figure 1 identifies the subwatershed basins within East Donegal, as well as the non-attaining (impaired) and attaining streams from the DEP 2014 Integrated List and the location of the 2010 Census urban area. Additional maps are provided in Appendix B.

Map B1 in Appendix B identifies the land use types throughout the Township, the MS4 outfall locations, and the storm sewershed boundaries grouped into Planning Areas.

East Donegal Township is over 80 percent non-urban lands, mostly used for agricultural activity. East Donegal's Urbanized Area (UA) covers only 2,401.4 acres based on the 2010 U.S. Census data. Less than 15 percent of this UA is impervious based on 2011 MapShed Land Use data. A significant portion of the UA is in agriculture or forested land use types. MapShed impervious surface cover by land use type includes the following ranges:

- **Low Density Residential and Mixed Use: <30% impervious**
- **Medium Density Residential and Mixed Use: 30 – 75% Impervious**
- **High Density Residential and Mixed Use: >75% Impervious**

An additional map, Map B2 in Appendix B, identifies the Planning Areas for the Chiques Creek, Donegal Creek, and Unnamed Tributaries of the Susquehanna River. It also includes the existing structural best management practice (BMP) that is considered in the calculation of the existing pollutant loads and the proposed location(s) of structural BMPs that will be implemented to achieve the required pollutant load reductions per watershed during the current permit cycle. Planning areas include all non-excluded areas on the maps and are primarily designated by subwatershed.

B.1 Mapping of Planning Areas

In accordance with DEP's guidelines, East Donegal Township used the following process to parse areas and establish their MS4 planning area for the PRP. Prior to beginning PRP development, East Donegal went through a desktop and field verification exercise to establish inlets, outlets, pipes, swales and outfalls ("system") within the Township.

As part of PRP development, East Donegal's system mapping was added to a base map with National Hydrology Dataset (NHD) streams, topography, and watershed boundaries in order to aid in the field drainage boundary assessment to establish MS4 planning areas for the PRP. Mapping also included areas that could be parsed out such as state-owned road right of ways and industrial facilities covered by existing NPDES (National Pollutant Discharge Elimination System) industrial stormwater permits.

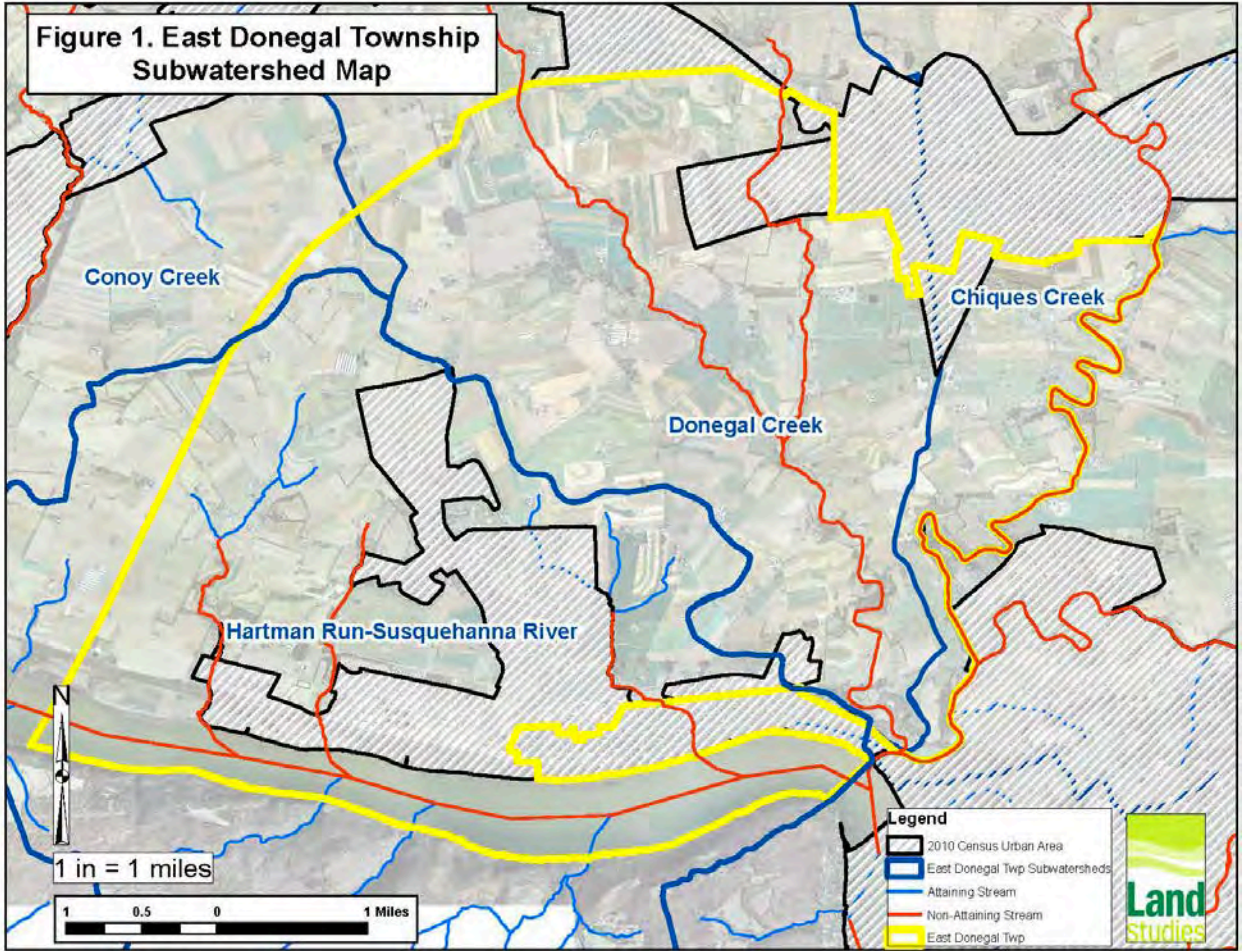
The field review then continued to field verify outfalls on NHD streams with matching observed general drainage flow to the map; or to determine that the regulated system (inlets, curb and gutter, etc.) tied to the end point adequately collects stormwater run-off from the drainage areas reviewed. This process involves a visual tracing against the system map. The field review is supported by a condensed desktop reconfirmation analysis, where a topographic map or elevations of an aerial image, as well as the "system" map, are reviewed to determine the areas draining to outfalls and how these areas could be combined into planning areas that can be mapped in MapShed.

Planning areas were then drawn to capture the drainage areas that are collected into the system and discharge via the outfall or group of outfalls within a watershed.

Within the UAs between these East Donegal drainage areas, there were over 500 acres of agricultural land and forested land that did not contain any MS4 infrastructure. These pervious areas that did not drain to the MS4 system were parsed out of the planning areas. Additionally, there were pockets of medium-density development that do not drain to any type of MS4 infrastructure, but drain as sheet flow into surrounding lands; thus, these areas were parsed out of the planning areas. In total, 894 acres of UA were excluded from the planning areas based on the aforementioned rationale (see Excluded Areas in Map B2).

NOTE: Excluded Areas are shown as overlays to the various planning areas displayed in Maps B1 and B2.

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C. Pollutants of Concern

Since the waterways of East Donegal Township ultimately drain to the Chesapeake Bay, the following are pollutants of concern: sediment, total nitrogen (TN), and total phosphorus (TP). Because of this drainage to the Chesapeake Bay, the Township must prepare a CBPRP in accordance with Appendix D in the PAG-13 General Permit. East Donegal Township also discharges stormwater to locally impaired waters, including the Chiques Creek, Donegal Creek and its tributaries, and Unnamed Tributaries to the Susquehanna. Therefore, it must reduce pollutant loads associated with those impairments and prepare an impaired waters PRP in accordance with Appendix E in the PAG-13 General Permit. East Donegal Township will select BMPs to reduce the sediment pollutant load by 10 percent, which is assumed to then reduce the TN and TP by three percent and five percent respectively according to DEP's PRP Instructions (3800-PM-BCW0100k).

Table 1 shows the affected subwatersheds within East Donegal Township and the pollutant(s) that are of concern to the municipality as shown on the DEP MS4 requirements table revised 4/7/2017. Other impairments listed in Table 1 that are not addressed in this upcoming permit cycle will be considered in future permit cycles.

Table 1. East Donegal Township MS4 Requirements Table

MS4 Planning Area	Pollutant(s) of Concern
Chiques Creek	Appendix E – Nutrients (4a)
Unnamed Tributaries to Susquehanna River	Appendix E – Nutrients, Siltation (5)
Susquehanna River ¹	Appendix B – Pathogens (5), Appendix C- PCBs (5)
Donegal Creek (including Unnamed Tributaries)	Appendix E – Nutrients, Organic Enrichment / Low DO, Suspended Solids (4a)
Chesapeake Bay Nutrients / Sediment	Appendix D – Nutrients, Siltation (4a)

¹NOTE1: The Susquehanna River to which the Unnamed Tributaries discharge is identified on the MS4 Requirements Table. The Susquehanna River is identified in the Appendix B Pollutants of Concern for pathogens and Appendix C Pollutants of Concern for PCBs; however, details on Appendix B and C Pollutants are not included within the scope of this CBPRP / PRP.

