NPDES Stormwater Discharges from MS4

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

Pennypack Creek
Southampton Creek
Wissahickon Creek

Upper Moreland Township
Montgomery County, Pennsylvania

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MS4 Pollutant Reduction Plan
for
Upper Moreland Township
Montgomery County, Pennsylvania

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A. Introduction

Upper Moreland Township, Montgomery County, is submitting this TMDL and Pollution Reduction Plan (PRP) in accordance with the requirements of *Individual Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems* (MS4); specifically, in accordance with the *MS4 Requirements Table (Municipal) Anticipated Obligations for Subsequent NPDES Permit Term*. Upper Moreland Township must create a TMDL and PRP due to discharges from their MS4 to Impaired Downstream Waters, which are listed as impaired within the below table and as noted in Appendix A:

Table A- 1: PA DEP MS4 Requirements Table

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Montgomery County						
UPPER MORELAND TWP	PAG130019	Yes	TMDL Plan	Southampton Creek		Flow Alterations, Other Habitat Alterations, Water/Flow Variability (4c)
				Wissahickon TMDL	TMDL Plan-Siltation, Suspended Solids (4a)	Cause Unknown (4a)
				Southampton Creek TMDL	TMDL Plan-Nutrients, Organic Enrichment/Low D.O., Siltation (4a)	
				Round Meadow Run	Appendix E-Siltation (5)	Cause Unknown (5)
				Pennypack Creek	Appendix E-Siltation (5)	Cause Unknown (5), Flow Alterations, Other Habitat Alterations, Water/Flow Variability (4c)
				Terwood Run	Appendix E-Siltation (5)	Cause Unknown (5)

Upper Moreland Township is required to develop a PRP for the Pennypack Creek (including Round Meadow Run & Terwood Run) along with establishing compliance with the Southampton Creek TMDL for Nutrients & Sediment as well as the Wissahickon TMDL for siltation. A TMDL Strategy Plan titled “MS4 Southampton Creek & Wissahickon Creek TMDL Strategy” was submitted to PA DEP for review and approval in May 2016. To date, no review comments or approval letter has been received. This PRP document is intended to be a supplement to the previously submitted TMDL Strategy. The purpose of this PRP is to outline how Upper Moreland will comply with the Individual Permit requirement to reduce 10% of sediment and 5% of nutrient loads from the MS4 to waters impaired by such pollutants. The plan will also demonstrate that the Township is on track to achieve the Southampton Creek TMDL for sediment and nutrient and Wissahickon Creek TMDL WLAs for sediment within the next 5 permit terms (25 years) that were contemplated in the 2016 TMDL strategy plan. The 2016 TMDL Strategy Plan is included within Appendix D of this report.

In accordance with guidance provided by DEP, achieving a 10% reduction in sediment will also result in a 5% nutrient reduction. As such, only sediment loading was considered in the pre- and post- improvement analysis of this report. The intent of this MS4 TMDL/PRP is to utilize the existing loading of sediment and pollutants discharged from the MS4 to Impaired Downstream Waters, and to present a plan to reduce these loadings. Since nearly all tributaries within the Urbanized Area of the Township ultimately drain to the Pennypack Creek, a Township-wide approach was taken to provide a 10% reduction in sediment across the Township rather than analyzing each tributary separately. This approach was suggested by PA DEP. In addition to the Pennypack Creek watershed, there is a *de minimis* area of the Wissahickon Creek watershed which is located within Upper Moreland Township, of which 8 acres are contained within the planning area. As such, the Township proposes to provide street sweeping and to remove sediment from existing stormwater inlets in order to reduce the 100 pounds per year requirement within this small planning area.

This Plan is organized to follow the "Required PRP Elements" presented in the PRP Instructions included as part of the *PAG-13 MS4 Individual Permit* instruction packages. This Plan will be evaluated and updated by Upper Moreland Township on an as-needed basis, based on 1) its effectiveness in reducing pollutant loads in discharges from the regulated small MS4, 2) the reasonableness of achieving the reductions, and 3) the cost/benefit of the BMP"(s) under consideration. If this occurs, Upper Moreland Township will work with the Department of Environmental Protection (DEP) for review and approval of any revisions or updates. The "potential BMPs" listed in this document are intended to show that compliance with the required reductions can be achieved within the coming 5-year term. The 5-year term is assumed to begin upon DEP's approval of this Pollution Reduction Plan. The Township reserves the right to implement a combination of the listed BMPs, remove BMPs, and/or add BMPs, should the opportunity to implement them present itself.

Each MS4 PRP must include the following Required PRP Elements:

- Public Participation
- Map
- Pollutants of Concern
- Determine Existing Loading for Pollutants of Concern
- Select BMPs to Achieve the Minimum Required Reductions in Pollutant Loading
- Identify Funding Mechanisms
- Identify Responsible Parties for Operation and Maintenance (O&M) of BMPs

B. Public Participation

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

- A complete copy of the TMDL/PRP shall be available for public review.
- A public notice containing a statement describing the plan, where it may be reviewed by the public and the length of time provided for the receipt of comments shall be published by the MS4 in a newspaper of general circulation in the area.
- Written comments shall be accepted by the MS4 for a minimum of 30 days from the date of public notice.
- The MS4 shall accept comments from any interested member of the public at a public meeting, which may include a regularly scheduled meeting of the governing body of the municipality or municipal authority that is the permittee.
- Consider, and make a record of the consideration of, each timely comment received from the public during the public comment period concerning the plan, identifying any changes made to the plan in response to the comment.

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

- Date TMDL/PRP public notice was published in newspaper: August 1, 2017
- Date TMDL/PRP was made available for public review/comment: August 1, 2017
- End date for receipt of written comments (30 days from the date of public notice): September 7, 2017
- Date TMDL/PRP listed on the public meeting agenda: August 7, 2017
- Date TMDL/PRP comments were accepted at a public meeting: August 7, 2017

C. Map

Mapping is an integral part of developing the TMDL/PRP and requires a level of detail suitable to determine the topography, MS4 drainage areas and loading for the listed impairments. The MS4 TMDL/PRP map shows the storm sewershed boundaries. The MS4 TMDL/PRP map also shows the proposed locations of BMPs that will be implemented in an effort to achieve the required pollutant load reductions. The storm sewershed boundaries shown on the Upper Moreland Township MS4 TMDL/PRP Map constitute the combined storm sewershed of all MS4 outfalls within the MS4's jurisdiction that discharge to the Pennypack Creek Watershed. The Township does not have any outfalls within the Wissahickon Creek Watershed.

Upper Moreland Township MS4 TMDL/PRP Map, located in Appendix C, identifies the storm sewershed boundaries, as well as, the proposed locations of potential structural BMPs to be implemented in order to achieve the required pollutant load reductions.

The Township's MS4 TMDL/PRP Map shows parsed areas, which are areas within the Township that are excluded in the calculation of existing pollutant loading due to the area not contributing flow to the Township's MS4. Examples of parsed areas include; drainage to PennDOT, Turnpike and/or Railroad Rights-of-ways, drainage to private roads (which do not connect to the Township's MS4), and direct drainage to the creek.

D. Pollutants of Concern

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

For TMDL/PRPs developed for impaired waters (Appendix E), the pollutants are based on the impairment listing as provided in the reference TMDL Plan and Appendix A of this report. If the impairment is based on siltation only, a minimum of 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., "Excessive Algal Growth" and "Organic Enrichment/Low D.O."), a minimum 5% TP reduction is required. If the impairment is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed. A minimum 10% reduction is required for sediments within the listed impaired waters, as well as, a 5% reduction for Nutrients within the Southampton Creek. As discussed previously, PA DEP has determined the required 10% sediment reduction to be the limiting factor. As such, the plan will identify BMPs that can be implemented to achieve the required reduction in siltation and it will be assumed that a 5% reduction in nutrients will be achieved across the Township's MS4 planning area.

The Southampton Creek TMDL (June 2008) identifies the required reduction of 34% of sediment within Upper Moreland's MS4 that is tributary to the Southampton creek. Since the previously submitted Southampton Creek TMDL Strategy Plan contemplated a 25 year period and this PRP proposes to reduce 10% of sediment within 5 years, the Township remains on track to hit the 34% sediment reduction required by the TMDL within the next five permit terms (25 years) identified in the TMDL Strategy (Submitted May 2016). Lastly, this plan proposes to reduce 5% of nutrients discharged from the Township's MS4 within the upcoming 5-year permit term. The WLA for nutrients in the Upper Moreland section of the Southampton Creek TMDL was stated as 1.46 lb/yr, which represented an unattainable 99.1% reduction. While the BMPs contemplated in this PRP will reduce loading by 5% in the next permit term, the Township plans to address nutrients in the Southampton Creek in subsequent permit terms by completing outfall sampling in order to determine the actual existing nutrient load from the Township's MS4.

E. Determine Existing Loading for Pollutants of Concern

In accordance with DEP requirements, existing loading must be calculated and reported as of the date of the development of this TMDL/PRP. Any methodology that calculates existing pollutant loading in terms of pounds per year, evaluates BNP-based pollutant reductions utilizing BMP effectiveness values contained in Document 3800-PM-BCW0100m (see Appendix E-23).

In modeling the existing load, a software program known as MapShed was utilized in the development of this MS4 TMDL/PRP to determine the source areas and the total load of listed impairments based on the existing land uses. MapShed is a customized GIS interface that is used to create input data for an enhanced version of the GWLF watershed model originally developed at Cornell University. MapShed was improved by Dr. Barry Evans and his group at PSIEE using AVGWLF, a GIS-based watershed modeling tool that uses hydrology, land cover, soils, topography, weather, pollutant discharges, and other critical environmental data to model sediment and nutrient transport within a watershed.

The baseline date for existing load calculations is July 2017 as ground cover at the time of initial submission of this Plan was contemplated. Upper Moreland Township's permit obligation applies only to runoff collected by and discharged from the MS4. The storm sewershed land area that is collected by and discharges from the MS4 to various tributaries of the Pennypack Creek and Wissahickon Creek has been delineated using PAMAP data known as Light Detection and Ranging (LiDAR) contours. LiDAR contours were also utilized in determining the planning areas. Refer to Appendix D for MapShed outputs related to the planning area calculations. The following tables reflect a summary of the required TMDL/PRP requirements as calculated in our 2016 TMDL Strategy and current TMDL/PRP Strategy:

Table E- 1: 2016 TMDL Strategy – Southampton Creek

MS4 SOUTHAMPTON CREEK TMDL SUMMARY		
Pollutant	**Sediment**	**Nutrient (Phosphorus)**
Existing Load (lbs/yr)	347,199	165
WLA (lbs/yr)	229,252	1.46
Required Reduction (%)	34%	99.1%
Required Reduction (lbs/yr)	117,947	163.54
Area of Southampton Creek Watershed in UMT (ac.)	856	
Area Parsed (ac.)	393	
Area Parsed (%)	46%	
Min. Required TMDL Reduction - 25 Years (lbs/yr)	63,796	88
Min. Required TMDL Reduction - 5 Years (lbs/yr)	12,759	18

Table E- 2: 2016 TMDL Strategy – Wissahickon Creek

MS4 WISSAHICKON CREEK TMDL SUMMARY	
Pollutant	**Sediment**
Existing Load (lbs/yr)	2,394
WLA (lbs/yr)	862
Required Reduction (%)	64%
Required Reduction (lbs/yr)	1,532
Area of Wissahickon Creek Watershed in UMT (ac.)	23.00
Area Parsed (ac.)	15.59
Area Parsed (%)	68%
Min. Required TMDL Reduction - 25 Years (lbs/yr)	494
Min. Required TMDL Reduction - 5 Years (lbs/yr)	99

Table E- 3: Upper Moreland Township Planning Area Summary – Pennypack Creek

Upper Moreland Township's Planning Area - Pennypack Creek	
Upper Moreland Twp Area in Watershed (ac)	5,119
Area Parsed (ac)	2,641
Area Parsed (%)	52%
Upper Moreland Twp Planning Area in Watershed (ac)	2,478

Table E- 4: Upper Moreland Township Planning Area Breakdown – Pennypack Creek

Upper Moreland Township's Planning Area - Pennypack Creek		
Parcel	**Load (lbs)**	**Area (ac)**
0	51,797	52
1	273,922	278
2	43,168	37
3	104,328	86
4	61,160	49
5	30,644	34
6	39,087	39
7	154,377	156
8	23,519	22
9	19,650	15
10	9,548	7
11	126,437	126
12	20,755	17
13	439,635	507
14	190,492	252
15	11,147	9
16	9,548	7
17	15,075	17
18	132,430	146
19	396,227	438
20	25,117	24
21	6,648	11
22	143,895	144
23	2,763	5
Total Baseline Load for Planning Area	**2,331,369.0**	2,478
Required PPR Sediment Reduction (10%)	**233,136.9**	***Areas from MapShed**

Table E- 5: Upper Moreland Township Planning Area Summary – Wissahickon Creek

Upper Moreland Township's Planning Area - Wissahickon Creek	
Upper Moreland Twp Area in Watershed (ac)	23.00
Area Parsed (ac)	15.59
Area Parsed (%)	68%
Upper Moreland Twp Planning Area in Watershed (ac)	7.41

Table E- 6: Upper Moreland Township Planning Area Breakdown – Wissahickon Creek

Upper Moreland Township's Planning Area - Wissahickon Creek		
Parcel	**Load (lbs)**	**Area (ac)**
0	1,003	7
Total Baseline Load for Planning Area	**1,003.0**	7
Required PRP Sediment Reduction (10%)	**100.3**	***Areas from MapShed**

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

Upper Moreland Township has a requirement to reduce siltation and nutrients. Implementation of BMPs or land use changes must be proposed that will result in meeting the minimum required reduction in pollutant loading with the storm sewershed(s) identified by the MS4. These BMP(s) must be implemented within five (5) years of DEP's approval of coverage under the PAG-13 Individual Permit, and must be located within the watershed of the applicable impaired waters, on either public or private property. BMPs that will be implemented by others (either in cooperation with the Township or otherwise) within the storm sewershed that will result in net pollution loading reductions (not E&S BMPs to satisfy Chapter 102 requirements) may be included within the TMDL/PRP.

Upper Moreland Township plans to achieve the sediment and nutrient reductions by designing, constructing, operating and maintaining select Best Management Practices (BMPs). Upper Moreland Township is required to implement this plan for 10% siltation reduction and 5% nutrient reduction over the next five (5) years and carry over the remaining TMDL reduction requirement until the subsequent terms.