In accordance with DEP's PRP Instructions document (3800-PM-BCW0100K), this report is required specifically for stormwater discharges of nutrients and sediment to surface waters for the Chesapeake Bay (Appendix D) and impaired waters (Appendix E). Separate from the PRP, Pollutant Control Measures (PCMs) described in DEP's General Permit (3800-PM-BCW0100d) are to be implemented for Appendix A, B, and/or C pollutants of concern identified in the MS4 Requirements Table.

The Chiques Creek is identified as impaired only for nutrients (not siltation); thus, a minimum five percent total phosphorus (TP) load reduction will be required. Since TP is the limiting nutrient, it is assumed that meeting the five percent TP reduction would satisfy the three percent total nitrogen (TN) reduction requirement. For the other watersheds that are identified as impaired for both siltation and nutrients, East Donegal is using the “presumptive approach” in which it is assumed that a 10 percent sediment reduction will also accomplish the required nutrient reduction. For these watersheds only sediment loads within each MS4 planning area are reported in this PRP.

As East Donegal Township is subject to both a CBPRP and an impaired waters PRP, it will select BMPs that target the impaired waters discharges first, as action toward the local impaired waters will have a beneficial impact on the Chesapeake Bay.

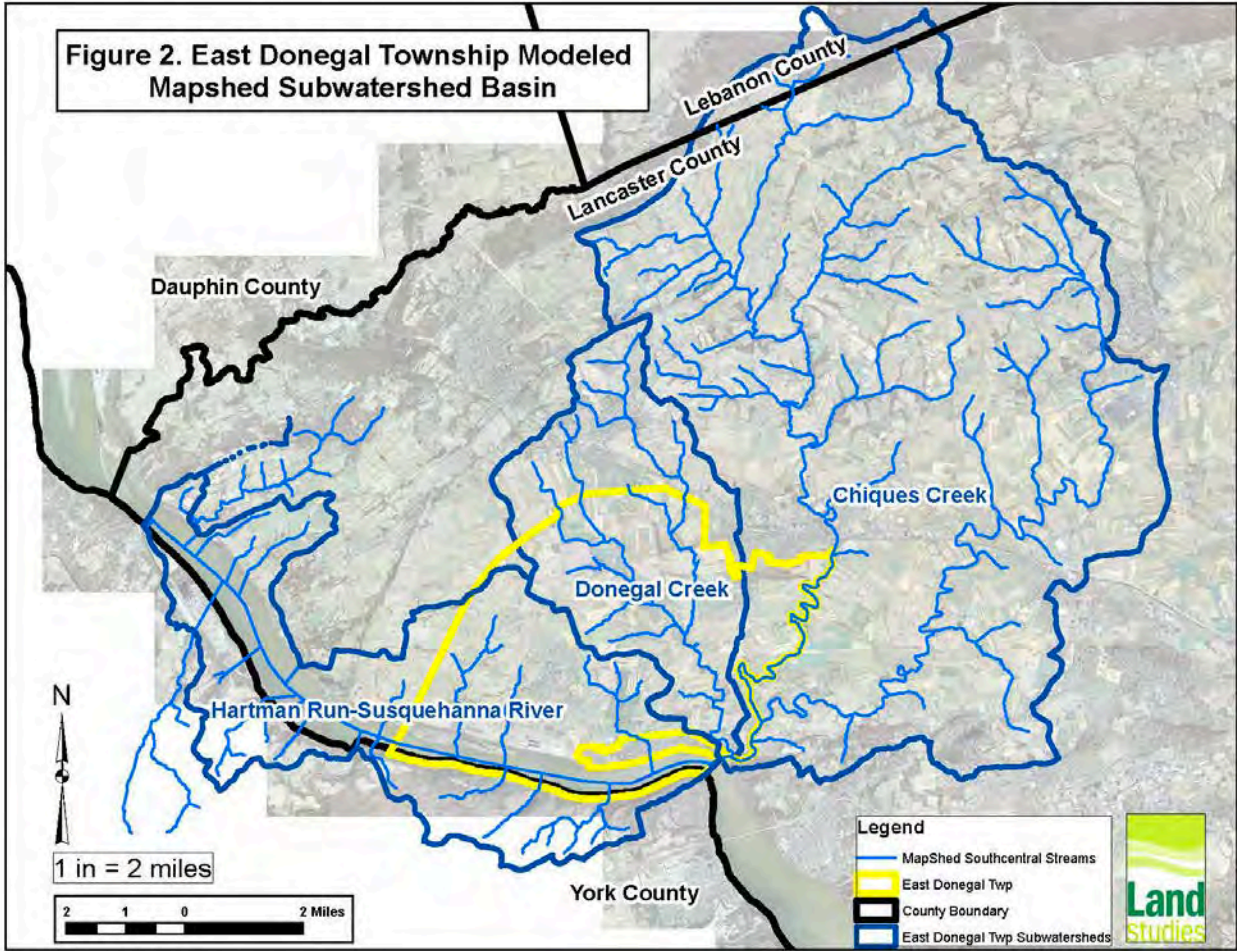
D. Existing Load for Pollutants of Concern

East Donegal has three primary watersheds: Unnamed Tributaries to the Susquehanna River, Donegal Creek, and Chiques Creek. The existing load for East Donegal’s corresponding Unnamed Tributaries to the Susquehanna, Donegal Creek, and Chiques Creek MS4 Planning Areas were calculated using MapShed. Although Chiques Creek is identified as impaired for nutrients only, the sediment loading from this drainage area must be addressed as part of the CBPRP load reduction requirements for the entire municipality.

In order to model loads from MS4 Planning areas in MapShed base model runs of the following subwatersheds (shown in Figure 2) were run:

- **Unnamed Tributaries to the Susquehanna River** - 29.7 square mile portion of the Hartman Run-Susquehanna River HUC12 subwatershed;
- **Donegal Creek** – 17.2 square mile portion of the Donegal Creek HUC12 subwatershed;
- **Chiques Creek** – 79.3 square mile portion of the Little Chiques Creek and Lower Chiques Creek HUC12 subwatersheds;

Each planning area was digitized as an urban area in MapShed and the corresponding base model was rerun for this planning area. The MapShed UA tool was then used to establish the loading for each planning area. Only one contiguous UA could be run in MapShed per model run. Therefore, in order to keep the number of MapShed model runs reasonable, the planning areas were kept as large as possible within a watershed. Land use acreage and corresponding load adjustments were made to some of the MapShed model runs to account for excluded areas that were included in the modeled planning areas and vice versa where smaller “islands” of land that are included in the planning area could not reasonably be included in the model run. Screenshots of MapShed input and output for each planning area run are provided in Appendix C.



D.1 Unnamed Tributaries to the Susquehanna River Existing Load

Table 2 shows the sediment loading rates for each land use type for the Unnamed Tributaries to the Susquehanna River Model Runs.

Table 2. East Donegal MapShed Sediment Land Use Loading Rates – Unnamed Tributaries to the Susquehanna River

MapShed Land Cover	Loading Rate (lb/ac)	Total Load (lb)
Hay/Pasture	86.1	10,246
Cropland	1,147.5	391,298
Forest	19.4	233
Wetland	0	0
Disturbed	0	0
Turfgrass	0	0
Open Land	209.5	17,179
LD Mixed	11.6	464
MD Mixed	57.1	2,113
HD Mixed	57.2	5,205
LD Residential	11.6	255
MD Residential	57.2	23,166
HD Residential	0	0
Water	0	0

Table 3. Existing load in the Unnamed Tributaries to the Susquehanna River Planning Area.

Planning Area Name	Total Acres (adjusted)	Land Use Sediment Load (lbs)	Streambank Sediment Load (lbs)	Total Mapshed Sediment Load (lb)	Existing BMP Load Reductions (lb)	Final Planning Area Existing Load (lbs)
UNTs to Susquehanna River	1,212.5	469,915	415,682	885,596	600	884,996
UNTs to Susquehanna River 10% Reduction						88,499.6

Based on these existing load calculations it was determined that the Unnamed Tributaries to the Susquehanna River Planning Area existing loading is 884,996 lbs. The minimum sediment reduction required for this Planning Area is 88,499.6 lbs. (as shown in Table 3).

East Donegal Township identified one structural BMP, located within the Unnamed Tributaries to the Susquehanna River Planning Area that is currently in place and functioning. The existing loading estimate was adjusted to account for pollutant reductions from this BMP.

Using the MapShed Urban BMP Editor to determine the sediment reductions resulting from this existing BMP, the sediment load from this BMP model run was compared to the Unnamed Tributaries to the Susquehanna River watershed model run and the difference was attributed to the existing BMP included in the BMP editor.

The existing BMP calculation information needed to populate the MapShed Urban BMP Editor is provided in Appendix C along with screenshots of the Urban BMP editor for each model run.

Table 4. Existing BMP

BMP:	East Donegal Twp Building Pervious Parking Lot Paving
Location:	Location = 40° 04' 41.43" N, 76° 34' 25.60" W
Map:	See Existing BMP on Map B2.
Permit #:	N/A
Load Reduction:	600 lbs/yr of sediment removal; Load reduction calculations were completed using MapShed (See Appendix C for details).
BMP Description:	The 0.09-acre parking lot of East Donegal Township's municipal building was converted to a pervious paving parking lot in 2016.
O&M Activities:	Quarterly inspections of the pervious pavement shall be conducted to verify that it is functioning as intended and no cracking is occurring. The pervious asphalt shall be vacuum swept at least once per year.

D.2 Chiques Creek Watershed Existing Load

Table 5 shows the sediment and nutrient loading rates for each land use type for the Chiques Creek Watershed Model Runs.

Table 5. East Donegal MapShed Sediment and Total Phosphorus Land Use Loading Rates – Chiques Creek

MapShed Land Cover	Sediment Loading Rate (lb/ac)	Total Sediment Load (lb)	Total P Loading Rate (lb/ac)	Total P Load (lb)
Hay/Pasture	124.7	873	0.24	1.68
Cropland	0	0	0	0
Forest	0	0	0	0
Wetland	0	0	0	0
Disturbed	0	0	0	0
Turfgrass	0	0	0	0
Open Land	188.2	1,317	0.16	1.12
LD Mixed	14.7	29	0.04	0.08
MD Mixed	65.4	327	0.16	0.8
HD Mixed	65.4	654	0.16	1.6
LD Residential	0	0	0	0
MD Residential	65.4	4,840	0.16	11.84
HD Residential	0	0	0	0
Water	0	0	0	0

Table 6. Existing sediment and TP load in the Chiques Creek Planning Area.

Planning Area Name	Total Acres (adjusted)	Land Use Sediment Load (lbs)	Streambank Sediment Load (lbs)	Total Mapshed Sediment Load (lb)	Existing BMP Load Reductions (lb)	Final Planning Area Existing Load (lbs)
Chiques Creek Sediment Load	105	8,040	99,448	107,489	N/A	107,489
Chiques Creek 10% Sediment Reduction						10,748.86
Chiques Creek Phosphorus Load		17.12	52.40	69.52	N/A	69.52
Chiques Creek 5% Phosphorus Reduction*						3.48

*Along with aggregating the sediment loads for the entire municipality, East Donegal Township will use the “presumptive approach” to address the nutrient only impairment for the Chiques Creek watershed per written approval from Scott Arwood from PADEP on 6/13/17 (Arwood, June 2017).

Based on these existing load calculations it was determined that the Chiques Creek Planning Area existing sediment loading is 107,489. The minimum sediment reduction required for this Planning Area is 10,748.86lbs (as shown in Table 6).

D.3 Donegal Creek Watershed Existing Load

Table 7 shows the sediment loading rates for each land use type for the Donegal Creek Watershed Model Runs.

Table 7. East Donegal MapShed Sediment Land Use Loading Rates – Donegal Creek

MapShed Land Cover	Loading Rate (lb/ac)	Total Load (lb)
Hay/Pasture	65.4	1,635
Cropland	833.1	39,156
Forest	6.4	13
Wetland	0	0
Disturbed	0	0
Turfgrass	0	0
Open Land	89.2	1,784
LD Mixed	13.8	138
MD Mixed	66.7	800
HD Mixed	66.6	799
LD Residential	0	0
MD Residential	66.6	2,930
HD Residential	0	0
Water	0	0

Based on these existing load calculations it was determined that the Donegal Creek Planning Area existing loading is 132,296 lbs. The minimum sediment reduction required for this Planning Area is 13,229.6 lbs. (as shown in Table 8).

Table 8. Existing load in the Donegal Creek Planning Area.

Planning Area Name	Total Acres (adjusted)	Land Use Sediment Load (lbs)	Streambank Sediment Load (lbs)	Total Mapshed Sediment Load (lb)	Existing BMP Load Reductions (lb)	Final Planning Area Existing Load (lbs)
Donegal Creek	172	90,647	41,649	132,296	N/A	132,296
Donegal Creek 10% Reduction						13,229.6

D.4 East Donegal Township's Total Aggregated Existing Load

East Donegal received written approval from DEP on June 13, 2017 to aggregate all of the watershed planning area loads for the municipality into a total aggregated load for East Donegal Township (Arwood, June 2017). Table 9 shows planning area loads and the total aggregated load for East Donegal Township.

Table 9. Total Existing Load for East Donegal Township.

Planning Area Name	Final Planning Area Existing Load (lbs)
UNTs to the Susquehanna River	884,996
Chiques Creek	107,489
Donegal Creek	132,296
Total Aggregated Load for East Donegal Twp	1,124,781
10% Sediment Reduction Requirement for Aggregated Load	112,478

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

Based on the 10 percent sediment reduction targets established above, East Donegal Township has identified a strategy to meet the minimum load reductions within five years following DEP's approval of permit coverage. The nutrient reduction requirements for the impaired waters are assumed to be addressed by the 10 percent sediment reductions.

Summary of Alternatives and Selection of BMPs

East Donegal Township evaluated multiple stormwater BMP projects and stream restoration projects considering the following criteria:

- Sediment reductions
- Cost per pound of pollutant reduction
- Ownership (public versus private land)
- Funding and Workforce availability
- Community benefit (site accessibility, visibility to the public, ability of public to experience benefits)
- Connectivity to other completed or proposed stormwater BMPs
- Timeframe to implement

The purpose of the evaluation was to determine the BMPs that would reduce the most pollutants for the least amount of money while getting closer to the goal of removing streams from the impaired waters list and protecting the Chesapeake Bay.

The Township determined that there are limited opportunities to implement stormwater BMPs throughout the municipality that can satisfy the PRP load reduction requirements; however, there is one stream restoration project along an unnamed tributary to the Susquehanna River that provides an opportunity to significantly reduce streambank erosion and sediment loading in the watershed. There are two additional stormwater BMP opportunities within the same watershed. The highest priority BMPs evaluated by East Donegal Township are summarized in Table 10 as potential BMPs that could be implemented to satisfy the load reduction requirements.

Table 10. Proposed BMPs for East Donegal Township

BMP ID Number	BMP Project	Sediment Load Reduction (lbs)
1	Evans Run Stream Restoration	138,000
2	East Donegal Twp Building Rain Garden	200
3	Longwood Basin Retrofit / Constructed Wet Meadow	15,800
	Total	154,000
	Required	112,478

East Donegal Township is not committing to implementing all of the projects listed in this report as that would exceed their required deduction. The final selection of BMPs to be implemented will be based on detailed design criteria and cost. The chosen BMP(s) will meet the 10 percent required sediment reduction and will be implemented by the end of the five-year permit cycle.

BMP 1 Evans Run Stream Restoration Project

East Donegal Township is considering a stream restoration project of approximately 1,200 LF that would be implemented along an unnamed tributary to the Susquehanna River, locally known as Evans Run. According to the DEP PRP Instructions, a 115 lb. /ft. sediment load

reduction can be applied to this project resulting in 138,000 lbs. of sediment reduction for the total project. This reach of stream is located on both sides of River Road near the intersection with Old Colebrook Road in Marietta. This project will require coordination with multiple private landowners. The exact location and length of this stream restoration project will be based on the final design details.

BMP 2: East Donegal Twp. Building Rain Garden

East Donegal Township intends to construct a rain garden to treat runoff from their Township office. The rain garden will serve as a Runoff Reduction practice as described by Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects, hereafter referred to as the “Expert Panel” (Schueler and Lane, 2015). MapShed was used to calculate the existing load and it was also used to calculate the load reduction resulting from the implementation of the rain garden. Desktop evaluation design characteristics are provided in Table 11 below. Screenshots from the MapShed Urban BMP Editor used in the model run are provided in Appendix C.

Table 11. East Donegal Twp Building Rain Garden

BMP	Total BMP Area (ac)	Total Acres Treated (ac)	BMP Depth Treated (ft)	Runoff Storage (RS) (ac ft)	Impervious Area (IA) (ac)	(RS)(12)/IA (Min=0, Max=2.5)	MapShed BMP sediment removal (lb)
East Donegal Twp . Bldg. Rain Garden	0.03	0.64	0.5	0.01	0.28	0.63	200

BMP 3: Longwood Basin Retrofit / Constructed Wet Meadow

East Donegal Township intends to retrofit an existing stormwater basin owned by the municipality off of Thornapple Drive. The Township intends to retrofit this stormwater basin and plant native meadow vegetation so that the constructed wet meadow filters the stormwater runoff that it receives. This BMP will serve as a Runoff Reduction practice, as described by the Expert Panel. MapShed was used to calculate the existing load and it was also used to calculate the load reduction resulting from the basin retrofit. Desktop evaluation design characteristics are provided in Table 12 below. Screenshots from the MapShed Urban BMP Editor used in the model run are provided in Appendix C.

Table 12. Longwood Basin Retrofit / Constructed Meadow

BMP	Total BMP Area (ac)	Total Acres Treated (ac)	BMP Depth Treated (ft)	Runoff Storage (RS) (ac ft)	Impervious Area (IA) (ac)	(RS)(12)/IA (Min=0, Max=2.5)	MapShed BMP sediment removal (lb)
Longwood Basin Retrofit Basin Retrofit / Constructed Wet Meadow	0.86	70	0.5	0.43	41	0.13	15,800

E.2. Funding Mechanism Identification

In order to install and maintain the BMPs listed in Section E, East Donegal proposes the following sponsors/partners and funding sources.

Table 13. BMP funding Sources

BMP#	Sponsor/Partner/Funding Sources
1	East Donegal budget funds, local business tax; DCNR, DEP, NFWF are potential grant sources for installation;
2	East Donegal budget funds, local business tax; DCNR, DEP, NFWF are potential grant sources for installation;
3	East Donegal budget funds, local business tax; DCNR, DEP, NFWF are potential grant sources for installation;

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

All stormwater BMPs installed under this PRP are subject to East Donegal's stormwater management ordinance.