Table F- 1: Summary of BMPs – Southampton Creek

Potential BMPs - Southampton Creek					
BMP #	**Type**	**Location**	**Area Treated (ac.)**	**TSS Reduction (lbs/yr)**	**Nutrient Reduction (lbs/yr)**
3	Extended Detention Basin Retrofit	Jason Drive (South)	14.52	8,856	1
4	Extended Detention Basin Retrofit	Jason Drive (North)	19.43	17,954	2
5	Basin Retrofit	Butternut Dr. & Acorn Pl.	30.45	16,521	3
9	Riparian Buffer Restoration	Pioneer Road & Byberry Road	4.22	207	6
		Minimum Required TMDL Reduction*		**12,759**	**18**
		Total Potential Reduction		**43,538**	**12**

* "Minimum Required TMDL is calculated based on 99.1% required reduction found in the Southampton Creek TMDL, which we believe this reduction to be unattainable based on current BMP practices. The Township will explore options within the 25-year term to accurately quantify the existing nutrient load from the MS4 to the Southampton Creek.

Table F- 2: Summary of BMPs – Pennypack Creek

Potential BMPs – Pennypack Creek				
BMP #	**Type**	**Location**	**Area Treated (ac.)**	**TSS Reduction (lbs/yr)**
1	Rain Garden Retrofit	Upper Moreland Middle School	5.06	3,531
2	Infiltration Basin	Upper Moreland Middle School	37.7	24,244
3	Extended Detention Basin Retrofit	Jason Drive (South)	14.52	8,856
4	Extended Detention Basin Retrofit	Jason Drive (North)	19.43	17,954
5	Basin Retrofit	Butternut Dr. & Acorn Pl.	30.45	16,521
6	Bioswale	Huntingdon Road & Mason Mills Rd	51.2	15,780
7	Streambank Stabilization	Huntington Valley Country Club	Up to 500 Feet	57,500
8	Streambank Stabilization	Terwood Park	Up to 500 Feet	57,500
9	Riparian Buffer Restoration	Pioneer Road & Byberry Road	4.22	207
10	Riparian Buffer Restoration	Boileau Park	3.82	1,300
11	Rain Garden/Bioswale	Boileau Park	4.32	2,630
12	Constructed Wetlands	Boileau Park	25.08	14,735
13	New Basin	Fair Oaks Park	47.62	29,978
14	Rain Garden A	Fulmor Heights	0.35	507
15	Rain Garden B	Fulmor Heights	0.09	130
16	Riparian Buffer Restoration	Fulmor Heights	1.14	1,325
17	U/G Basin	Fulmor Heights	0.66	956
18	Bioswale	Fulmor Heights	4.25	3,068
19	Basin Retrofit	Colonial Road & Warminster Road	10.71	3,351
20	Basin Retrofit	Rose Circle	19.3	12,471
21	Streambank Stabilization	Warminster Road & SEPTA	Up to 350 Feet	40,250
22	Streambank Stabilization	Public Works	Up to 500 Feet	57,500
			Required TSS Reduction	**233,137**
			Total Potential TSS Reduction	**370,294**

Table F- 3: Summary of BMPs – Wissahickon Creek

Potential BMPs - Wissahickon Creek				
BMP #	**Type**	**Location**	**Area Treated (ac.)**	**TSS Reduction (lbs/yr)**
N/A	Street Sweeping & Inlet Cleaning	Various	N/A	100
			Minimum Required TMDL Reduction	**99**
			Minimum Required PRP Reduction	**100**
			Total Potential TSS Reduction	**100**

The above tables are a summary of the proposed BMPs under consideration, including BMP type, location, area treated, and potential sediment removed (lbs/yr). Specific locations and drainage areas are depicted on the map found in Appendix C.

Proposed load reductions were calculated using the BMP Effectiveness Table in conjunction with the MapShed program. MapShed is a customized GIS interface that is used to create input data for an enhanced version of the GWLF watershed model originally developed at Cornell University. MapShed was improved by Dr. Barry Evans and his group at PSIEE using AVGWLF, a GIS-based watershed modeling tool that uses hydrology, land cover, soils, topography, weather, pollutant discharges, and other critical environmental data to model sediment and nutrient transport within a watershed. Refer to Appendix E for MapShed input parameters and outputs related to each BMP.

The proposed reduction in sediment for each BMP is calculated by taking the proposed TSS loading with the BMP and deducting it from the base total watershed loading. The new watershed loading for each BMP can be found in Appendix E - Urban Area Viewer window. The base total watershed loading for the Pennypack Creek, 15,367,068 pounds, can be found in Appendix D-2. By taking the difference of the two loadings pre- and post-BMP, the result is the net TSS and Nutrient (Phosphorus) reduction for each BMP. The summation of all proposed BMP load reductions for the Pennypack Creek yielded a total sediment reduction that exceeded both the TMDL and PRP requirements for this permit term.

Since the proposed BMPs exceed the minimum TSS reduction requirements, Upper Moreland Township reserves the right to choose which BMPs are to be implemented and the linear footage of streambank stabilized in order to satisfy the MS4 TMDL/PRP requirements of this permit term. The BMPs included in Tables F-1, F-2, and F-3 are shown to demonstrate compliance, and the Township intends to implement a combination of the listed BMPs to meet the minimum required pollutant load reductions.

After parsing, the area of the Wisshickon Creek Watershed that is within the Township's MS4 planning area is relatively small. The opportunity to implement BMPs is limited and as such street sweeping and clearing debris and sediment from inlets has been determined as the most viable BMP option.

This PRP is a working document and in the event that any of the above-listed BMPs cannot be implemented, the Township understands that this plan will need to be revised in order to achieve compliance within the current 5-year permit term. The Township remains fully committed to meeting applicable water standards and has the ability to revise the plan and include detailed BMP design and additional BMPs for consideration if additional controls are required in the long-term.

G. Identify Funding Mechanism(s)

The Municipality intends to apply for all related grants, such as Growing Greener, Watershed Restoration Protection, DCNR, etc. The Municipality intends to utilize general funds to cover the design and construction costs for the proposed BMPs should grant money not be awarded. Once the PRP has been approved by PADEP, the Municipality intends to authorize design of the BMPs, upon which time a feasibility and cost analysis will be prepared to determine the order for which the potential BMPs will be implemented.

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

Once implemented, the BMPs must be maintained in order to continue producing the expected pollutant reductions. Actual O&M activities will be identified by the MS4 in their Annual MS4 Status Reports, submitted under the Permit.

Applicants must identify the following for each selected BMP:

- The parties responsible for ongoing O&M;
- The activities involved with O&M for each BMP; and
- The frequency at which O&M activities will occur

Table H- 1: Operation & Maintenance of BMPs – Pennypack Creek

BMP O&M Table - Pennypack Creek				
BMP #	**Type**	**Location**	**Responsible Party**	**Activity & Frequency**
1	Rain Garden Retrofit	Upper Moreland Middle School	Upper Moreland SD	Per PA BMP Manual
2	Infiltration Basin	Upper Moreland Middle School	Upper Moreland SD	Per PA BMP Manual
3	Extended Detention Basin Retrofit	Jason Drive (South)	Upper Moreland Township	Per PA BMP Manual
4	Extended Detention Basin Retrofit	Jason Drive (North)	Upper Moreland Township	Per PA BMP Manual
5	Basin Retrofit	Butternut Dr. & Acorn Pl.	Upper Moreland Township	Per PA BMP Manual
6	Bioswale	Huntingdon Road & Mason Mills Rd	Upper Moreland Township	Per PA BMP Manual
7	Streambank Stabilization	Huntington Valley Country Club	Upper Moreland Township	Per PA BMP Manual
8	Streambank Stabilization	Terwood Park	Upper Moreland Township	Per PA BMP Manual
9	Riparian Buffer Restoration	Pioneer Road & Byberry Road	Upper Moreland Township	Per PA BMP Manual
10	Riparian Buffer Restoration	Boileau Park	Upper Moreland Township	Per PA BMP Manual
11	Rain Garden/Bioswale	Boileau Park	Upper Moreland Township	Per PA BMP Manual
12	Constructed Wetlands	Boileau Park	Upper Moreland Township	Per PA BMP Manual
13	New Basin	Fair Oaks Park	Upper Moreland Township	Per PA BMP Manual

14	Rain Garden A	Fulmor Heights	Upper Moreland Township	Per PA BMP Manual
15	Rain Garden B	Fulmor Heights	Upper Moreland Township	Per PA BMP Manual
16	Riparian Buffer Restoration	Fulmor Heights	Upper Moreland Township	Per PA BMP Manual
17	U/G Basin	Fulmor Heights	Upper Moreland Township	Per PA BMP Manual
18	Bioswale	Fulmor Heights	Upper Moreland Township	Per PA BMP Manual
19	Basin Retrofit	Colonial Road & Warminster Road	Upper Moreland Township	Per PA BMP Manual
20	Basin Retrofit	Rose Circle	Upper Moreland Township	Per PA BMP Manual
21	Streambank Stabilization	Warminster Road & SEPTA	Upper Moreland Township	Per PA BMP Manual
22	Streambank Stabilization	Public Works	Upper Moreland Township	Per PA BMP Manual

Table H- 2: Operation & Maintenance of BMPs – Wissahickon Creek

BMP O&M Table - Pennypack Creek				
BMP #	**Type**	**Location**	**Responsible Party**	**Activity & Frequency**
N/A	Street Sweeping & Inlet Cleaning	Various	Upper Moreland Township	Per PA BMP Manual

As shown in tables H-1 and H-2, Upper Moreland Township will be responsible for ownership and maintenance of all constructed BMPs with the exception of the Rain Garden and Basin Retrofit on the School District's Middle School property. The Township will ensure continued maintenance of the Middle School BMPs through an Ownership & Maintenance covenant prepared by the Township Solicitor.

I. General Information

Terms: The term “nutrients” refers to “Total Nitrogen” (TN) and “Total Phosphorus” (TP) unless specifically stated otherwise in DEP’s latest Integrated Report. The terms “sediment,” “siltation,” and “suspended solids” all refer to inorganic solids and are hereinafter referred to as “sediment.”

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

For PRPs developed for impaired waters (Appendix E), the pollutant(s) are based on the impairment listing, as provided in the MS4 Requirements Table. If the impairment is based on siltation only, a minimum 10% sediment reduction is required. If the impairment is based on nutrients only or other surrogates for nutrients (e.g., “Excessive Algal Growth” and “Organic Enrichment/Low D.O.”), a minimum 5% TP reduction is required. If the impaired is due to both siltation and nutrients, both sediment (10% reduction) and TP (5% reduction) must be addressed.

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

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

BMP Effectiveness: All MS4s must use the BMP effectiveness values contained within DEP's BMP Effectiveness Values document (3800-PM-BCW0100m) or Chesapeake Bay Program expert panel reports for BMPs listed in those resources when determining pollutant load reductions in TMDL/PRPs. For BMPs not listed in 3800-PM-BCW0100m or expert panel reports, MS4s may use effectiveness values from other technical resources; such resources must be documented in the TMDL/PRP.

Combining PRPs: If the MS4 discharges into multiple local surface waters impaired for nutrients and/or sediment, one PRP may be submitted to satisfy Appendix E but calculations and BMP selections must be completed independently for the storm sewershed of each impaired water. If, for example, an MS4 permittee must complete three PRPs according to the MS4 Requirements Table for three separate surface waters, storm sewershed maps must be developed, existing loads must be calculated, and BMPs must be implemented for pollutant reductions independently within those storm sewersheds. In other words, BMPs cannot be implemented in one storm sewershed to count toward pollutant reductions in an entirely separate storm sewershed for a different impaired water.

Where local surface waters are impaired for nutrients and/or sediment, and those waters are tributary to a larger body of water that is also impaired, MS4s can propose BMPs within the upstream impaired waters to meet the pollutant reduction requirements of both the upstream and downstream waters. For example, if Stream A flows through a municipality that is tributary to Stream B, both are impaired and the MS4 has discharges to both streams, the MS4 can implement BMPs in the storm sewershed of Stream A to satisfy pollutant reduction requirements for both Streams A and B. In general, the MS4 permittee would not be able to satisfy pollutant reduction requirements for both streams if BMPs were only implemented in the storm sewershed of Stream B; however, on a case by case basis DEP will consider such proposals where it can be demonstrated that implementing BMPs in the upstream storm sewershed is infeasible.

If, however, Stream A does not flow into Stream B, both are impaired and the MS4 has discharges to both streams, in general DEP would expect that BMPs be implemented in the storm sewershed of both streams to meet pollutant reduction requirements.

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

Joint PRPs: MS4s may develop and submit a joint PRP, regardless of whether the MS4s will be submitting a "joint NOI" or are already co-permittees. In general, the MS4s participating in a joint PRP should have contiguous land areas. The "study area" to be mapped is the combined storm sewershed for all MS4 jurisdictions.

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

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

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

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

that is due following completion of the 5th year of General Permit coverage. For example, if DEP issues written approval of coverage to a permittee on June 1, 2018, the required pollutant load reductions must be implemented by June 1, 2023 and the final report documenting the BMPs that were implemented (with appropriate calculations) must be attached to the annual report that is due September 30, 2023. In general, the same methodology used to calculate the existing pollutant loads should be used in the final report to demonstrate the reductions. If BMP effectiveness values are updated in DEP's BMP Effectiveness Values document or Chesapeake Bay Program expert panel reports between the time the PRP is approved and the time the final report is developed, those updated effectiveness values may be used.