The Operation and Maintenance (O&M) activities for each BMP are included in the table below. If the BMP is located on private land, the landowner must convey an easement to the Township to allow for access for periodic inspections and maintenance, as needed. Actual O&M activities will be listed in the Annual MS4 Status Report sent to the PADEP under the General Permit.

Table 14. BMP O&M Activities

BMP #	Parties Responsible for O&M	O&M Activities	Frequency for O&M Activities
1	Township Public Works Department and maintenance staff, as coordinated with the landowner;	Inspection in accordance with stream restoration final design;	Biannual inspections for first three years and annual inspections thereafter. Additional inspections following large storm events; Additional O&M activities will be detailed in the final design;
2	Township Public Works Department and maintenance staff;	Inspect BMP, mow and weed, replace vegetation if necessary, cleanout trash and provide additional O&M as	Weed BMP during the growing season as dictated by plants chosen during design; inspect BMP according SWM ordinance/program, clean

		specified in final design;	out all trash and debris. Additional O&M activities/frequency will be detailed in the final design.
3	Township Public Works Department and maintenance staff;	Inspect BMP, mow and weed, replace vegetation if necessary, cleanout trash and provide additional O&M as specified in final design;	Mow BMP during the growing season as dictated by plants chosen during design. Inspect BMP according to SWM ordinance; clean out all trash and debris; Additional O&M activities/frequency will be detailed in the final design.

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G. Works Cited

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Appendix A
Public Participation: Item A1. Public Notice; Item A2. Written Public Comments;
Item A3. Record of Consideration of Written Public Comments

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Appendix B

Maps B1. East Donegal Planning Area and Landuse Types; Map B2. East Donegal Planning Areas with Outfalls and Proposed BMPs

Map B1. East Donegal Township Land Use Types and Planning Areas

Legend

- ★ MS4 Outfall
- ▨ Excluded Area
- ▨ MS4 Planning Areas

Road

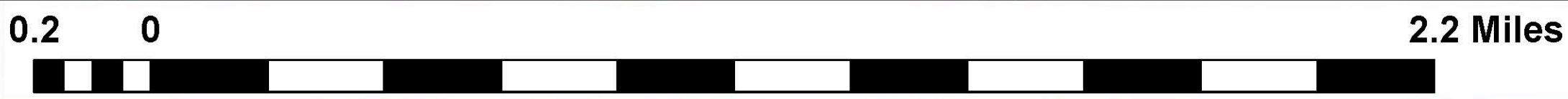
- MUNICIPAL
- PRIVATE
- STATE

— MapShed Southcentral Streams

2011 Mapshed Southcentral Land Use Data

- Water
- Low-Density Mixed Urban
- High-Density Mixed Urban
- Hay / Pasture
- Cropland
- Forest
- Forest
- Forest
- Wetland
- Wetland
- Disturbed
- Turf / Golf
- Low-Density Residential
- Medium-Density Residential
- High-Density Residential
- Medium-Density Mixed Urban
- Open Land
- East Donegal Twp

1 in = 0.2 miles



Map B2. East Donegal Township MS4 PRP Map

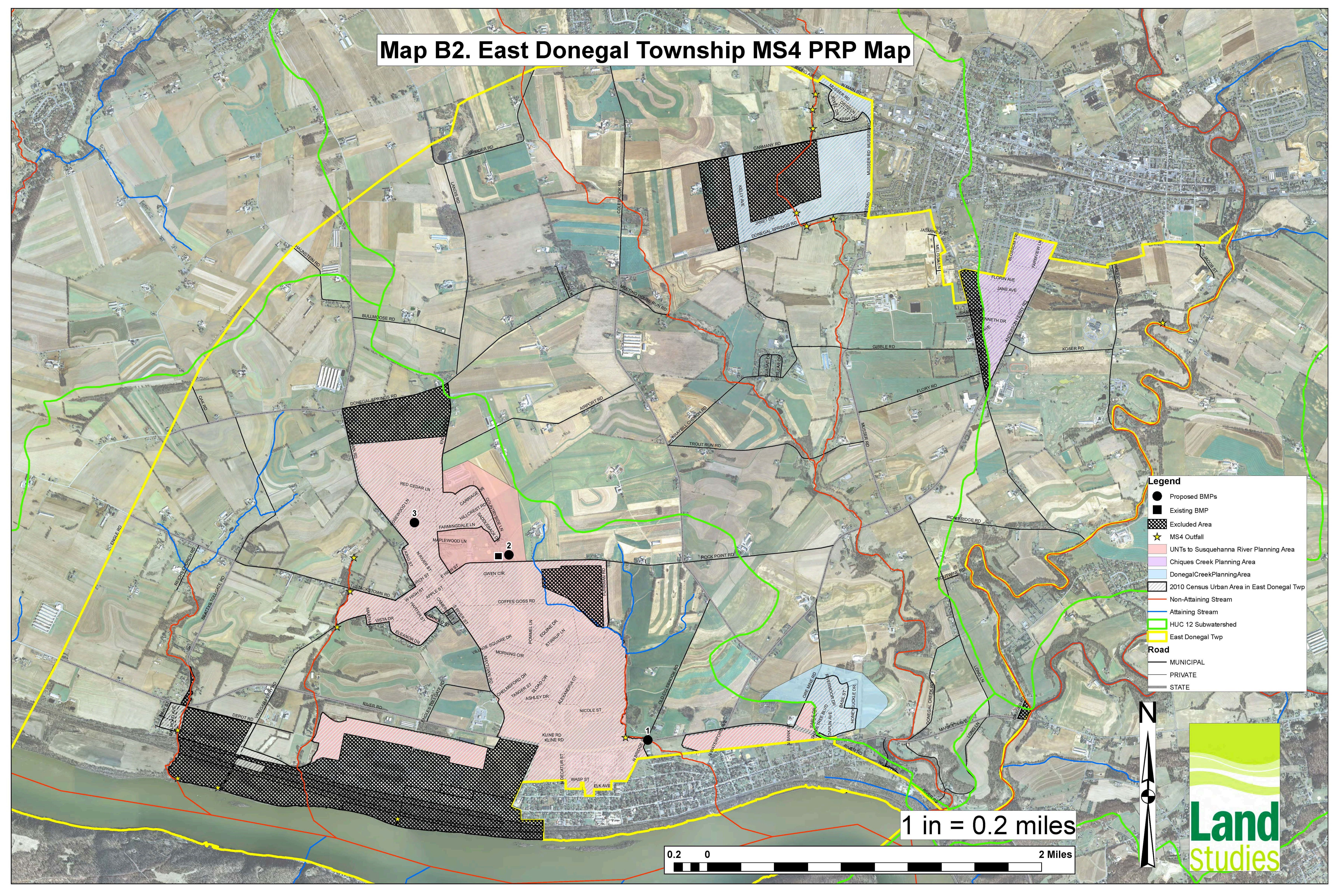
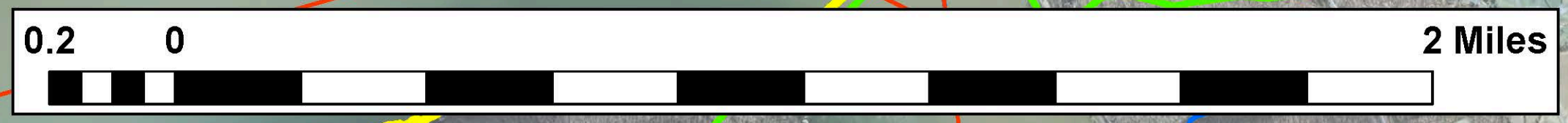
Legend

- Proposed BMPs
- Existing BMP
- ▨ Excluded Area
- ★ MS4 Outfall
- ▨ UNTs to Susquehanna River Planning Area
- ▨ Chiques Creek Planning Area
- ▨ Donegal Creek Planning Area
- ▨ 2010 Census Urban Area in East Donegal Twp
- Non-Attaining Stream
- Attaining Stream
- HUC 12 Subwatershed
- East Donegal Twp

Road

- MUNICIPAL
- PRIVATE
- STATE

1 in = 0.2 miles



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Appendix C

Summary of MapShed Runs and MapShed Inputs and Results

East Donegal Township Existing Stormwater BMPs - Sediment Reduction Calculations

Site	Input Data for Mapshed Urban Scenario BMP Editor										Mapshed Sediment Load (lb)	Sediment Removal (lb)
	RR or ST	BMP Acreage	Runoff Storage (RS) (ac ft)	Impervious Area (IA) (ac)	(RS)(12)/IA (Min=0, Max=2.5)	Pervious Area (ac)	Sediment Removal %**	% Impervious	Rainfall Depth (cm)	Acres to Hectares		
East Donegal Township Building Permeable Paving	RR	0.09	0.06	0.96	0.71	0.19	0.66	0.83	1.79	0.47	8,298,200.00	600.00

Mapshed Baseline Load Values for UNTs to the Susquehanna River:

Sed. (lb)
8,298,800.00

Unnamed Tributaries to the Susquehanna River Baseline Watershed Input and Results

The following screenshots represent the input for the baseline watershed model. The following data was customized in this model run:

- Percent bank fraction was adjusted so soil nutrient concentration match what is included in the "Recommendation of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (2014). N - 2.28 lb/T and P - 1.05 lb/T
- Groundwater concentrations were customized based on data acquired from the Groundwater Monitoring Network data downloaded from the PADEP Wave GIS tool accessed on May 4, 2017.
- No rural or urban BMP data, point source or animal data was included in the model run.

UNTs to the Susquehanna River Baseline Watershed Results

GWLF Total Loads for file: EDT_SusquehannaModBar **Period of analysis:** 24 years from 1975 to 1998

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dissolved N	Total N	Dissolved P	Total P
Hay/Pasture	2543	2.6	885.1	109.5	1104.7	1542.7	306.1	455.6
Cropland	3936	4.5	18256.0	2258.3	11539.6	20572.6	826.8	3911.6
Forest	4655	0.8	364.3	45.1	160.3	340.6	8.4	70.0
Wetland	376	6.9	3.9	0.5	111.1	113.0	5.8	6.5
Disturbed	106	5.8	28.0	3.5	2.8	16.6	1.4	6.1
Turfgrass	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Land	964	4.5	816.3	101.0	487.1	891.0	9.7	147.7
Bare Rock	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sandy Areas	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unpaved Roads	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LD Mixed	551	2.9	0.0	3.2	51.1	164.8	7.0	18.1
MD Mixed	554	8.0	0.0	15.8	218.3	692.7	29.6	75.9
HD Mixed	521	11.3	0.0	14.9	205.6	652.5	27.9	71.5
LD Residential	363	2.9	0.0	2.1	33.7	108.7	4.6	11.9
MD Residential	865	4.9	0.0	24.7	341.0	1082.3	46.2	118.5
HD Residential	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Animals						0.0		0.0
Tile Drainage				0.0		0.0		0.0
Stream Bank				1570.9		3582.5		1631.4
Groundwater					242336.7	242336.7	847.3	847.3
Point Sources					0.0	0.0	0.0	0.0
Septic Systems					3944.0	3944.0	0.0	0.0
Totals	15434.2	3.40	20353.7	4149.4	260536.0	276040.7	2121.0	7372.1

[Go Back](#)
[Pathogen Loads](#)
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UNTs to the Susquehanna River Baseline Watershed Transport Data

Urban Land				
	Area (ha)	%Imp	CNI	CNP
LD Mixed	223	0.15	92	74
MD Mixed	224	0.52	98	79
HD Mixed	211	0.87	98	79
LD Residential	147	0.15	92	74
MD Residential	350	0.52	92	74
HD Residential	0	0.0	0	0

Rural Land						
	Area (ha)	CN	K	LS	C	P
Hay/Pasture	1029	75	0.315	0.508	0.03	0.45
Cropland	1593	82	0.316	0.482	0.42	0.45
Forest	1884	60	0.292	1.85	0.002	0.45
Wetland	152	87	0.148	0.437	0.01	0.1
Disturbed	43	85	0.303	0.675	0.08	0.1
Turf/Golf	0	0	0.0	0.0	0.0	0.0
Open Land	390	82	0.314	0.931	0.04	0.45
Bare Rock	0	0	0.0	0.0	0.0	0.0
Sandy Areas	0	0	0.0	0.0	0.0	0.0
Unpaved Road	0	0	0.0	0.0	0.0	0.0

Month	Ket	Adjust %ET	Day Hours	Grow Seas	Eros Coef	Stream Extract	Ground Extract
Jan	0.64	1.0	9.4	0	0.12	0.0	0.0
Feb	0.7	1.0	10.4	0	0.12	0.0	0.0
Mar	0.72	1.0	11.8	0	0.3	0.0	0.0
Apr	0.89	1.0	13.2	1	0.3	0.0	0.0
May	0.98	1.0	14.3	1	0.3	0.0	0.0
Jun	1.04	1.0	14.8	1	0.3	0.0	0.0
Jul	1.07	1.0	14.6	1	0.3	0.0	0.0
Aug	1.09	1.0	13.6	1	0.3	0.0	0.0
Sep	1.1	1.0	12.2	1	0.3	0.0	0.0
Oct	1.11	1.0	10.8	1	0.12	0.0	0.0
Nov	0.96	1.0	9.7	0	0.12	0.0	0.0
Dec	0.88	1.0	9.2	0	0.12	0.0	0.0

Sediment A Factor	1.0344E-03	Values 0 - 1
Sed A Adjustment	1.0	
Avail Water Cap (cm)	17.032	
Sed Delivery Ratio	0.124	
GW Recess Coeff	0.1	
GW Seepage Coeff	0.0	
% Tile Drained (Ag)	0.0	

Save File Export to JPEG Close

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Chiques Creek Baseline Watershed Input and Results

The following screenshots represent the input for the baseline watershed model. The following data was customized in this model run:

- Percent bank fraction was adjusted so soil nutrient concentration match what is included in the “Recommendation of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (2014). N – 2.28 lb/T and P – 1.05 lb/T
- Groundwater concentrations were customized based on data acquired from the Groundwater Monitoring Network data downloaded from the PADEP Wave GIS tool accessed on May 4, 2017.
- No rural or urban BMP data, point source or animal data was included in the model run.

Chiques Creek Baseline Watershed Results

GWLF Total Loads for file: EDT_Chiques_6817_ModBa **Period of analysis:** 21 years from 1978 to 1998

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dissolved N	Total N	Dissolved P	Total P
Hay/Pasture	12207	2.8	8244.3	760.9	5830.1	8873.8	1766.3	2962.5
Cropland	20072	4.9	175577.5	16205.8	64150.0	128973.2	5026.2	30501.7
Forest	6588	2.4	545.5	50.4	681.5	883.0	35.9	115.0
Wetland	225	7.4	6.3	0.6	71.2	73.5	3.7	4.7
Disturbed	168	8.8	71.9	6.6	6.7	33.2	3.4	13.8
Turfgrass	208	2.1	32.2	3.0	241.2	253.1	25.0	29.7
Open Land	2911	7.4	2967.7	273.9	2425.5	3521.2	48.5	479.1
Bare Rock	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sandy Areas	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unpaved Roads	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LD Mixed	1236	3.1	0.0	9.1	135.9	448.1	18.9	49.2
MD Mixed	1305	8.5	0.0	42.7	608.3	1933.7	83.0	213.0
HD Mixed	1752	12.0	0.0	57.3	816.7	2596.6	111.4	286.0
LD Residential	1421	3.1	0.0	10.4	156.3	515.4	21.7	56.5
MD Residential	2595	5.2	0.0	84.9	1209.6	3845.4	165.0	423.6
HD Residential	7	7.2	0.0	0.2	3.5	11.0	0.5	1.2
Farm Animals						0.0		0.0
Tile Drainage				0.0		0.0		0.0
Stream Bank				7704.6		17566.4		8115.2
Groundwater					712314.2	712314.2	2490.6	2490.6
Point Sources					0.0	0.0	0.0	0.0
Septic Systems					12591.2	12591.2	0.0	0.0
Totals	50693.6	4.50	187445.5	25210.5	801241.9	894433.0	9800.1	45741.7

[Go Back](#)
[Pathogen Loads](#)
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Chiques Creek Baseline Watershed Transport Data

Urban Land				
	Area (ha)	%Imp	CNI	CNP
LD Mixed	500	0.15	92	74
MD Mixed	528	0.52	98	79
HD Mixed	709	0.87	98	79
LD Residential	575	0.15	92	74
MD Residential	1050	0.52	92	74
HD Residential	3	0.87	92	74

Rural Land						
	Area (ha)	CN	K	LS	C	P
Hay/Pasture	4940	75	0.284	0.912	0.03	0.52
Cropland	8123	82	0.29	0.826	0.42	0.52
Forest	2666	73	0.287	1.659	0.002	0.52
Wetland	91	87	0.288	0.58	0.01	0.1
Disturbed	68	89	0.315	1.016	0.08	0.1
Turf/Golf	84	71	0.311	0.498	0.03	0.2
Open Land	1178	87	0.298	0.984	0.04	0.52
Bare Rock	0	0	0.0	0.0	0.0	0.0
Sandy Areas	0	0	0.0	0.0	0.0	0.0
Unpaved Road	0	0	0.0	0.0	0.0	0.0

Month	Ket	Adjust %ET	Day Hours	Grow Seas	Eros Coef	Stream Extract	Ground Extract
Jan	0.62	1.0	9.4	0	0.12	0.0	0.0
Feb	0.67	1.0	10.4	0	0.12	0.0	0.0
Mar	0.7	1.0	11.8	0	0.3	0.0	0.0
Apr	0.89	1.0	13.2	1	0.3	0.0	0.0
May	1.0	1.0	14.3	1	0.3	0.0	0.0
Jun	1.06	1.0	14.9	1	0.3	0.0	0.0
Jul	1.1	1.0	14.6	1	0.3	0.0	0.0
Aug	1.12	1.0	13.6	1	0.3	0.0	0.0
Sep	1.13	1.0	12.2	1	0.3	0.0	0.0
Oct	1.14	1.0	10.8	1	0.12	0.0	0.0
Nov	0.97	1.0	9.7	0	0.12	0.0	0.0
Dec	0.87	1.0	9.1	0	0.12	0.0	0.0

Sediment A Factor	9.3613E-04	Values 0 - 1
Sed A Adjustment	1.0	
Avail Water Cap (cm)	18.793	
Sed Delivery Ratio	0.092	
GW Recess Coeff	0.1	
GW Seepage Coeff	0.0	
% Tile Drained (Ag)	0.0	

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Donegal Creek Baseline Watershed Input and Results

The following screenshots represent the input for the baseline watershed model. The following data was customized in this model run:

- Percent bank fraction was adjusted so soil nutrient concentration match what is included in the “Recommendation of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects (2014). N – 2.28 lb/T and P – 1.05 lb/T
- Groundwater concentrations were customized based on data acquired from the Groundwater Monitoring Network data downloaded from the PADEP Wave GIS tool accessed on May 4, 2017.
- No rural or urban BMP data, point source or animal data was included in the model run.