Appendix A

Applicable portion of the MS4 Requirements Table (Municipal) Anticipated Obligations for Subsequent NPDES Permit Term (Revised 9/8/2017)

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Montgomery County						
UPPER FREDERICK TWP	PAG130129	No		Goshenhoppen Creek	Appendix E-Nutrients (5)	
UPPER GWYNEDD TWP	PAG130031	Yes	TMDL Plan	Wissahickon Creek	Appendix E-Nutrients (4a), Appendix B-Pathogens (5)	Other Habitat Alterations, Water/Flow Variability (4c)
				Skippack Creek	Appendix E-Excessive Algal Growth, Nutrients (5)	
				Wissahickon TMDL	TMDL Plan-Siltation, Suspended Solids (4a)	Cause Unknown (4a)
				Zacharias Creek	Appendix B-Pathogens (5)	Flow Alterations (4c)
				Towamencin Creek	Appendix E-Excessive Algal Growth (5)	Water/Flow Variability (4c)
				Skippack Creek Watershed TMDL	TMDL Plan-Siltation (4a)	
UPPER HANOVER TWP	PAG130109*	No		Green Lane Reservoir	Appendix E-Organic Enrichment/Low D.O. (4a)	
UPPER MERION TWP	PAG130042	No		Crow Creek	Appendix E-Siltation (5)	Water/Flow Variability (4c)
				Unnamed Tributaries to Schuylkill River	Appendix E-Siltation (5)	Water/Flow Variability (4c)
				Trout Creek	Appendix E-Siltation (5)	Cause Unknown (4a), Water/Flow Variability (4c)
				Schuylkill River PCB TMDL	Appendix C-PCB (4a)	
				Schuylkill River	Appendix C-PCB (4a)	
				Gulph Creek	Appendix E-Siltation (5)	Water/Flow Variability (4c)
				Matsunk Creek	Appendix E-Siltation (5)	Water/Flow Variability (4c)
UPPER MORELAND TWP	PAG130019	Yes	TMDL Plan	Wissahickon TMDL	TMDL Plan-Siltation, Suspended Solids (4a)	Cause Unknown (4a)
				Pennypack Creek	Appendix E-Siltation (5)	Cause Unknown (5), Flow Alterations, Other Habitat Alterations, Water/Flow Variability (4c)
				Terwood Run	Appendix E-Siltation (5)	Cause Unknown (5)
				Round Meadow Run	Appendix E-Siltation (5)	Cause Unknown (5)
				Southampton Creek TMDL	TMDL Plan-Nutrients, Organic Enrichment/Low D.O., Siltation (4a)	
				Southampton Creek		Flow Alterations, Other Habitat Alterations, Water/Flow Variability (4c)
UPPER POTTSGROVE TWP	PAG130107	No		Unnamed Tributaries to Manatawny Creek	Appendix E-Siltation (5)	Flow Alterations, Other Habitat Alterations (4c)
				Schuylkill River	Appendix C-PCB (4a)	
UPPER PROVIDENCE TWP	PAG130108	No		Doe Run	Appendix E-Siltation (5)	Water/Flow Variability (4c)
				Donny Brook	Appendix E-Siltation (5)	Water/Flow Variability (4c)
				Perkiomen Creek	Appendix B-Pathogens (5)	
				Schuylkill River PCB TMDL	Appendix C-PCB (4a)	
				Schuylkill River	Appendix C-PCB (4a)	
				Schoolhouse Run	Appendix E-Siltation (5)	

Appendix B

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

Appendix B-1: Public Notice & Proof of Advertisement

NOTICE OF PUBLIC MEETING

NOTICE IS HEREBY GIVEN that **Upper Moreland Township Board of Commissioners** will hold a public meeting on **Monday, August 7, 2017 at 7:00 p.m.** in the public meeting room of the Upper Moreland Township building at 117 Park Avenue, Willow Grove, PA 19090 for the purpose of reviewing and receiving public comment on the Upper Moreland Township MS4 Pollution Reduction Plan. The MS4 Pollution Reduction Plan outlines the plan the Township will use to reduce pollutants discharged from the Township storm sewer system (MS4) consistent with the PA DEP PAG-13 MS4 Individual Permit requirements. The Township is soliciting written comments on the Pollution Reduction Plan until September 7, 2017. Comments must be submitted in writing to the attention of the Township Manager at 117 Park Avenue, Willow Grove, PA 19090 or by email at (ddodies@uppermoreland.org.) Comments submitted via facsimile will not be accepted. Comments, including comments submitted by email, must include the originator's name and address. The document will be available for review at the Township office at 117 Park Avenue, Willow Grove, PA 19090 during regular office hours Monday – Friday 8:30 a.m. to 4:30 p.m. The document is also available for review on the Township website at www.uppermoreland.org.

By order of the
Board of Commissioners
David A. Dodies
Township Manager/Secretary

1t Jy 30 7146744

LEGAL NOTICE

NOTICE IS HEREBY GIVEN that Upper Moreland Township Board of Commissioners will hold a public meeting on Monday, August 7, 2017 at 7:00 p.m. in the public meeting room of the Upper Moreland Township building at 117 Park Avenue, Willow Grove, PA 19090 for purpose of reviewing and receiving public comment on the Upper Moreland Township MS4 Pollution Reduction Plan. The MS4 Pollution Reduction Plan outlines the plan the Township will use to reduce pollutants discharged from the Township storm sewer system (MS4) consistent with the PA DEP PAG-13 MS4 Individual Permit requirements. The Township is soliciting written comments on the Pollution Reduction Plan until September 7, 2017. Comments must be submitted in writing to the attention of the Township Manager at 117 Park Avenue, Willow Grove, PA 19090 or by email at (ddodies@uppermoreland.org.) Comments submitted via facsimile will not be accepted. Comments, including comments submitted by email, must include the originator's name and address. The document will be available for review at the Township office at 117 Park Avenue, Willow Grove, PA 19090 during regular office hours Monday – Friday 8:30 a.m. to 4:30 p.m. The document is also available for review on the Township website at www.uppermoreland.org.

David Dodies
Township Manager

Appendix B-2: Public Comments Received

No public comments were received during the comment period. The plan was discussed at a public meeting on August 7, 2017.

Appendix B-3: Public Meeting Agenda and Meeting Minutes

Board of Commissioners Members: Commissioner and President, R. Samuel Valenza; Commissioner and Vice President, Joseph A. Lavalle; Commissioners Donald B. Tucker, Jr., Kevin Spearing, Donna D. Parsell, Kip McFatridge, and Donald G. Warner

I. **Call to Order**: The Regular Meeting of the Board of Commissioners of Upper Moreland Township was called to order by the President of the Board of Commissioners, R. Samuel Valenza, at 7:15 p.m.

II. **Moment of Silent Meditation/Pledge of Allegiance**

III. **Roll Call:** Commissioners Valenza, Spearing, McFatridge, Lavalle, Tucker, Jr., and Warner. Absent: Commissioner Parsell. Also present: David A. Dodies, Township Manager and Catherine Harper, Township Solicitor.

IV. **Presentations/Announcements:**

A. Commissioner Valenza made the following announcements:
- The Community Development Committee, Finance & Administration Committee, Parks & Recreation Committee and Public Health & Safety Committee Meetings have been cancelled for the month of August.
- The Board of Commissioners held an Executive Session prior to tonight's meeting to discuss legal and personnel matters.

B. Jim Hersh, P.E., Gilmore & Associates presented the proposed draft of the MS4 Pollution Reduction Plan:
- The current plan must be renewed by September 15, 2017, and the Township is responsible to reduce 10% of approximately 220,000 lbs. of sediment runoff into the Pennypack Creek.
  - Commissioner Spearing asked if the Township receives credit for collecting sediment from street cleaning. Mr. Hersh stated that there is an approximate 9% reduction in sediment collected from street sweeping which the Department of Environmental Protection does not count towards BMP credits.
- The YMCA's proposed streambank stabilization at Terwood Park and the School District's installation of rain gardens and basin retrofits at the Middle School can be applied toward MS4 reduction count without using Township funds.
- Retrofitting three existing stormwater basins is proposed; two in the area of Jason Drive and one in the area of Butternut Drive. Bioswales are proposed for places identified within the Township that have substantial drainage flowing to underground pipes or natural channels that present erosion at the bottom.
  - Commissioner Valenza commented that the area behind Gibson Drive, from County Line Road, west of Davisville Road, was not included in the plan. Mr. Hersh stated that the plan is open to revisions.
  - Commissioner Valenza asked if the maximum reduction rate changes every five years. Mr. Hersh stated that the permit term is five years and estimated at a 10% reduction.
- Mr. Hersh stated that Fair Oaks Basin would cost the Township approximately $560,000 and reduce 30,000 lbs. of sediment per year, as compared to the three proposed retrofits, estimated at $180,000, which reduces 46,000 lbs. of sediment per year. He suggested that it is cost effective to implement Fair Oaks Basin with assistance from a grant, thereby eliminating expense of two proposed retrofits.
- Mr. Hersh stated that there is potential from William Penn Foundation to fund Boileau Park Basin for streambank stabilization and the increase of wetlands.

- Mr. Hersh identified two streambank stabilization areas to add to the list; one at the Pennypack Circle Tributary, behind the apartments, and the second at the Huntingdon Valley Country Club.
- Commissioner Spearing stated that he would like to add the streambank located at the storage unit property on Maryland Road, next to the Jamestown Apartments, across the road from the Lexus Thompson dealership.
- Commission Spearing asked if streambank stabilization and buffer repair credits are available from the streambank at Abington Hospital along Commerce Drive. Mr. Hersh stated that it is not included.
- Commissioner Spearing asked if credits are available from the Turnpike's proposed basin and expansion of wetlands at the Willow Grove Interchange. Mr. Hersh stated that they will explore the potential opportunities.
- Commissioner Lavalle commented on the environmental impact regarding the pollutants expelled from the Willow Grove Naval Base and its effect on the area and new development. Mr. Hersh could not comment on this issue with regard to this report. Commissioner Spearing commented that the Department of Environmental Protection did not ask the Township to submit pollution concerns regarding area waterways.
- Mr. Hersh confirmed to Ms. Harper that the MS4 Pollution Reduction Plan does not require a Resolution and he will submit the plan on behalf of the Board of Commissioners by the deadline of September 15, 2017.

PUBLIC HEARING #1937 was held and closed to consider **Ordinance #1680** Amending Chapter 330 "Vehicles and Traffic" Section 330-15 "Parking Prohibited at All Times" of the Upper Moreland Township Code of Ordinances to add the North side of Ashley Street for thirty feet near its intersection with Warminster Road as prohibited for parking and requiring the posting of traffic signs in accordance with this ordinance.

REGULAR MEETING

V. **Public Comments – Non-Agenda Items Only:**

- Richard Barrolla, 2517 Hagen Drive, commented on noise projected from a business located on Turnpike Drive. Commissioner Valenza directed the resident to provide details on the address and issues to Mr. Dodies for further investigation into the matter.

VI. **Treasurer's Activity Report** – July 2017: The Treasurer's Activity Report was unanimously approved as submitted.

VII. **Approval of Minutes**: The Regular Meeting Minutes of July 10, 2017 were unanimously approved as submitted.

VIII. **Committee Recommendations:**

A. **Finance & Administrative Committee:**

1. **Appointments/Reappointments:**
   The Board of Commissioners unanimously approved by a vote of 6-0 (Commissioner Parsell was absent), the following re-appointments and appointments as submitted:
   a. Arlene B. Rubin to the Upper Moreland Township Historical Commission serving as required "Solicitor" position, for a new three-year term to expire on December 31, 2019.
   b. Glenn DePalantino to the Upper Moreland Township Environmental Advisory Council to fulfill the remaining term of Alicia M. Caruso, to expire on January 1, 2018.

c. Stacey Efkowitz as a voting member of the Upper Moreland Township Police & Fire Civil Service Commission, to fulfill the remaining term of Whitney Zylstra, to expire on December 31, 2020.
d. Appointment of Stephen Martin as an alternate member of the Upper Moreland Township Police & Fire Civil Service Commission, to fulfill the remaining term of Stacey Efkowitz, to expire on December 31, 2020.

2. **List of Bills Payable:** The List of Bills were unanimously approved as submitted.
3. **Other Items -** Nothing to report.
4. **New Business:**
   a. The Board of Commissioners unanimously approved by a vote of 6-0 (Commissioner Parsell was absent) - a request from Upper Moreland Historical Commission for an $800 appropriation to fund the cost related to an historical re-enactment at the annual Community Day on October 1, 2017.
      - Commissioner Valenza explained that due to the timing of the event and the cancellation of the Community Development Meeting for August, there is no opportunity to initiate a recommendation to the Board of Commissioners for a vote before September.
      - Michelle Young explained that a budget shortage resulted from a 2016 item that was not paid until 2017. The $800 will pay for an interactive theatre company to present a re-enactment of historical people associated with the Township of Upper Moreland.

B. **Community Development Committee**:

1. **Code Enforcement –** Nothing to report.
2. **Land Development/Subdivision Applications:**
   a. The Board of Commissioners unanimously approved by vote of 6-0 (Commissioner Parsell was absent), **Resolution No. R-2017-30** - the waiver request of property owners at 1509 and 1511 Sycamore Avenue of a setback distance from property line.
   b. The Board of Commissioners unanimously approved a slightly amended resolution by a vote of 6-0 (Commissioner Parsell was absent), **Resolution No. R-2017-31** – the request from D. LaRosa Builders to adjust the location of an existing lot line; a portion of one parcel is to be combined with an adjacent parcel on Krugel Street with conditions.
      - Commissioner Lavalle reviewed the list of seven waivers.
      - The Board of Commissioners directed Ms. Harper to revise Waiver #6 to read, "the applicant has requested a waiver of the standards of tree replacement required by Section 345, for trees destroyed by development to be replaced on each lot", referenced in McCloskey & Faber's review letter.
   c. The Board of Commissioners approved by a vote of 5-0, (Commissioner McFatridge abstained and Commissioner Parsell was absent), **Resolution No. R-2017-32** – the request from Philadelphia Freedom Valley YMCA granting preliminary/final Land Development approval with conditions for the development of the YMCA on its site located at 3400 Davisville Road.
      - Commissioner Lavalle reiterated five transportation improvements that the applicant shall provide:
        1. Improvements to the intersection of Terwood and Davisville Roads;
        2. Improvements to the intersection of Byberry and Davisville Roads;
        3. Improvements to the intersection of site driveway and Davisville Road;
        4. Transportation Impact Fee in the amount of $446,000; and
        5. Installation of 2 sets of flood gates.
      - Commissioner Lavalle reviewed 23 waivers in Section C.

- Mr. Barollo, asked if Waiver C(3) includes future expansion. Matt Witters, Eustace Engineering, confirmed that calculations were included.
- Commissioner Spearing asked what category of stormwater event, in Waiver C(4), was considered for the possibility of overflow from the gabion walls. Mr. Witters stated that back-to-back cataclysmic events were considered to accumulate approximately 16 inches of stormwater within 48 hours.