Donegal Creek Baseline Watershed Results

GWLF Total Loads for file: EDT_DonegalCreekModBa **Period of analysis:** 21 years from 1978 to 1998

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dissolved N	Total N	Dissolved P	Total P
Hay/Pasture	2698	2.8	605.7	88.3	1288.8	1641.8	397.3	539.7
Cropland	4833	4.9	13816.6	2013.1	15447.2	23499.5	1231.4	4480.5
Forest	383	2.4	8.4	1.2	39.6	44.5	2.1	4.1
Wetland	15	7.4	0.2	0.0	4.7	4.8	0.2	0.3
Disturbed	12	8.8	1.0	0.2	0.5	1.1	0.2	0.5
Turfgrass	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Land	771	7.4	235.9	34.4	642.4	779.9	12.9	68.3
Bare Rock	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sandy Areas	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unpaved Roads	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LD Mixed	381	3.1	0.0	2.6	44.0	138.0	6.0	15.3
MD Mixed	499	8.5	0.0	16.6	218.7	699.0	30.0	77.3
HD Mixed	408	12.0	0.0	13.6	178.6	571.0	24.5	63.2
LD Residential	114	3.1	0.0	0.8	13.1	41.2	1.8	4.6
MD Residential	853	5.2	0.0	28.4	373.4	1193.9	51.3	132.1
HD Residential	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Animals						0.0		0.0
Tile Drainage				0.0		0.0		0.0
Stream Bank				858.3		1957.7		899.5
Groundwater					138442.3	138442.3	484.1	484.1
Point Sources					0.0	0.0	0.0	0.0
Septic Systems					1876.5	1876.5	0.0	0.0
Totals	10966.5	4.80	14667.8	3057.5	158569.8	170891.2	2241.9	6769.4

[Go Back](#)
[Pathogen Loads](#)
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Donegal Creek Baseline Watershed Transport Data

Urban Land				
	Area (ha)	%Imp	CNI	CNP
LD Mixed	154	0.15	92	74
MD Mixed	202	0.52	98	79
HD Mixed	165	0.87	98	79
LD Residential	46	0.15	92	74
MD Residential	345	0.52	92	74
HD Residential	0	0.0	0	0

Rural Land						
	Area (ha)	CN	K	LS	C	P
Hay/Pasture	1092	75	0.312	0.319	0.03	0.45
Cropland	1956	82	0.316	0.286	0.42	0.45
Forest	155	73	0.309	0.471	0.002	0.45
Wetland	6	87	0.32	0.254	0.01	0.1
Disturbed	5	89	0.316	0.196	0.08	0.1
Turf/Golf	0	0	0.0	0.0	0.0	0.0
Open Land	312	87	0.313	0.325	0.04	0.45
Bare Rock	0	0	0.0	0.0	0.0	0.0
Sandy Areas	0	0	0.0	0.0	0.0	0.0
Unpaved Road	0	0	0.0	0.0	0.0	0.0

Month	Ket	Adjust %ET	Day Hours	Grow Seas	Eros Coef	Stream Extract	Ground Extract
Jan	0.61	1.0	9.4	0	0.12	0.0	0.0
Feb	0.66	1.0	10.4	0	0.12	0.0	0.0
Mar	0.69	1.0	11.8	0	0.3	0.0	0.0
Apr	0.88	1.0	13.2	1	0.3	0.0	0.0
May	0.98	1.0	14.3	1	0.3	0.0	0.0
Jun	1.05	1.0	14.9	1	0.3	0.0	0.0
Jul	1.08	1.0	14.6	1	0.3	0.0	0.0
Aug	1.1	1.0	13.6	1	0.3	0.0	0.0
Sep	1.12	1.0	12.2	1	0.3	0.0	0.0
Oct	1.12	1.0	10.8	1	0.12	0.0	0.0
Nov	0.96	1.0	9.7	0	0.12	0.0	0.0
Dec	0.86	1.0	9.1	0	0.12	0.0	0.0

Sediment A Factor	1.1389E-03	Values 0 - 1
Sed A Adjustment	1.0	
Avail Water Cap (cm)	25.304	
Sed Delivery Ratio	0.146	
GW Recess Coeff	0.1	
GW Seepage Coeff	0.0	
% Tile Drained (Ag)	0.0	

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MapShed Planning Area UA Tool Results

The exact same inputs used for the baseline watershed model runs were used for their respective planning area model runs. The Urban Areas digitized for the model runs captured as much acreage as possible while excluding as much of the parsed ground as was reasonably possible to get the most accurate loading rates. In some cases, land use acreage adjustments were still necessary to exclude parsed area and include “islands” of planning area that weren’t captured in the model run. The total loads for each planning area and acreage adjustments are shown in the Existing Loads section of the PRP.

Screen shots of the UA Tool for each Urban Area MS4 Planning Area Run are provided below.

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UNTs to the Susquehanna River Planning Area

Select input data file: C:\Mapshed\Runfiles\SusquehannaPlanning5417\Output\SusquehannaPlanningArea5417-11-346_ualesv

Watershed Totals Municipality Loads Regulated Loads Unregulated Loads

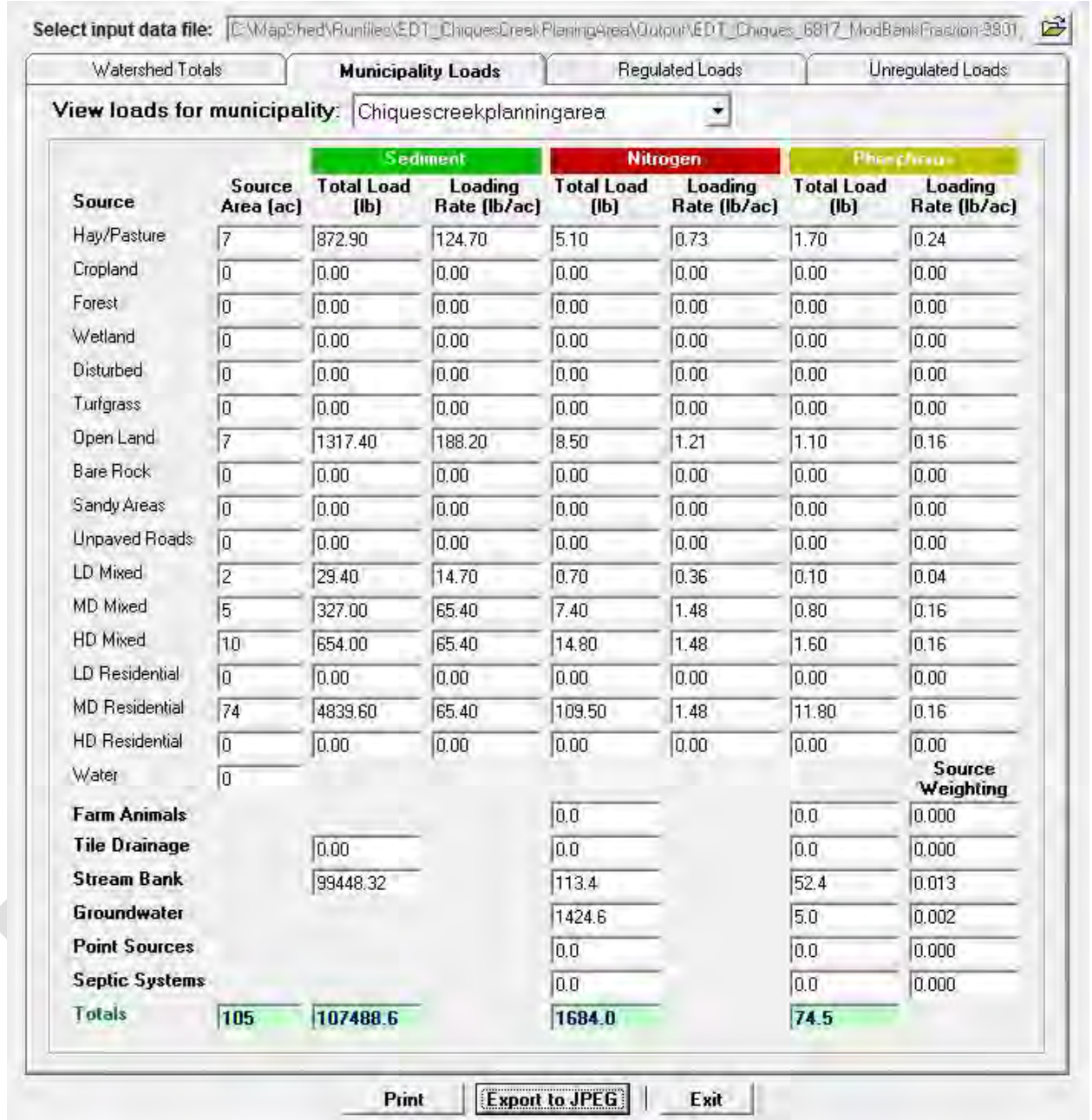
View loads for municipality: Susquehannaplanningarea