- Commissioner Lavalle reviewed waiver conditions in Section D3 and D4.
  - Francis Carver, a resident of 3045 Davisville Road, asked if traffic plans have been approved by PennDOT. Guy DiMartino, Traffic Planning and Design, Inc., stated that concept plans and roadway improvements were communicated to PennDOT and the applicant is advancing towards the Highway Occupancy Permit approval from PennDOT.
  - Mr. Carver asked to clarify the proposed length of the right turn lane in front of his property. Mr. DiMartino stated that, as discussed at the July 17, 2017, Community Development Committee Meeting, the right turn lane will extend 450 feet beyond the existing Park access, relocating the current Park access further to the north. Mr. Carver stated that he is opposed to the 450-foot lane and prefers the 300-foot lane. He then asked about plans for a "Do Not Block The Box" on Pennypack Road. Mr. DiMartino stated that they are proposing road striping and a "Do Not Block The Box".
  - Mr. Carver asked about the impact on large trees along the 4-foot walkway. Mr. Witters stated that it is within the right-of-way, and they will coordinate with property owners once design improvements begin with consideration to minimally impact trees.
  - Mr. Barollo asked if there will be a meeting with property owners and PennDOT to discuss acquiring property for turn lanes proposed at Davisville and Byberry Roads. Commissioner Valenza said that Mr. Hersh, Township Engineer, will determine the calculations and ensure compliance in the process.
  - Mr. Barollo further questioned if they will survey residents for their opinion on traffic in the area. Commissioner McFatridge stated that Commissioner Valenza asked the Board of Commissioners to investigate using the Traffic Impact Fee to add a right turn lane onto Byberry Road and compensate property owners who forfeit property. Mr. Barollo made further comments that the YMCA should have developed their business at the former Willow Grove Naval Air Base property instead.
- Jonathan Grosser, attorney for the YMCA, confirmed that the YMCA acquired ownership of the property in the past week.

3. **List of Upcoming Zoning Hearing Board Applications** – There are no Zoning Applications to be considered by the Hearing Board for August 2017. The next meeting will be held in September 2017.
4. **Other Items:**
   a. The Board of Commissioners unanimously approved by a vote of 6-0 (Commissioner Parsell was absent), **Resolution No. 2017-33** – the request from Luft Investments LLC, to permit the use of an area within Upper Moreland Township's Right-of-Way for the construction of a retaining wall.

C. **Parks & Recreation Committee** - Nothing to report.

D. **Public Health & Safety Committee**:
   1. **Other Items:**

a. The Board of Commissioners unanimously approved by a vote of 6-0 (Commissioner Parsell was absent), **Ordinance No. 1680** - amending Chapter 330 "Vehicles and Traffic" Section 330-15 "Parking Prohibited at All Times" of the Upper Moreland Township Code of Ordinances to add the North side of Ashley Street for thirty feet near its intersection with Warminster Road as prohibited for parking and requiring the posting of traffic signs in accordance with this ordinance.

IX. **New Business:**

- Ms. Harper reported on two legislative enactments:
  1. Act 22 was signed on July 7, 2017 by Governor Tom Wolf, going into effect September 2017, which allows for body cams on police officers.
     - Chief Murphy stated that the local policy is being updated and will be presented at the Public Health & Safety Committee Meeting in September.
     - Chief Murphy stated a presentation is scheduled to discuss the Parking Ordinance for the Township at the Public Health & Safety Meeting in September. Commissioner Valenza directed Chief Murphy to provide a copy for review by mid-August, prior to the presentation.
  2. There is a pending Bill with the Pennsylvania House Consumer Affairs Committee regarding Distributed Antenna Systems which removes a township's rights regarding small DAS systems located in the Rights-Of-Way. Ms. Harper urged the Board of Commissioners to complete their review of the draft Ordinance as soon as possible to be grandfathered into the Bill.

X. **Commissioner Comments:**

- Commissioner Warner commented with regards to the YMCA development and on how well the community can positively work together with a developer. He looks forward to the YMCA operating in the Township.
- The Board of Commissioners unanimously agreed by a vote of 6-0 (Commissioner Parsell was absent) to approve the use of the Township street sweeper on School District lots, without incurring damage to the street sweeper, and not to exceed 16 hours or two days of cleanup work.
  - Mr. Dodies presented a request from the School District to use the Township's street sweeper to clean their lots before the start of school, excluding the Middle School. He explained that it would entail approximately 12-15 hours of work at $160 per hour and recommends that the Township invoice for the service.
  - Commissioner McFatridge commented that the Township should not invoice, because the School District does not invoice for use of their athletic fields. Commissioner Spearing agreed, but noted that these lots are in the midst of construction work, and substantial cleanup is the responsibility of the contractor on the site.
- Commissioner Spearing commended the YMCA, Township staff, consultants, and the public for working together to complete the development's approval. He disagrees with the 501C, but believes that the YMCA will attract business to the Township.

XI. **Adjournment:** There being no further business to discuss, the meeting was adjourned at 10 p.m.

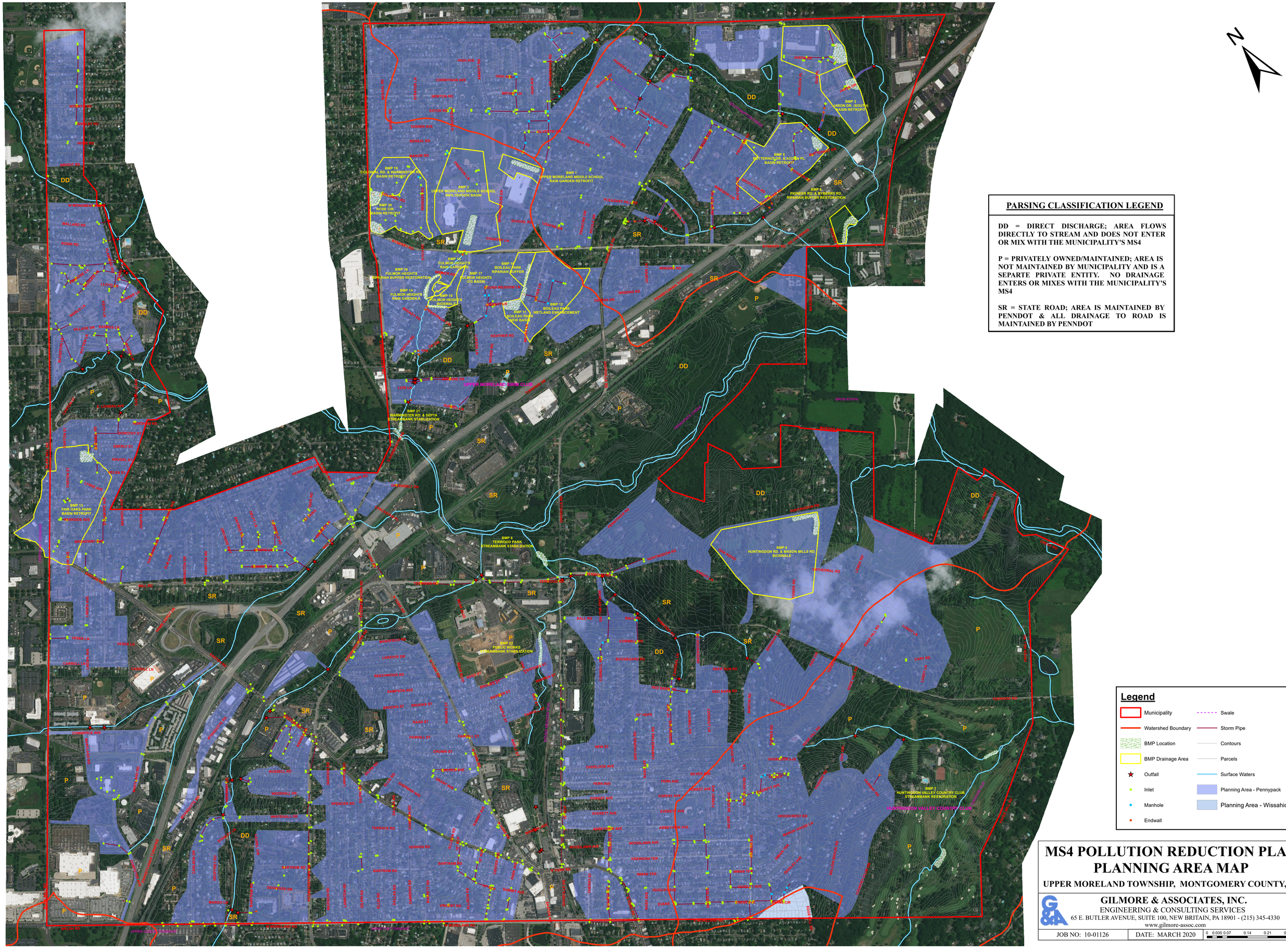
Respectfully submitted by: Kathleen Kristire.

Appendix B-4: Record of Consideration

The Township did not receive any comments at the public meeting. No changes were made to the document.

Appendix C

Upper Moreland Township MS4 PRP Planning Area Map



PARSING CLASSIFICATION LEGEND

DD = DIRECT DISCHARGE; AREA FLOWS DIRECTLY TO STREAM AND DOES NOT ENTER OR MIX WITH THE MUNICIPALITY'S MS4

P = PRIVATELY OWNED/MAINTAINED; AREA IS NOT MAINTAINED BY MUNICIPALITY AND IS A SEPARTE PRIVATE ENTITY. NO DRAINAGE ENTERS OR MIXES WITH THE MUNICIPALITY'S MS4

SR = STATE ROAD; AREA IS MAINTAINED BY PENNDOT & ALL DRAINAGE TO ROAD IS MAINTAINED BY PENNDOT

Legend

- Municipality
- Watershed Boundary
- BMP Location
- BMP Drainage Area
- Outfall
- Inlet
- Manhole
- Endwall
- Swale
- Storm Pipe
- Contours
- Parcels
- Surface Waters
- Planning Area - Pennypack
- Planning Area - Wissahickon

MS4 POLLUTION REDUCTION PLAN
PLANNING AREA MAP

UPPER MORELAND TOWNSHIP, MONTGOMERY COUNTY, PA

GILMORE & ASSOCIATES, INC.
ENGINEERING & CONSULTING SERVICES
65 E. BUTLER AVENUE, SUITE 100, NEW BRITAIN, PA 18901 - (215) 345-4330
www.gilmore-assoc.com

JOB NO: 10-01126 | DATE: MARCH 2020 | 0 0.035 0.07 0.14 0.21 0.28 Miles

Appendix D

Appendix D-1: 2016 TMDL Strategy Plan prepared by Gilmore & Associates, Inc. issued May 27, 2016.

Appendix D-2: Total Watershed Loading in Pennypack Creek (MapShed)

Appendix D-3: Total Loading for Planning Areas for Pennypack Creek within Upper Moreland Township (MapShed)

Appendix D-4: Total Watershed Loading in Wissahickon Creek (MapShed)

Appendix D-5: Total Loading for Planning Areas for Wissahickon Creek within Upper Moreland Township (MapShed)

Appendix D-1: 2016 TMDL Strategy Plan

GILMORE & ASSOCIATES, INC.
ENGINEERING & CONSULTING SERVICES

VIA FEDEX OVERNIGHT

May 27, 2016

File No. 10-01126

Jennifer L. Fields, P.E.
Clean Water Program Manager
PA Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

Reference: Upper Moreland Township – TMDL Strategy Plan
NPDES Stormwater Permit No. PAG130019
File Type: MS4
Montgomery County

Dear Ms. Fields:

Enclosed please find the MS4 Southampton Creek & Wissahickon Creek TMDL Strategy plan that Gilmore & Associates, Inc. is submitting on behalf of the Upper Moreland Township. The plan has been revised to address comments contained in your May 28, 2015 review letter. As such, the MS4 tributary area has been revised to include all land within the Township that drains to the MS3. Areas within the Township that do not drain to the municipal system were parsed out of the tributary area per guidance from your office.

On behalf of Upper Moreland Township, we wish to thank you for your assistance. Please call us if you have any questions or require additional information.

Sincerely,

James J. Hersh, P.E.
Project Engineer
Gilmore & Associates, Inc.

JJH/

Enclosure: As Referenced

cc: Paul Purtell, Director of Code Enforcement (encl. hand delivered)
David Dodies, Township Manager (w/o encl.)
Erik Garton, P.E., V.P., Gilmore & Associates, Inc.

MS4 Southampton Creek & Wissahickon Creek TMDL Strategy

For
Upper Moreland Township
Montgomery County

April 2016

Prepared For:

Upper Moreland Township
117 Park Avenue
Willow Grove, PA 19090
(215) 659-3100

Prepared By:
Gilmore & Associates, Inc.
Engineers ♦ Land Surveyors ♦ Planners ♦ GIS Consultants
65 East Butler Avenue, Suite 100
New Britain, PA 18901
215-345-4330

Table of Contents

I. Introduction

Upper Moreland Township, located in Montgomery County, is comprised of 7.5 square miles of land situated within the Wissahickon Creek and Pennypack Creek watersheds. The Township owns and maintains a small municipal separate storm sewer system (MS4) requiring a National Pollutant Discharge Elimination System (NPDES) permit to allow discharge of stormwater runoff to waters of the Commonwealth of Pennsylvania. The Wissahickon Creek watershed and the Southampton Creek watershed have approved Total Maximum Daily Loads (TMDLs). These plans establish waste load allocations (WLA) for Upper Moreland Township limiting the amount of pollutants that are permitted to be discharged to waters of the Commonwealth of Pennsylvania. At the time of this Strategy, the Wissahickon TMDL plan has siltation (sediment) WLAs attributed to the Township and the Southampton TMDL plan has siltation and nutrient (total phosphorous) WLAs attributed to the Township. This MS4 TMDL Strategy is prepared to satisfy the siltation and nutrient WLAs of the Southampton Creek and siltation of the Wissahickon Creek TMDL Plans.

The intent of this MS4 TMDL Strategy is to establish the WLA of the Township and to present a plan to reduce waste loads discharged from the regulated small MS4 consistent with the WLAs in the approved Southampton Creek Watershed TMDL and Wissahickon Creek Watershed TMDL. Upon approval of these Strategies by the Pennsylvania Department of Environmental Protection (PADEP), the Township will provide MS4 TMDL Design Details for implementation of the Strategy. Together, these documents, the MS4 TMDL Strategies and the MS4 TMDL Design Details, comprise the MS4 TMDL Plans satisfying the requirement of the Township's NPDES MS4 Permit. Implementation of the TMDL Plan is an adaptive, iterative and dynamic process. The TMDL Plan will be evaluated and updated by the Township on an as-needed basis, based upon its effectiveness in reducing pollutant loads in discharges from the regulated small MS4, the reasonableness of achieving the WLAs, and the cost/benefit of the best management practices (BMPs) under consideration.

Upper Moreland Township has been engaged with watershed partners within the Southampton Creek Watershed to determine if joint planning efforts towards compliance with TMDL requirements will be beneficial to the municipalities. Several meetings have taken place in January – March 2016 with staff and engineers from Lower Moreland Township, Upper Southampton Township, Warminster Township, and Bryn Athyn Borough. The meetings provided great insight into the challenges that each municipality faces in terms of achieving pollutant reductions within the watershed. The current TMDL Strategy Plan, which is contained in this document, is intended to achieve compliance for Upper Moreland Township only. As outlined in the Southampton Creek TMDL strategy portion of this report, Upper Moreland Township is committed to exploring watershed wide initiatives in the future and will continue to work with adjacent municipalities within the Southampton Creek watershed to determine if viable joint planning efforts can have a mutual impact on water quality within the region.

II. Established TMDLs

Southampton Creek

The Southampton Creek watershed covers approximately 1.35 square miles of Upper Moreland Township. This watershed then flows into the main Pennypack Creek watershed, which encompasses almost all of Upper Moreland Township.

While no TMDL exists for the Pennypack Creek, which is an impaired stream for sediment, the USEPA established total phosphorous and sediment TMDLs for the Southampton Creek sub-watershed on June 30, 2008. The TMDL, titled *Nutrient and Sediment TMDLs for the Southampton Creek Watershed, Pennsylvania*, is for the Southampton Creek in Montgomery and Bucks counties within Hydrologic Unit Code 02040202 (Lower Delaware). TMDLs were also established for Upper Southampton & Warminster Townships in Bucks County and Lower Moreland Township, Upper Moreland Township, and Bryn Athyn Borough in Montgomery County.

Based on the land use loading rates, tables 1 and 2 show WLAs established for Upper Moreland Township:

Table 1: Summary of Southampton Creek required reductions to meet PADEP standards

UPPER MORELAND TOWNSHIP SOUTHAMPTON CREEK TMDL SUMMARY				
Pollutant	Existing Load	WLA	Reduction	Reduction
	(lb/year)	(lb/year)	(%)	(lb/year)
Sediment	347,199	229,252	34.0%	117,947
Nutrient (Total Phosphorus)	165.00	1.46	99.1%	163.54

Since required reduction percentages were not included in the TMDL for each municipality, information detailing how the required reductions were calculated is provided in the "Waste Load Calculations" section below and data are available in Appendix B.

Wissahickon Creek

In addition to the Southampton Creek Watershed, approximately 45.8 acres of land in Upper Moreland is located within the Wissahickon Creek watershed. The Wissahickon Creek has a TMDL approved by EPA in 2003, which establishes WLAs for sediment within each municipality in the watershed. Please refer to the *Upper Moreland Township Watershed Boundary Map*, included in Appendix A, for limits of the Southampton and Wissahickon Creek Watersheds within the Township.

Table 2: Summary of Wissahickon Creek required sediment reductions to meet PADEP standards

UPPER MORELAND TOWNSHIP WISSAHICKON CREEK TMDL SUMMARY				
Pollutant	Existing Load	WLA	Reduction	Reduction
	(lb/year)	(lb/year)	(%)	(lb/year)
Sediment	2,394	862	64.0%	1,532

III. Waste Load Calculations

The calculations described in this section are intended to provide baseline and allocated waste loads for the Township's goal of achieving the waste load removals outlined in the Southampton Creek TMDL. Only areas tributary to the Township MS4 were included as area contributing to waste loads.

MS4 Tributary Area

The existing pollutant loads presented in Section II, tables 1 and 2, are allocated to the entire Township area within the Southampton Creek watershed and Wissahickon Creek Watershed. The Township's permit obligation applies only to runoff collected by and discharged from the MS4. Tables 3 and 4 summarize areas which are not tributary to the Township's MS4. The pollutant loads generated from these non-tributary areas are parsed from the Township loads to determine that which is attributed to only the MS4. The Township reserves the right to modify parsed areas in the future. Any modification to parsed areas will be documented in future updates of the MS4 TMDL Plan. Please refer to the *TMDL Maps*, included in Appendix A, for limits of the parsed areas within the Southampton Creek and Wissahickon Creek Watershed in Upper Moreland Township.

Table 3: Percentage of Southampton Creek Watershed in Upper Moreland Township within MS4

Southampton Creek Watershed Parsed Areas		
Area Description	**Acres**	**%**
Township within Watershed	863	100.00%
Tributary to PennDOT Roads, R.R., R.O.W.	127.9	14.82%
Not Tributary to MS4	174.5	20.22%
Parsed from MS4	**302.4**	**35.04%**
Tributary to MS4	**560.6**	**64.96%**

Table 4: Percentage of Wissahickon Creek Watershed in Upper Moreland Township within MS4

Wissahickon Creek Watershed Parsed Areas		
Area Description	**Acres**	**%**
Township within Watershed	45.8	100.00%
Tributary to PennDOT Roads	32.4	70.79%
Not Tributary to MS4	0.0	0.00%
Parsed from MS4	**32.4**	70.79%
Tributary to MS4	**13.4**	29.21%

MS4 Waste Load Calculations

Tables 5 and 6 summarize the existing waste loads, WLAs, and required pollutant reductions attributed to the MS4 after accounting for parsed areas. The values presented in Section II are reduced by 35.04% for the Southampton Creek and by 70.79% for the Wissahickon Creek.

Table 5: Summary of Southampton Creek required reductions to meet PADEP standards based upon areas tributary to MS4

MS4 SOUTHAMPTON CREEK TMDL SUMMARY				
Pollutant	Existing Load	WLA	Reduction	Reduction
	(lb/year)	(lb/year)	(%)	(lb/year)
Sediment	225,540	148,922	34.0%	76,618.4
Nutrient (Total Phosphorus)	107.83	0.95	99.1%	106.9

Table 6: Summary of Wissahickon Creek required reductions to meet PADEP standards based upon areas tributary to MS4

MS4 WISSAHICKON CREEK TMDL SUMMARY				
Pollutant	Existing Load	WLA	Reduction	Reduction
	(lb/year)	(lb/year)	(%)	(lb/year)
Sediment	699.29	252	64.0%	447

IV. TMDL Compliance Strategy

As presented in Section III, Upper Moreland Township has a significant requirement to reduce sediment and total phosphorus discharging from the MS4. The Township plans to achieve the sediment and phosphorus reduction using two basic approaches listed below and described in subsequent sections.

- Quantify existing best management practices (BMPs)
- Implement new BMPs

The Township intends to implement this Strategy over the next 25 years. The Township intends that at or before the conclusion of 25 years, the sediment and nutrient reduction required in Section III will be achieved and the assumptions made in the approved watershed TMDL Plan regarding attaining water quality will be satisfied.

The Township anticipates that setting realistic goals which can be quantified by "measurable" success, the reduction percentages outlined in the approved watershed TMDL Plans can be met and water quality in all waterways within the Township will be positively impacted by implementation of this MS4 TMDL Strategy. Implementation of the MS4 TMDL Plan is an adaptive, iterative and dynamic process. The MS4 TMDL Plan will be evaluated and updated by the Township on an as-needed basis based upon its effectiveness in reducing pollutant loads in discharges from the regulated small MS4, the reasonableness of achieving the WLAs and the cost/benefit of the BMP under consideration. Therefore, it is intended that this Strategy, in its entirety, including the implementation term, may be modified by the Township periodically to reflect actual results, achievable goals and obstacles encountered during the process of implementation of this Strategy. As funding or other opportunities become available, the BMPs discussed below may be altered or new BMPs added to this TMDL Strategy.

Pollutant Load Concentration Method

In subsequent sections of this Strategy, pollutant load concentrations are required to quantify the amount of pollutants generated from areas tributary to existing and potential new BMPs. The Water Quality Analysis of Pollutant Loading method from Worksheet 12 of the PADEP's Pennsylvania Stormwater Best Management Practices Manual dated December 30, 2006 (PA BMP Manual) is utilized to approximate sediment generated on an annual basis. The method requires three input parameters:

- Pollutant event mean concentration (EMC) in mg/L from Table 8.3 of the PA BMP Manual
- Tributary area in acres (measured from a map)
- Annual runoff depth in feet

For the purposes of the Strategy, runoff depth was calculated using 4 years (2011 – 2014) of daily rain gauge data from the Ambler Borough Waste Water Treatment Plant (WWTP) and the SCS Runoff Curve Number Method (NRCS, TR-55) accounting for the initial abstraction and land cover classification. Since the Ambler Borough WWTP is within 8.5 miles of Upper Moreland Township, the rainfall data is considered representative of average rainfall in the Township. Based on this information, Table 7 shows the average annual runoff with respect to the type of land cover.

Table 7: Descriptions of various land types within Upper Moreland Township and their relative CN coefficient and average runoff per year

LAND COVER CLASSIFICATION	CN	AVERAGE ANNUAL RUNOFF (in/year)	AVERAGE ANNUAL RUNOFF (ft/year)
Forest	62	4.63	0.39
Meadow	60	4.10	0.34
Fertilized Planting Area	65	5.53	0.46
Native Planting Area	58	3.62	0.30
Lawn, Low Input	68	6.59	0.55
Lawn, High Input	65	5.53	0.46
Golf Course Fairway/Green	68	6.59	0.55
Grassed Athlethc Field	70	7.39	0.62
Rooftop	98	43.51	3.63
High Traffic Street/Highway	97	39.80	3.32
Medium Traffic Street	90	23.96	2.00
Low Traffic/Residential Street	89	22.47	1.87
Res. Driveway, Play Courts, etc.	98	43.51	3.63
High Traffic Parkng Lot	98	43.51	3.63
Low Traffic Parking Lot	98	43.51	3.63

Existing BMPs

The Southampton TMDL Plan was based on analysis completed through 2006. Several BMPs have been installed within the Township following the analysis included in the TMDL Plan. The following parameters are used to determine the sediment load from these areas and the reduction provided by the associated BMPs.

- Tributary area – determined by inspection of the storm sewer map.
- Area cover conditions – percentage of impervious pervious areas was determined from approved land development plans or from aerial photography.
- Runoff depth – values for impervious and lawn areas.
- TSS EMC – 21 mg/L and 58 mg/L were used for impervious areas to account for rooftops and low traffic parking areas respectively, 180 mg/L was used for lawns, low input.
- TP EMC – 0.13 mg/L and 0.15 mg/L were used for impervious areas to account for rooftops and low traffic parking areas respectively, 0.40 mg/L was used for lawns, low input.

While a detailed tabulation of the existing BMP calculations can be found in Appendix C, Table 8 shows a brief summary of the sediment and phosphorus reductions. Let it be noted, there are currently no existing BMPs within the Wissahickon Creek Watershed in Upper Moreland Township that were installed after the WLAs were established in the 2003 plan.

Table 8: Existing BMP measures within the Southampton Creek that reduce sediment and total phosphorus

EXISTING BMP SUMMARY WITHIN SOUTHAMPTON CREEK WATERSHED				
	Sediment Load	Sediment Reduction	Phosphorus Load	Phosphorus Reduction
	(lbs/yr)	(lbs/yr)	(lbs/yr)	(lbs/yr)
4205 Shoemaker Road	28	24	0.08	0.07
LaRosa Shoemaker Road	140	119	0.41	0.35
TOTALS	168	143	0.49	0.42

Potential New BMPs

The Township anticipates that sediment and nutrient reduction from existing BMPs and from future projects subject to new Ordinance requirements will not achieve the substantial pollutant reduction required by the TMDL Plan. The Township includes with this Strategy several potential BMPs that may be implementable in striving to meet the WLA requirements. These potential BMPs may be on private property and therefore, no guarantee is provided that these BMPs can or will be implemented. Implementation of any BMP expected to contribute to achieving the goal of this Strategy will require planning, design, permitting approval, property owner consent, etc. Therefore, the potential BMPs presented in this MS4 TMDL Plan are to be considered conceptual in scope and in no way imply any obligation of the Township to implement these specific BMPs in the locations identified. As stated previously, implementation of the TMDL Plan is an adaptive, iterative and dynamic process. The TMDL Plan will be evaluated and updated by the Township on an as-needed basis based upon its effectiveness in reducing pollutant loads in discharges from the regulated small MS4, the reasonableness of achieving the WLAs and the cost/benefit of the BMP under consideration.

Street Sweeping Program

Previous to 2012, the Township utilized a sub-contractor for all street sweeping operations within the Township. In 2013, the Township purchased its own street sweeping machine, which is operated by the Township Public Works Department. Since street sweeping was sub-contracted, it was done on an as needed basis and each street in the Township was only swept twice a year. Per new Township procedures, each street within the Township is swept at least once a month, which equates to a 600% increase in sweeping from the time when the TMDL studies were conducted. The calculations provided in Appendix D of this report assume a 50% reduction in sediment and phosphorous for runoff that is generated from public right of ways. We believe this estimate to be conservative, considering the PA DEP BMP Manual cites that 85% removals for both TSS and TP can be achieved through a street sweeping program.

Streambank Restoration

The Southampton Creek TMDL attributes approximately 268,000 lbs/yr of sediment is generated from streambank erosion in Upper Moreland Township. There are several locations throughout the Township where the stream traverses land that is Township owned. As such, there is the potential for stabilization projects in this area that will reduce the future erosion of the waterway banks. The Township has had great success in the

past with stream bank enhancement projects and the naturalized techniques have been found to hold up extremely well over time and prevent future erosion.

Basin Retrofits

There are two existing basins in the Southampton Creek watershed portion of the Township, which have significant drainage areas. These basins were constructed prior to the use of current naturalized and low impact stormwater management techniques. As such, they provide no water quality function to the waterway. The basins can be retrofit with native, wet tolerant plantings, sediment fore-bays, amended soils, etc., which will provide water quality functions. Additionally, infiltration testing can be conducted to analyze the underlying soils to determine if groundwater recharge is feasible.

Potential Pollutant Reduction Summary

The Southampton Creek TMDL plan requires reductions in sediment and total phosphorus of 34.0% and 99.1%, respectively. The Wissahickon Creek TMDL plan requires a reduction in sediment of 64.0%. The potential decreases in sediment and phosphorus from the proposed BMPs can be seen in tables 9 and 10. Calculations supporting each BMP are provided in Appendix D.

Table 9: Tabulated sediment and phosphorus reductions from potential BMP practices to be implemented in the Southampton Creek Watershed

POTENTIAL BMP SUMMARY FOR SOUTHAMPTON CREEK WATERSHED				
BMP	Sediment Load (lb/yr)	Sediment Reduction (lb/yr)	Phosphorus Load (lb/yr)	Phosphorus Reduction (lb/yr)
Streetsweeping	53,169	26,584	213.24	106.62
Streambank Restoration	49,394	41,985	0.00	0.00
Basin Retrofits	12,042	10,235	45.43	38.61
TOTAL	**114,605**	**78,805**	**259**	**145**

*Streambank Restoration is under the assumption that 2,500 feet of streambank restoration will occur.