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus	
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	119	10245.90	86.10	72.60	0.61	21.40	0.18
Cropland	341	391297.50	1147.50	1783.40	5.23	337.60	0.99
Forest	12	232.80	19.40	0.80	0.07	0.20	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	82	17179.00	209.50	75.40	0.92	12.30	0.15
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	40	464.00	11.60	12.00	0.30	1.20	0.03
MD Mixed	37	2112.70	57.10	46.30	1.25	5.20	0.14
HD Mixed	91	5205.20	57.20	113.80	1.25	12.70	0.14
LD Residential	22	255.20	11.60	6.60	0.30	0.70	0.03
MD Residential	405	23166.00	57.20	506.30	1.25	56.70	0.14
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		415681.56		432.3		198.6	0.240
Groundwater				27384.1		95.7	0.113
Point Sources				0.0		0.0	0.000
Septic Systems				240.6		0.0	0.061
Totals	1149	865839.9		30674.2		742.3	

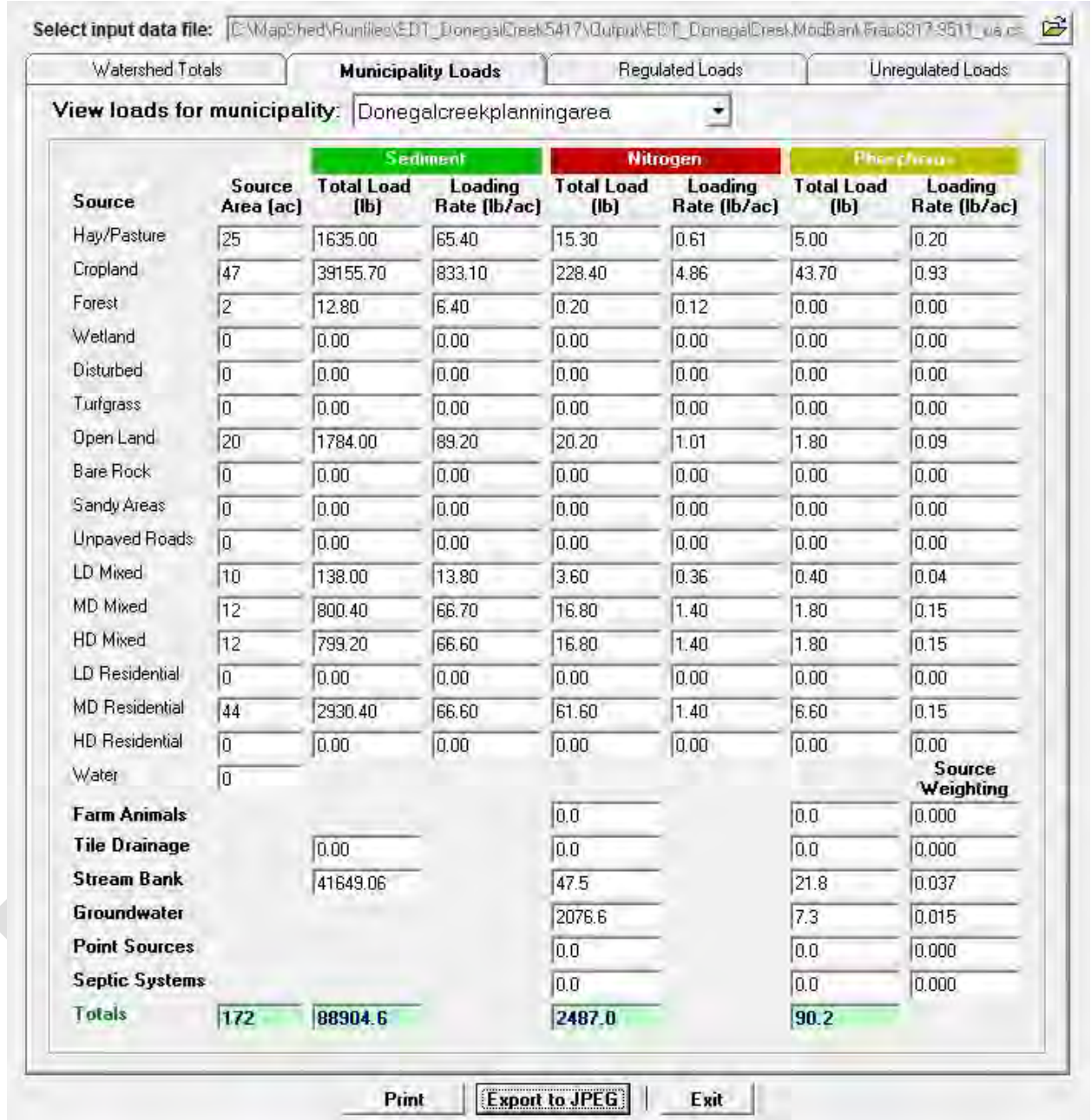
Source Weighting

Print Export to JPEG Exit

Chiques Creek Planning Area



Donegal Creek Planning Area



Existing Stormwater BMP in the Unnamed Tributaries to the Susquehanna River Model Run

The following screen shots represent the entries into the Urban BMP Editor in the MapShed model as well as the MapShed model run results. Aside from the inputs into the Urban BMP editor, all inputs matched the Unnamed Tributaries to the Susquehanna River Baseline Watershed Run.

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UNTs to the Susquehanna River Existing Runoff Reduction BMPs Input

Urban Scenario BMP Editor

Performance Standard Calculations

Retrofits

BMP Type: Pervious Pavement with Infiltration Bed

Area Treated (ha)		Existing Area (ha)	
LD Residential	0	LD Residential	147
MD Residential	0	MD Residential	350
HD Residential	0	HD Residential	0
LD Mixed	0	LD Mixed	223
MD Mixed	0	MD Mixed	224
HD Mixed	0.47	HD Mixed	211
Total	0	Total	1155

Rainfall Captured (2.54 cm = 1 in)
 Depth (cm) 1.79 Run
 Volume (m3) 73

Calculated Reduction Efficiency
 TN 0.53 TP 0.62 TSS 0.66

New Development

BMP Type: Select BMP Type

Area Developed (ha)	Area Replaced (ha)	Existing Area (ha)
LD Residential	Hay/Pasture	Hay/Pasture
0	0	1029
MD Residential	Cropland	Cropland
0	0	1593
HD Residential	Forest	Forest
0	0	1884
LD Mixed	Disturbed	Disturbed
0	0	43
MD Mixed	Turfgrass	Turfgrass
0	0	0
HD Mixed	Open Land	Open Land
0	0	390
Total	Total	Total
0	0	4939

Rainfall Captured (2.54 cm = 1 in)
 Depth (cm) 7.10 Run
 Volume (m3) 0

Calculated Reduction Efficiency
 TN 0.00 TP 0.00 TSS 0.00

Stream Protection

Vegetative buffer strip width (m) 0

Fraction of streams treated (0-1) 0.000

Total streams in non-ag areas (km) 58.1

Streams w/bank stabilization (km) 0.0

Street Sweeping

Fraction of area treated (0-1) 1.000

Sweep Type Mechanical Vacuum

Times/month

Jan	Apr	Jul	Oct
0	0	0	0
Feb	May	Aug	Nov
0	0	0	0
Mar	Jun	Sep	Dec
0	0	0	0

[Rural BMP Editor](#)

[BMP Efficiency Editor](#)

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UNTs to the Susquehanna River Existing Runoff Reduction BMPs Results

GWLF Total Loads for file: EDT_SusquehannaExistingf Period of analysis: 24 years from 1975 to 1998

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dissolved N	Total N	Dissolved P	Total P
Hay/Pasture	2543	2.6	885.1	109.5	1104.7	1542.7	306.1	455.6
Cropland	3936	4.5	18256.0	2258.3	11539.6	20572.6	826.8	3911.6
Forest	4655	0.8	364.3	45.1	160.3	340.6	8.4	70.0
Wetland	376	6.9	3.9	0.5	111.1	113.0	5.8	6.5
Disturbed	106	5.8	28.0	3.5	2.8	16.6	1.4	6.1
Turfgrass	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Land	964	4.5	816.3	101.0	487.1	891.0	9.7	147.7
Bare Rock	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sandy Areas	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unpaved Roads	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LD Mixed	551	2.9	0.0	3.2	51.1	164.8	7.0	18.1
MD Mixed	554	8.0	0.0	15.8	218.2	692.4	29.6	75.8
HD Mixed	521	11.3	0.0	14.9	205.5	652.2	27.8	71.4
LD Residential	363	2.9	0.0	2.1	33.7	108.6	4.6	11.9
MD Residential	865	4.9	0.0	24.7	340.9	1081.9	46.2	118.5
HD Residential	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Animals						0.0		0.0
Tile Drainage				0.0		0.0		0.0
Stream Bank				1570.6		3580.3		1631.4
Groundwater					242336.7	242336.7	847.3	847.3
Point Sources					0.0	0.0	0.0	0.0
Septic Systems					3944.0	3944.0	0.0	0.0
Totals	15434.2	3.40	20353.7	4149.1	260535.7	276037.5	2120.9	7372.0