Table 10: Tabulated sediment reductions from potential BMP practices to be implemented in the Wissahickon Creek Watershed

POTENTIAL BMP SUMMARY FOR WISSAHICKON CREEK WATERSHED		
BMP	Sediment Load (lb/yr)	Sediment Reduction (lb/yr)
Streetsweeping	908	454

TMDL Compliance Strategy Summary

Tables 11 and 12 summarize the total sediment and phosphorus loads, the WLA and required sediment and phosphorus reductions within the MS4. The tables also show the pollutant reductions from the existing and potential BMP measures to exceed the MS4 required pollutant reductions.

Table 11: Summary of reductions in Southampton Creek Watershed

SOUTHAMPTON CREEK WATERSHED			
Description	Unit	Sediment	Phosphorus
MS4 Sediment Load	lb/year	225,540	107.18
MS4 Required Pollutant Reduction	%	34.0%	99.1%
MS4 Required Pollutant Reduction	**lb/year**	**76,618**	**106.24**
Existing BMPs	lb/year	-143	-0.42
Future Potential BMPs	lb/year	-78,805	-145.23
Pollutant Reduction Potential	**lb/year**	**-78,948**	**-145.65**
Net Potential Reduction	**lb/year**	**-2,330**	**-39.41**

Table 12: Summary of reductions in Wissahickon Creek Watershed

WISSAHICKON CREEK WATERSHED		
Description	Unit	Sediment
MS4 Sediment Load	lb/year	699
MS4 Required Pollutant Reduction	%	64.0%
MS4 Required Pollutant Reduction	**lb/year**	**447**
Existing BMPs	lb/year	0
Future Potential BMPs	lb/year	-454
Pollutant Reduction Potential	**lb/year**	**-454**
Net Potential Reduction	**lb/year**	**-7**

Table 11 indicates that implementation of this Strategy will reduce sediment pollution by 78,948 lbs/yr and phosphorus by 145.65 lbs/yr within the Southampton Creek watershed.

Table 12 indicates that 454 lbs/yr of sediment will be reduced from the Wissahickon Creek watershed. Given the required pollutant reductions, the potential pollutant reduction BMPs will exceed the requirements and make a significant impact on pollution reduction over the next 25 years. This plan shows that compliance with the requirements of each TMDL can be achieved.

V. Public Participation

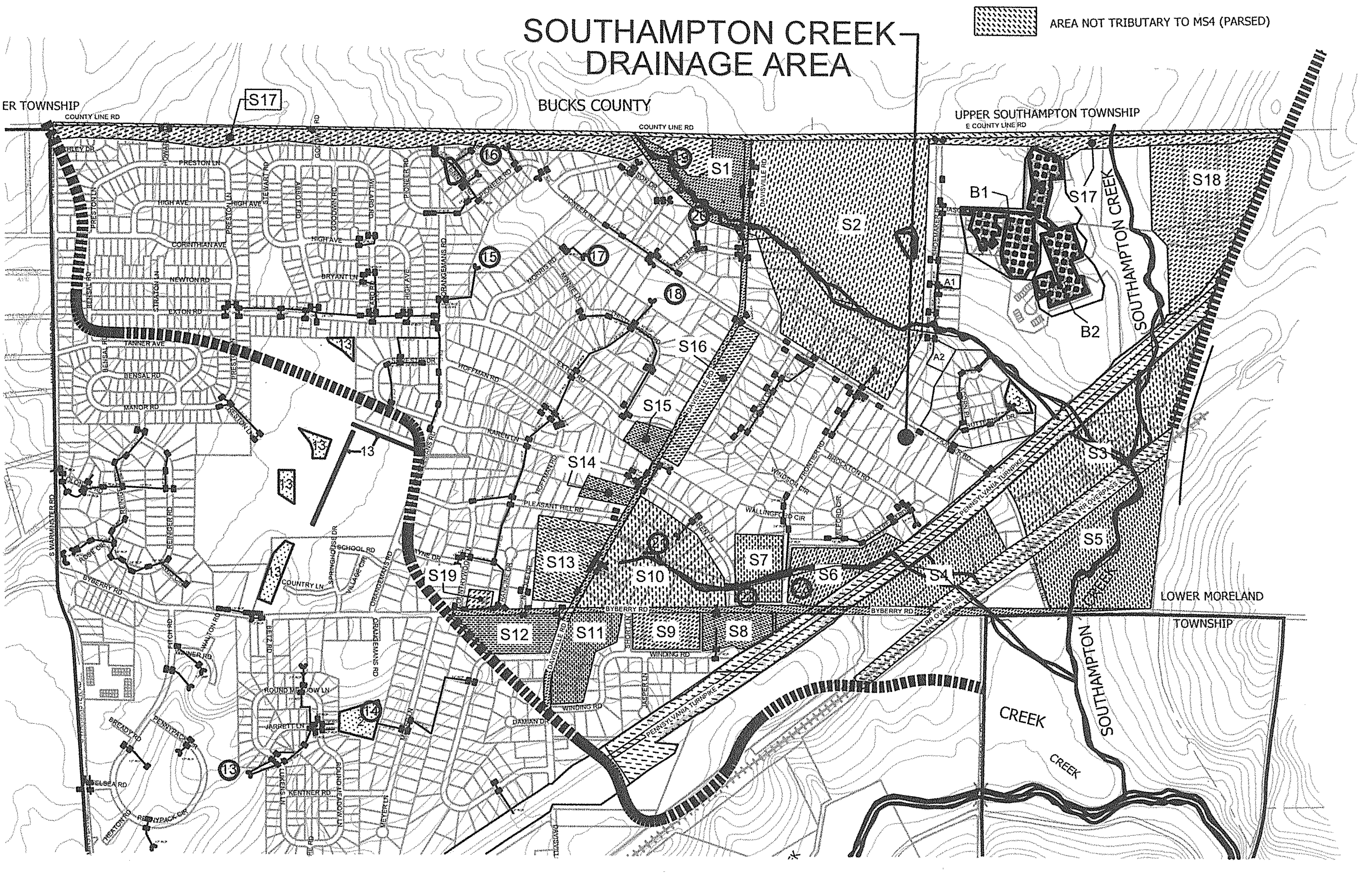
As part of the preparation of this MS4 TMDL Strategy, PADEP requires solicitation of public involvement and participation. The following are required:

- A copy of the MS4 TMDL Strategy must be available for public review.
- Publish, in a newspaper of general circulation in the area, a public notice containing a statement describing the Strategy, where it may be reviewed by the public, and the length of time provided for the receipt of comments.
- Accept written comments for a minimum of 30 days from the date of public notice.
- Accept any verbal or written comments from any interested member of the public at a public meeting or hearing.
- Consider and make a record of the consideration of each timely comment received from the public during the public comment period concerning the Strategy, identifying any changes made to the Strategy in response to the comment.

As required, a copy of the newspaper notice, a copy of all written comments received from the public, and a copy of the record of consideration of all timely comments received in the public comment period are included as Appendix E.

APPENDIX A

Upper Moreland Township Watershed Boundary Map & TMDL Map



AREA NOT TRIBUTARY TO MS4 (PARSED)
SOUTHAMPTON CREEK DRAINAGE AREA
BUCKS COUNTY
UPPER SOUTHAMPTON TOWNSHIP
ER TOWNSHIP
LOWER MORELAND TOWNSHIP
COUNTY LINE RD
SOUTHAMPTON CREEK
PENNSYLVANIA TURNPIKE
BYBERRY RD
DAVISVILLE RD
S1
S2
S3
S4
S5
S6
S7
S8
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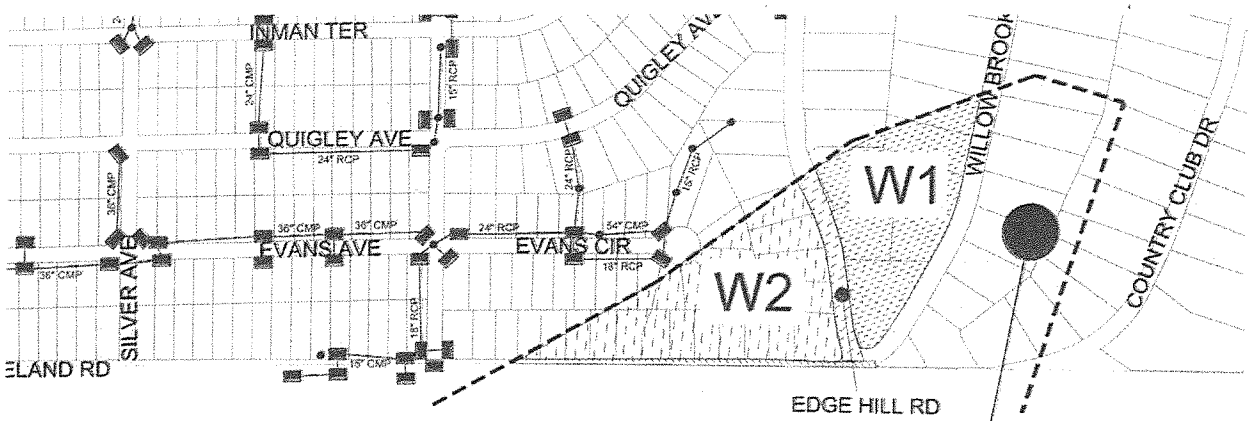
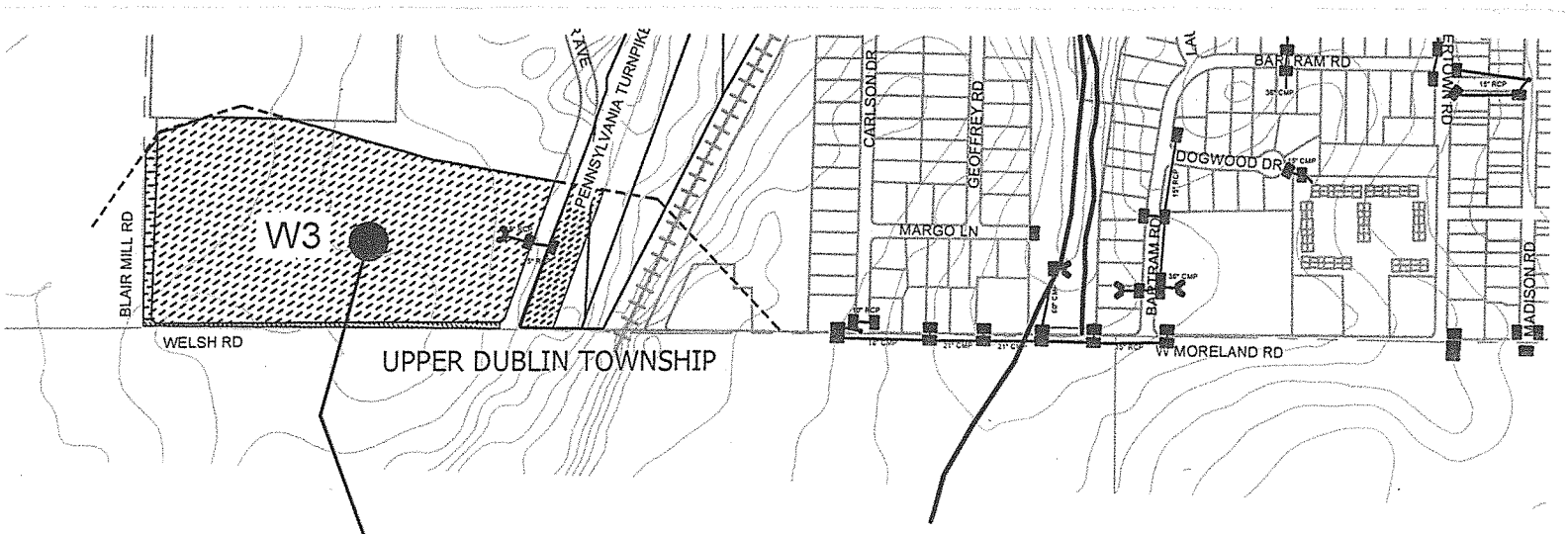


WISSAHICKON CREEK DRAINAGE AREA



WISSAHICKON CREEK DRAINAGE AREA

AREA NOT TRIBUTARY TO MS4 (PARSED)

APPENDIX B

Sediment and Total Phosphorous WLA Calculations –Southampton Creek Watershed

Appendix B1 - Sediment Waste Load Allocation Calculations for Southampton Creek Watershed

Land Use Source	Upper Moreland in Watershed (ac)	Existing Loading Rate (lb/ac/yr)	Existing Waste Load (lb/yr)	Target Loading Rate (lb/ac/yr)	Allocated Waste Load (lb/yr)	% Reduction
Hay/Pasture	14	93	1,302	42	565	56.61%
Cropland	7	758	5,306	623	4,160	21.60%
Forest	116	7	812	4	465	42.73%
Transitional Land	2	2,708	5,416	1,229	1,913	64.68%
Low Intensity Development	597	98	58,506	50	29,944	48.82%
High Intensity Development	127	56	7,112	45	5,672	20.25%
Streambank Erosion	22.09%	1,216,589	268,745	844,428	186,534	30.59%
TOTAL:	**863**		**347,199**		**229,252**	**33.97%**

NOTE:
Area of Upper Moreland in Watershed are from Table 18 "Sediment WLAs for MS4 Municipalities in Southampton Watershed" of Southampton Creek TMDL.
Existing Loading Rates (lb/ac/yr) based on Table 12 "Existing Sediment Load for Southampton Creek Watershed" of Southampton Creek TMDL.
Existing Waste Load (lb/yr) = Acres * Existing Loading
Target Loading Rates (lb/ac/yr) from Table 19 "Land Use Loading Rates for MS4 WLAs" of Southampton Creek TMDL
Allocated Waste Load (lb/yr) = Acres * Allocated Loading
Calculated Allocated Load (lb/yr) was compared to Table 18 "Sediment WLAs for MS4 Municipalities in Southampton Watershed" of Southampton Creek TMDL and found to be significantly similar
% Reduction = (Existing Waste Load - Allocated Waste Load)/Existing Waste Load
Upper Moreland Area based on "Township Maintained Rights-of-Way within the Southampton Creek Watershed" and Township-Owned Property within the Southampton Creek Watershed spreadsheets.