Go Back

Pathogen Loads

Export to JPEG

Print

Close

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Appendix D
Proposed BMP Load Reduction Calculations

Stream BMPs - Sediment and Nutrient Reduction Calculations*			
Site	BMP ID	Length (ft)	Sediment Removal (lbs)
Evans Run Stream Restoration	1	1,200	138,000

*Sediment Load Reductions Calculated at 115 lbs./lf Based on PADEP's PRP Instructions

East Donegal Township Proposed Stormwater BMPs - Sediment Reduction Calculations

Input Data for Mapshed Urban Scenario BMP Editor													
Site	BMP ID	RR or ST	BMP Acreage	Runoff Storage (RS) (ac ft)	Impervious Area (IA) (ac)	(RS)(12)/IA (Min=0, Max=2.5)	Pervious Area (ac)	Sediment Removal %**	% Impervious	Rainfall Depth (cm)	Acre to Hectares	Mapshed Sediment Load (lb)	Sediment Removal (lb)
East Donegal Township Building Rain Garden	2	RR	0.03	0.01	0.28	0.63	0.36	0.63	0.44	1.59	0.26	8,298,600	200
Longwood Basin Retrofit / Constructed Meadow	3	RR	0.86	0.43	41.00	0.13	29.00	0.19	0.59	0.32	28.33	8,283,000	15,800
												Proposed Stream BMP	138,000
												TOTAL Proposed BMP Sediment Load Reduction:	154,000
												EDT 10% Reduction Requirement:	112,478
Mapshed Baseline Load Values for UNTs to the Susquehanna River:													
												Sed. (lb)	
													8,298,800.00

Proposed Stormwater BMPs in the Unnamed Tributaries to the Susquehanna River Model Runs

For BMPs #2 and #3, the following screen shots represent the entries into the Urban BMP Editor in the MapShed model as well as the MapShed model run results. Aside from the inputs into the Urban BMP editor, all inputs matched the Unnamed Tributaries to the Susquehanna River Baseline Watershed Run.

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UNTs to the Susquehanna River Proposed BMP#2 Input

Urban Scenario BMP Editor

Performance Standard Calculations

Retrofits

BMP Type: Rain Garden / Bioretention

Area Treated (ha)		Existing Area (ha)	
LD Residential	0	LD Residential	147
MD Residential	0	MD Residential	350
HD Residential	0	HD Residential	0
LD Mixed	0	LD Mixed	223
MD Mixed	0.26	MD Mixed	224
HD Mixed	0	HD Mixed	211
Total	0	Total	1155

Rainfall Captured (2.54 cm = 1 in)
 Depth (cm): 1.59
 Volume (m3): 21

Calculated Reduction Efficiency:
 TN: 0.50 TP: 0.59 TSS: 0.63

New Development

BMP Type: Select BMP Type

Area Developed (ha)	Area Replaced (ha)	Existing Area (ha)
LD Residential	Hay/Pasture	Hay/Pasture
MD Residential	Cropland	Cropland
HD Residential	Forest	Forest
LD Mixed	Disturbed	Disturbed
MD Mixed	Turfgrass	Turfgrass
HD Mixed	Open Land	Open Land
Total	0	4939

Rainfall Captured (2.54 cm = 1 in)
 Depth (cm): 7.10
 Volume (m3): 0

Calculated Reduction Efficiency:
 TN: 0.00 TP: 0.00 TSS: 0.00

Stream Protection

Vegetative buffer strip width (m): 0

Fraction of streams treated (0-1): 0.000

Total streams in non-ag areas (km): 58.1

Streams w/bank stabilization (km): 0.0

Street Sweeping

Fraction of area treated (0-1): 1.000

Sweep Type: Mechanical Vacuum

Times/month

Jan	Apr	Jul	Oct
Feb	May	Aug	Nov
Mar	Jun	Sep	Dec

[Rural BMP Editor](#)

[BMP Efficiency Editor](#)

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[Close](#)

UNTs to the Susquehanna River Proposed BMP #2 Results

GWLF Total Loads for file: EDT_SusquehannaPropose Period of analysis: 24 years from 1975 to 1998

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dissolved N	Total N	Dissolved P	Total P
Hay/Pasture	2543	2.6	885.1	109.5	1104.7	1542.7	306.1	455.6
Cropland	3936	4.5	18256.0	2258.3	11539.6	20572.6	826.8	3911.6
Forest	4655	0.8	364.3	45.1	160.3	340.6	8.4	70.0
Wetland	376	6.9	3.9	0.5	111.1	113.0	5.8	6.5
Disturbed	106	5.8	28.0	3.5	2.8	16.6	1.4	6.1
Turfgrass	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Land	964	4.5	816.3	101.0	487.1	891.0	9.7	147.7
Bare Rock	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sandy Areas	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unpaved Roads	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LD Mixed	551	2.9	0.0	3.2	51.1	164.8	7.0	18.1
MD Mixed	554	8.0	0.0	15.8	218.2	692.6	29.6	75.8
HD Mixed	521	11.3	0.0	14.9	205.6	652.4	27.9	71.5
LD Residential	363	2.9	0.0	2.1	33.7	108.6	4.6	11.9
MD Residential	865	4.9	0.0	24.7	341.0	1082.2	46.2	118.5
HD Residential	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Animals						0.0		0.0
Tile Drainage				0.0		0.0		0.0
Stream Bank				1570.8		3580.3		1631.4
Groundwater					242336.7	242336.7	847.3	847.3
Point Sources					0.0	0.0	0.0	0.0
Septic Systems					3944.0	3944.0	0.0	0.0
Totals	15434.2	3.40	20353.7	4149.3	260535.9	276038.2	2121.0	7372.1

Go Back

Pathogen Loads

Export to JPEG

Print

Close

UNTs to the Susquehanna River Proposed BMP# 3 Input

Urban Scenario BMP Editor

Performance Standard Calculations

Retrofits

BMP Type: Infiltration Basin

Area Treated (ha)		Existing Area (ha)	
LD Residential	0	LD Residential	147
MD Residential	0	MD Residential	350
HD Residential	0	HD Residential	0
LD Mixed	0	LD Mixed	223
MD Mixed	28.33	MD Mixed	224
HD Mixed	0	HD Mixed	211
Total	28	Total	1155

Rainfall Captured (2.54 cm = 1 in)

Depth (cm) 0.32 Run

Volume (m3) 471

Calculated Reduction Efficiency

TN 0.15 TP 0.18 TSS 0.19

New Development

BMP Type: Select BMP Type

Area Developed (ha)	Area Replaced (ha)	Existing Area (ha)	
LD Residential	0	Hay/Pasture	1029
MD Residential	0	Cropland	1593
HD Residential	0	Forest	1884
LD Mixed	0	Disturbed	43
MD Mixed	0	Turfgrass	0
HD Mixed	0	Open Land	390
Total	0	Total	4939

Rainfall Captured (2.54 cm = 1 in)

Depth (cm) 7.10 Run

Volume (m3) 0

Calculated Reduction Efficiency

TN 0.00 TP 0.00 TSS 0.00

Stream Protection

Vegetative buffer strip width (m) 0

Fraction of streams treated (0-1) 0.000

Total streams in non-ag areas (km) 58.1

Streams w/bank stabilization (km) 0.0

Street Sweeping

Fraction of area treated (0-1) 1.000

Sweep Type Mechanical Vacuum

Times/month

Jan	0	Apr	0	Jul	0	Oct	0
Feb	0	May	0	Aug	0	Nov	0
Mar	0	Jun	0	Sep	0	Dec	0

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[Close](#)

UNTs to the Susquehanna River Proposed BMP #3 Results

GWLF Total Loads for file: EDT_SusquehannaBasin62 Period of analysis: 24 years from 1975 to 1998

Source	Area (Acres)	Runoff (in)	Tons		Total Loads (Pounds)			
			Erosion	Sediment	Dissolved N	Total N	Dissolved P	Total P
Hay/Pasture	2543	2.6	885.1	109.5	1104.7	1542.7	306.1	455.6
Cropland	3936	4.5	18256.0	2258.3	11539.6	20572.6	826.8	3911.6
Forest	4655	0.8	364.3	45.1	160.3	340.6	8.4	70.0
Wetland	376	6.9	3.9	0.5	111.1	113.0	5.8	6.5
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Turfgrass	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Land	964	4.5	816.3	101.0	487.1	891.0	9.7	147.7
Bare Rock	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sandy Areas	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unpaved Roads	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LD Mixed	551	2.9	0.0	3.2	51.1	164.8	7.0	18.1
MD Mixed	554	8.0	0.0	15.8	218.3	692.7	29.6	75.9
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MD Residential	865	4.9	0.0	24.7	341.0	1082.3	46.2	118.5
HD Residential	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Farm Animals						0.0		0.0
Tile Drainage				0.0		0.0		0.0
Stream Bank				1563.0		3562.7		1622.6
Groundwater					242336.7	242336.7	847.3	847.3
Point Sources					0.0	0.0	0.0	0.0
Septic Systems					3944.0	3944.0	0.0	0.0
Totals	15434.2	3.40	20353.7	4141.5	260536.0	276020.9	2121.0	7363.3

Go Back

Pathogen Loads

Export to JPEG

Print

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