Appendix B2 - Total Phosphorous Waste Load Allocation Calculations for Southampton Creek Watershed

Land Use Source	Total Area (Ha)	Total Area (ac)	23 Year Existing Waste Load TP Mass (kg)	23 Year Existing Waste Load TP Weight (lb)	Existing Loading Rate TP (lb/ac/yr)	Upper Moreland Area (ac)	Upper Moreland Existing Load (lb/yr)	Upper Moreland Allocated Waste Load (lb/yr)	% Reduction
Hay/Pasture	19	46.95	3.26	231.42	0.2143	14	3.00	0.03	
Cropland	78	192.74	32.70	2,321.33	0.5236	7	3.67	0.03	
Coniferous Forest	25	61.78	0.12	8.52	0.0060		-	-	
Mixed Forest	28	69.19	0.13	9.23	0.0058	116	0.67	0.01	
Deciduous Forest	109	269.34	0.51	36.20	0.0058		0.00	0.00	
Transition	15	37.07	15.23	1,081.16	1.2682	2	-	-	
Low Intensity Development	973	2,404.33	56.56	4,015.12	0.0726	597	43.35	0.38	
High Intensity Development	329	812.98	46.51	3,301.69	0.1766	127	22.43	0.20	
Streambank			19.40	1,377.18	59.8775	22.09%	13.23	0.12	
Groundwater			116.88	8,297.17	360.7464	22.16%	79.94	0.70	
Septic System			3.41	242.07			0.00	0.00	
TOTAL:		**3,894.37**	**294.71**	**20,921.10**		**863**	**166.28**	**1.46**	**99.12%**

Total Area (Ha) and 23 Year Existing TP (kg) from Appendix C "Summary of AVGWLF Model Output for Southampton Watershed" of Southampton Creek TMDL
Total Area (ac) and 23 Year Existing TP (lb) are based on standard conversion factors
1 Ha = 2.47105 ac
1 kg = 2.20462 lbm
Weight (lb) = mass (lbm) * 32.2 ft/sec/sec
Existing Loading Rates (lb/ac/yr) = 23 Year Existing Waste Load TP (lb)/Total Area (ac)/23 years
Upper Moreland Area (Ac) from Table 18 "Sediment WLAs for MS4 Municipalities in Southampton Watershed" of Southampton Creek TMDL.
All Forest assumed to be Mixed Forest, since no Forest type breakdown is available and all 3 forest types have existing loading rate TP of 0.0002 lb/ac/yr.
Existing Load (lb/yr) = Upper Moreland Acres (Ac) * Existing Loading TP (lb/ac/yr)
Total Allocated Load (lb/yr) from Table 24 "TP WLAs for MS4 Municipalities in Southampton Watershed" of Southampton Creek TMDL
% Reduction = (Existing Waste Load - Allocated Waste Load)/Existing Waste Load * 100
Upper Moreland Area based on "Township Maintained Rights-of-Way within the Southampton Creek Watershed" and "Township-Owned Property within the Southampton Creek Watershed" spreadsheets

APPENDIX C

Existing Best Management Practices

Appendix C - Existing Best Management Practices

Southampton Drainage Area BMP Review

Southampton Drainage Area BMP- Sediment															
No.	LOCATION	G&A Project	TRIBUTARY AREA (ac)	IMPERVIOUS COVER (%)	IMPERVIOUS COVER (ac)	RUNOFF DEPTH (in)	TSS EMC IMPERVIOUS (mg/L)	IMPERVIOUS TSS (lb/year)	LAWN COVER (%)	LAWN COVER (ac)	RUNOFF DEPTH (in)	TSS EMC LAWN (mg/L)	LAWN TSS (lb/year)	TOTAL SEDIMENT (lb/year)	85% SEDIMENT REDUCTION (lb/year)
A1	4205 Shoemaker Road	10-03068	0.1	50%	0.05	33	39.5	15	50%	0.05	6.59	180	13	28	24
A2	LaRosa Shoemaker Road	13-10103	0.5	50%	0.25	33	39.5	73	50%	0.25	6.59	180	67	140	119
													TOTAL	168	143

Southampton Drainage Area BMP- Phosphorus															
No.	LOCATION	G&A Project	TRIBUTARY AREA (ac)	IMPERVIOUS COVER (%)	IMPERVIOUS COVER (ac)	RUNOFF DEPTH (in)	TP EMC IMPERVIOUS (mg/L)	IMPERVIOUS TP (lb/year)	LAWN COVER (%)	LAWN COVER (ac)	RUNOFF DEPTH (in)	TP EMC LAWN (mg/L)	LAWN TP (lb/year)	TOTAL TP (lb/year)	85% TP REDUCTION (lb/year)
A1	4205 Shoemaker Road	10-03068	0.1	50%	0.05	33	0.14	0.1	50%	0.05	6.59	0.4	0.0	0.1	0.1
A2	LaRosa Shoemaker Road	13-10103	0.5	50%	0.25	33	0.14	0.3	50%	0.25	6.59	0.4	0.1	0.4	0.3
													TOTAL	0.5	0.4

Runoff Volume = [Area, (ac)] * [Runoff Depth, (ft)]
Runoff depth is from Ambler Borough WWTP rain gauge from 2011 to 2014 and calculated using the SCS Runoff Curve Number method.

EMC = Event Mean Concentration (mg/L)
TSS EMC = 21 mg/L for Rooftops (Table A-1, PA BMP Manual)
TSS EMC = 58 mg/L for Low Traffic Parking Lot (Table A-1, PA BMP Manual)
TSS EMC Impervious = (21 + 58)/2 = 39.5
TSS EMC = 180 mg/L for Lawn, Low Input (Table A-1, PA BMP Manual)

TSS EMC = 0.13 mg/L for Rooftops (Table A-2, PA BMP Manual)
TSS EMC = 0.15 mg/L for Low Traffic Parking Lot (Table A-2, PA BMP Manual)
TSS EMC Impervious = (0.13 + 0.15)/2 = 0.14
TSS EMC = 0.40 mg/L for Lawn, Low Input (Table A-2, PA BMP Manual)

BMP Removal Efficiences from Table A-4, PA BMP Manual

	TSS	TP
6.4.2 Infiltration Basin	85%	85%

APPENDIX D

Potential New Best Management Practices

Appendix D1 - Streetsweeping BMPs

TOWNSHIP MAINTAINED RIGHT-OF-WAYS WITHIN THE SOUTHAMPTON CREEK WATERSHED

Street Name	Land Use (Classification)	Sidewalks	Curb	Roadway Length (ft)	Right-of-Way Width (ft)	Roadway Width (ft)	Impervious Area (sf)	Grass Area (sf)	Area (ac)	TSS Load (lb/yr)	Phosphorus (lb/yr)	50% TSS Streetsweeping Reduction (lb/yr)	50% TP Streetsweeping Reduction (lb/yr)
Abbotts	Low Traffic	YES	YES	1,478	50	30	57,658	16,262	1.70	1,214	4.89	607	2.4
Acorn Place	Low Traffic	YES	YES	528	50	30	20,592	5,808	0.61	434	1.74	217	0.9
Ashley Drive	Low Traffic	NO	YES	422	50	30	13,094	8,026	0.48	302	1.17	151	0.6
Bensal Road	Low Traffic	YES	YES	1,742	46	26	60,984	19,166	1.84	1,296	5.19	648	2.6
Brockton Road	Low Traffic	YES	YES	898	50	30	35,006	9,874	1.03	737	2.97	369	1.5
Bryant Road	Low Traffic	YES	YES	475	50	30	18,533	5,227	0.55	390	1.57	195	0.8
Bryers Road	Low Traffic	YES	YES	686	50	30	26,770	7,550	0.79	564	2.27	282	1.1
Butternut	Low Traffic	YES	YES	686	50	40	33,634	686	0.79	654	2.73	327	1.4
Centennial Road	Low Traffic	YES	YES	475	50	30	18,533	5,227	0.55	390	1.57	195	0.8
Colony Drive	Low Traffic	YES	YES	1,003	50	30	39,125	11,035	1.15	824	3.32	412	1.7
Corinthian Avenue	Low Traffic	YES	YES	1,426	50	30	55,598	15,682	1.64	1,171	4.71	585	2.4
Country Wood Lane	Low Traffic	NO	YES	898	56	36	33,211	17,054	1.15	746	2.92	373	1.5
Exton Road	Low Traffic	YES	YES	5,174	50	30	201,802	56,918	5.94	4,249	17.10	2,124	8.5
Francine Drive	Low Traffic	YES	YES	581	50	30	22,651	6,389	0.67	477	1.92	238	1.0
Frontier Road	Low Traffic	YES	YES	1,584	50	30	61,776	17,424	1.82	1,301	5.23	650	2.6
Gibson Drive	Low Traffic	YES	YES	2,059	50	30	80,309	22,651	2.36	1,691	6.80	845	3.4
Goodwin Road	Low Traffic	YES	YES	686	50	30	26,770	7,550	0.79	564	2.27	282	1.1
High Avenue	Low Traffic	YES	YES	3,274	50	30	127,670	36,010	3.76	2,688	10.82	1,344	5.4
Hoffman	Low Traffic	YES	YES	1,901	50	30	74,131	20,909	2.18	1,561	6.28	780	3.1
Howard Road	Low Traffic	YES	YES	317	50	30	12,355	3,485	0.36	260	1.05	130	0.5
Ivystream Road	Low Traffic	YES	YES	1,267	50	30	49,421	13,939	1.45	1,041	4.19	520	2.1
Jason Drive	Low Traffic	YES	YES	2,006	50	30	78,250	22,070	2.30	1,647	6.63	824	3.3
Jasper Lane	Low Traffic	YES	YES	581	50	30	22,651	6,389	0.67	477	1.92	238	1.0
Karen Lane	Low Traffic	YES	YES	3,274	50	30	127,670	36,010	3.76	2,688	10.82	1,344	5.4
Lisayne Road	Low Traffic	YES	YES	634	50	30	24,710	6,970	0.73	520	2.09	260	1.0
Milford Circle	Low Traffic	YES	YES	264	50	30	10,296	2,904	0.30	217	0.87	108	0.4
Minnie Lane	Low Traffic	YES	YES	528	50	30	20,592	5,808	0.61	434	1.74	217	0.9
Morris Road	Low Traffic	YES	YES	950	50	30	37,066	10,454	1.09	780	3.14	390	1.6
Newton Road	Low Traffic	NO	YES	1,478	46	26	39,917	28,090	1.56	944	3.61	472	1.8
Nicole Drive	Low Traffic	NO	YES	528	40	26	14,256	6,864	0.48	318	1.25	159	0.6
Orangemans Road	Low Traffic	YES	YES	2,587	60	40	126,763	28,457	3.56	2,624	10.64	1,312	5.3
Oakwood Drive	Low Traffic	YES	YES	634	50	30	24,710	6,970	0.73	520	2.09	260	1.0
Pleasant Hill Road	Low Traffic	YES	YES	1,795	50	30	70,013	19,747	2.06	1,474	5.93	737	3.0
Preston Lane	Low Traffic	YES	YES	3,538	50	30	137,966	38,914	4.06	2,905	11.69	1,452	5.8
Pioneer Road	Low Traffic	YES	YES	10,560	44	24	348,480	116,160	10.67	7,447	29.77	3,723	14.9
Shoemaker	Low Traffic	NO	YES	2,429	44	24	60,720	46,147	2.45	1,456	5.54	728	2.8
Short Lane	Low Traffic	YES	YES	370	50	30	14,414	4,066	0.42	303	1.22	152	0.6
Silvestri Drive	Low Traffic	YES	YES	1,373	50	30	53,539	15,101	1.58	1,127	4.54	564	2.3
Stewart Road	Low Traffic	YES	YES	739	50	30	28,829	8,131	0.85	607	2.44	303	1.2
Thistlewood Road	Low Traffic	YES	YES	1,848	50	30	72,072	20,328	2.12	1,517	6.11	759	3.1
Wallingford Circle	Low Traffic	NO	YES	317	50	30	9,821	6,019	0.36	227	0.88	113	0.4
Willard Road	Low Traffic	YES	YES	634	50	30	24,710	6,970	0.73	520	2.09	260	1.0
Winding Road	Low Traffic	YES	YES	2,059	50	30	80,309	22,651	2.36	1,691	6.80	845	3.4
Windsor Circle	Low Traffic	YES	YES	211	50	30	8,237	2,323	0.24	173	0.70	87	0.3
								TOTALS	75.30	53,169	213.24	26,584.47	106.62

TOWNSHIP MAINTAINED RIGHT-OF-WAYS WITHIN THE WISSAHICKON CREEK WATERSHED

Street Name	Land Use (Classification)	Sidewalks	Curb	Roadway Length (ft)	Right-of-Way Width (ft)	Roadway Width (ft)	Impervious Area (sf)	Grass Area (sf)	Area (ac)	TSS Load (lb/yr)	50% TSS Streetsweeping Reduction (lb/yr)
Country Club Drive	Low Traffic	NO	YES	760	60	20	15,960	29,640	1.05	490	245
Willow Brook Road	Low Traffic	NO	YES	800	40	20	16,800	15,200	0.73	418	209
								TOTALS	1.78	908.19	454.09

NOTE:
Pollutant Load = [EMC, (mg/L)] * [Runoff Volume, (ac*ft)] * [2.7, unit conversion]

EMC = Event Mean Concentration (mg/L)
TSS EMC = 86 mg/L for Low Traffic Residential Streets (Table A-1, PA BMP Manual)
TSS EMC = 180 mg/L for Lawn, Low Input (Table A-1, PA BMP Manual)
TP EMC = 0.36 for Low Traffic Residential Streets (Table A-2, PA BMP Manual)
TP EMC = 0.40 for Lawn, Low Input (Table A-2, PA BMP Manual)

BMP Removal Efficiences from Table A-4, PA BMP Manual

	TSS	TP
5.9.1 Streetsweeping	50%	50%

Reduced from PA BMP Manual values to be conservative

Runoff Volume = [Area, (ac)] * [Runoff Depth, (ft)]
Imperv. Runoff Depth = 43.5 in = 3.63 ft
Grass Runoff Depth = 6.6 in = 0.55 ft
Runoff depth is from Ambler Borough WWTP rain gauge from 2011 to 2014 and calculated using the SCS Runoff Curve Number method.

Appendix D2 - Streambank Restoration BMP

Total Length of Southampton Creek Stream in Upper Moreland Township	13,602	LF
Existing Streambank Erosion for Southampton Creek Watershed	1,216,589	lb/yr
Upper Moreland Township Percentage of Streambank Erosion	22.09	%
Upper Moreland Township Existing Streambank Erosion	268,745	lb/yr
Upper Moreland Township Annual Streambank Erosion Rate, per unit length of stream	19.76	lb/lf/yr
Upper Moreland Township Sediment from 2,500 LF Streambank (Both sides)	49,394	lb/yr
Upper Moreland Township Sediment Removed from 2,500 LF Streambank Restoration	**41,985**	**lb/yr**

References:
Length of Southampton Creek stream in Upper Moreland Township measured from mapping.
Existing Streambank Erosion for Watershed - Table 12, Southampton Watershed TMDL, 2008, EPA.
Upper Moreland Township's percentage of streambank erosion - Table 18, Southampton Watershed TMDL, 2008,

Assumption:
Streambank restoration eliminates 85% of erosion from streambanks

Appendix D3 - Potential Basin BMP Retrofits

Name	Impervious (sf)	Grass (sf)	Area (acres)	TSS Sediment Load (lb/yr)	Phosphorus Load (lb/yr)	85% TSS Reduction (lb/yr)	85% Phosphorus Reduction (lb/yr)
B1	317764	259004	13.24	7729.61	29.24	6570.17	24.85
B2	174156	154300	7.54	4312.12	16.19	3665.30	13.76
		Totals	20.78	12041.72	45.43	10235.47	38.61

NOTE:
Pollutant Load = [EMC, (mg/L)] * [Runoff Volume, (ac*ft)] * [2.7, unit conversion]

EMC = Event Mean Concentration (mg/L)
TSS EMC = 86 mg/L for Low Traffic Residential Streets (Table A-1, PA BMP Manual)
TSS EMC = 180 mg/L for Lawn, Low Input (Table A-1, PA BMP Manual)
TP EMC = 0.36 for Low Traffic Residential Streets (Table A-2, PA BMP Manual)
TP EMC = 0.40 for Lawn, Low Input (Table A-2, PA BMP Manual)

Runoff Volume = [Area, (ac)] * [Runoff Depth, (ft)]
Imperv. Runoff Depth = 43.5 in = 3.63 ft
Grass Runoff Depth = 6.6 in = 0.55 ft
Runoff depth is from Ambler Borough WWTP rain gauge from 2011 to 2014 and calculated using the SCS Runoff Curve Number method.

BMP Removal Efficiences from Table A-4, PA BMP Manual

	TSS	TP
6.4.5 Rain Garden/ Bioretention	85%	85%

APPENDIX E

Public Comment and Response

UPPER MORELAND TOWNSHIP
MONTGOMERY COUNTY, PENNSYLVANIA

Township News

MS4 TMDL STRATEGY

Posted In: Township Information, Posted: 4/29/2016 10:27 AM

The Upper Moreland Township Board of Commissioners Community Development Committee will hold a public meeting on Monday, May 9, 2016 at 7:00pm at the Upper Moreland Township Building, 117 Park Avenue, Willow Grove, PA 19090 for the purpose of receiving public comment on the Upper Moreland Township MS4 Southampton and Wissahickon Creeks TMDL Strategy Plan. The MS4 TMDL Strategy Plan outlines how the Township will act to reduce pollutants discharged from the Township storm sewer system (MS4) consistent with the waste load allocations presented in the Southampton and Wissahickon Creeks TMDL study. The Township is soliciting written comments on this plan until May 30, 2016. Documents must be submitted in writing to the attention of the Township Manager, David A. Dodies, at 117 Park Avenue, Willow Grove, PA 19090 or by email to ddodies@uppermoreland.org . Comments, including those submitted by email, must include the originator's name and address. The document will be available for review at the Township office at 117 Park Avenue, Willow Grove, PA 19090 during regular office hours Monday – Friday 8:30am to 4:30pm. The document is also available for review on the Township website at www.uppermoreland.org .

News Main

UPPER MORELAND TOWNSHIP
MONTGOMERY COUNTY, PENNSYLVANIA

Meeting Minutes And Agendas

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Community Development

MONDAY, MAY 09 2016

UPPER MORELAND TOWNSHIP

Committee Meeting Agenda

May 9, 2016

7:00 p.m.

DRAFT AGENDA SUBJECT TO CHANGE

I. Moment of Silent Meditation

II. Pledge of Allegiance

III. Presentations/Announcements

Community Development Committee: Joseph A. Lavalle, Chair; Kip McFatridge and Kevin C. Spearing, Members; Paul E. Purtell, Director of Code Enforcement; and, David Elsier, Director of Public Works.

I. Call to Order

II. Roll Call

III. Approval of Minutes – Minutes of *April 11, 2016* (attachment)

IV. Reports

1. Code Enforcement Department Reports – *April, 2016 and 2015* (attachments)
2. Public Works Department Report – *April, 2016* (attachment)
3. Public Works Recycling Report – *April, 2016* (attachment)
4. Engineer's Report – *May, 2016* (attachment)
5. Landscape Architect's Report – *May 2, 2016* (attachment)
6. Traffic Engineer's Report – *May 4, 2016* (attachment)
7. Upper Moreland School District – Construction/Other Items
8. Horsham Land Redevelopment Authority {HLRA} – to monitor status of redevelopment of former Willow Grove Naval Air Station property
9. Willow Grove Chamber of Commerce
10. Environmental Advisory Council {EAC}

11. Pennsylvania Review Advisory Council

Upper Moreland Historical Commission

V. Land Development/Subdivision

VI. Old Business

1. Township Stormwater Management Improvement Implementation Plan [continue on agenda]

VII. New Business

1. Request for Waiver from School District re: Construction Trailers and Storage units (attachments)
2. Draft MS4 TMDL Plan for Southampton and Wissahickon Creeks (attachment)
3. Sketch presentation for proposed residential development at 301 Woodlawn Avenue (attachments)

VIII. Other Items

1. Review of Veterans Memorial Park Fountain [drawings under review]

IX. Redevelopment

A. Redevelopment Reports

1. AECOM Monthly Status Report [no activity to report this month]
2. Upper Moreland Revitalization Task Force {update}

B. Old Business

C. New Business

X. Visitor Comments

XI. Commissioner Comments

XII. Adjournment

To view minutes and agendas prior to June 16th, 2008, please visit our Minutes & Agenda Archive.
To view video recordings of Commissioner's meetings, please visit our Meeting Videos page.

Upper Moreland Township
TMDL Strategy Plan
Record of Public Comments

Comment Number	Comment Date	Comment Type	Comment Author	Author Address	Comment Summary	Comment Response	Changes Made to Strategy
1	5/19/2016	Letter to TWP Manager	PennFuture	8 West Market Street, Suite 901 Wilkes-Barre, PA 18701	Provide a list of BMPs that will be implemented during permit term along with a timeline for WLA compliance	TMDL Strategy has a 25 year compliance timeline and BMPs that will be implemented to achieve compliance are outlined in the report.	None
2	5/19/2016	Letter to TWP Manager	PennFuture	8 West Market Street, Suite 901 Wilkes-Barre, PA 18701	Describe plans for operations & maintence of existing BMPs	Existing BMPs are on private property and the Township has O&M agreements with the property owners for the continued maintenance of the BMPs	None

PennFUTURE
Every environmental victory grows the economy.

Citizens for Pennsylvania's Future
8 West Market Street, Suite 901
Wilkes-Barre, PA 18701
info@pennfuture.org
www.pennfuture.org

May 19, 2016

Via electronic mail (ddodies@uppermoreland.org)

Mr. David A. Dodies
Township Manager
Upper Moreland Township
117 Park Avenue
Willow Grove, PA 19090

Re: Upper Moreland Township Draft TMDL Strategy Revised April 2016

Mr. Dodies:

Citizens for Pennsylvania's Future (PennFuture) submits these comments about Upper Moreland Township's "MS4 Southampton Creek & Wissahickon Creek TMDL Strategy" Revised April 2016 (TMDL Strategy). Upper Moreland Township (the Township) provided notice about the public comment period for its TMDL Strategy on its website at http://www.uppermoreland.org/news/article.aspx?aid=7197 (last accessed May 17, 2016).

PennFuture is a membership-based public interest, environmental organization whose activities include advocating and advancing legislative action on a state and federal level; providing education for the public; and assisting citizens in public advocacy. PennFuture is concerned with the protection of Pennsylvania's waters and the conservation of its resources for future generations.

PennFuture supports the Township's efforts to reduce the sediment and phosphorus loads that its municipal separate storm sewer system (MS4) contributes to the Southampton Creek and Wissahickon Creek. We are pleased that the Township has already implemented several best management practices (BMPs) that have begun to improve water quality. TMDL Strategy at 6-7. We are also pleased with the Township's efforts to collaborate with other municipalities on a watershed-based approach to reducing pollutant loads to Southampton Creek. TMDL Strategy at 1.

The effort to minimize stormwater pollution and achieve water quality standards, however, is a significant undertaking that will require long-term commitment and responsibility. The draft TMDL Strategy demonstrates that the Township takes its obligations seriously, but the proposal can be improved in a number of ways. PennFuture offers the following comments to improve the draft TMDL Strategy.

1.) The Township should provide a list of BMPs that will be implemented during this permit term and a timeline for final compliance with the WLAs.

The goal of a TMDL Strategy is to develop a plan for achieving the pollutant load reductions required by the wasteload allocations (WLAs) in the TMDL report. The TMDL Strategy should include a "timeline (schedule) with milestones." DEP PAG-13 NOI Instructions (Rev. 8/2012) at 4. It should also include a list of BMPs that will be implemented during the current permit term.

Although the Township's TMDL Strategy indicates that it will be implemented "over 25 years," (TMDL Strategy at 4), it does not provide milestones that will help evaluate progress over the next 25 years. Similarly, the TMDL Strategy does not indicate which of the many BMPs listed in Appendix D will be implemented during the current permit term. The TMDL Strategy should be updated to provide this information.

2.) The Township should describe its plans for operating and maintaining existing BMPs.

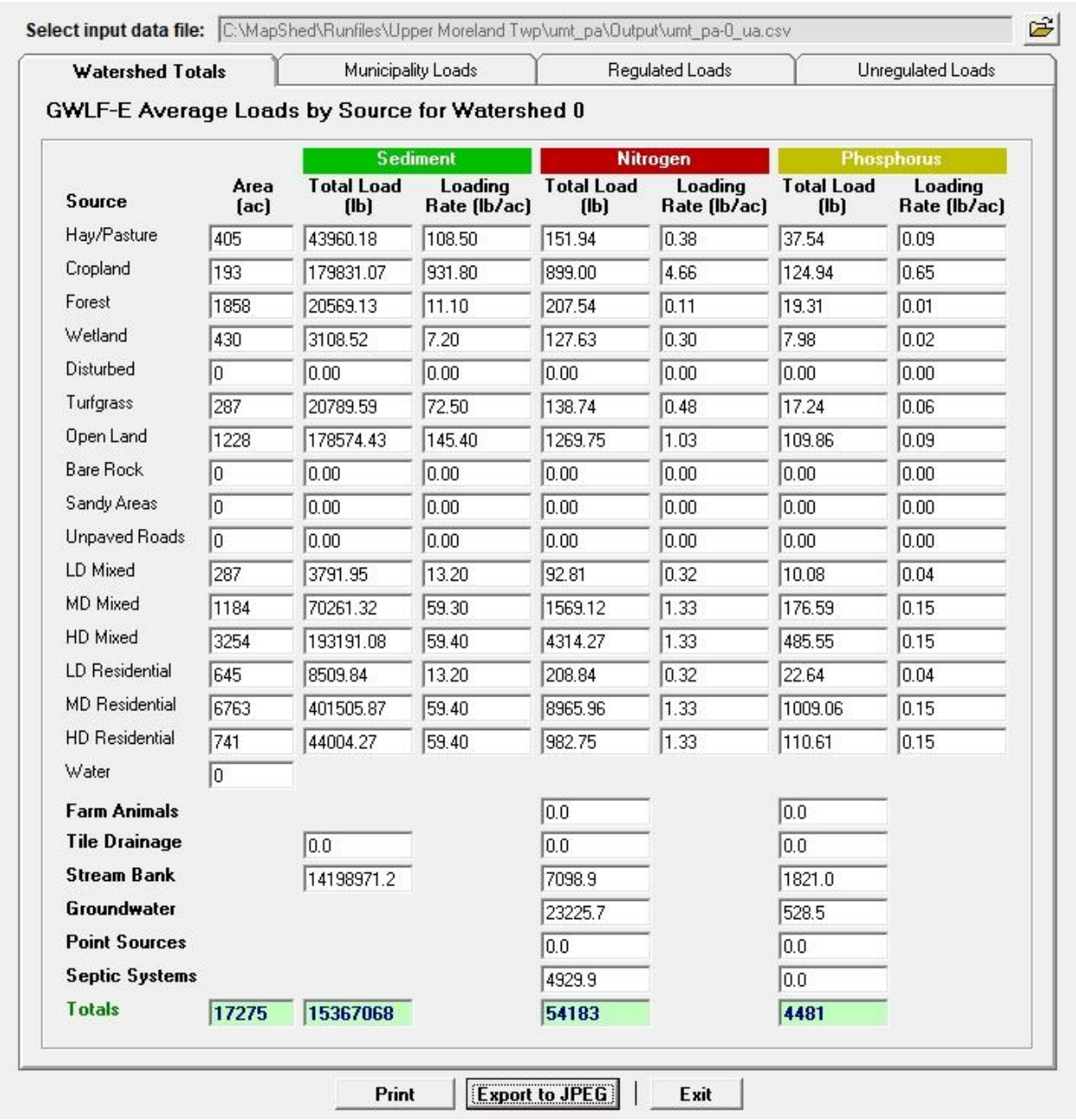
The TMDL Strategy should address operation and maintenance plans for existing BMPs for which you are claiming credit. Although the TMDL Strategy indicates that the Township intends to claim credit for existing BMPs at 4205 Shoemaker Road and "LaRosa Shoemaker Road" (TMDL Strategy at Appendix C), there is no operation or maintenance plan included in the TMDL Strategy for these BMPs. The Township should revise its TMDL Strategy to add operation and maintenance plans for these BMPs.

Thank you for your time and consideration of PennFuture's comments.

Sincerely,

Michael D. Helbing
Staff Attorney
helbing@pennfuture.org
(570) 208-4007

Appendix D- 2: Total Watershed Loading for Pennypack Creek



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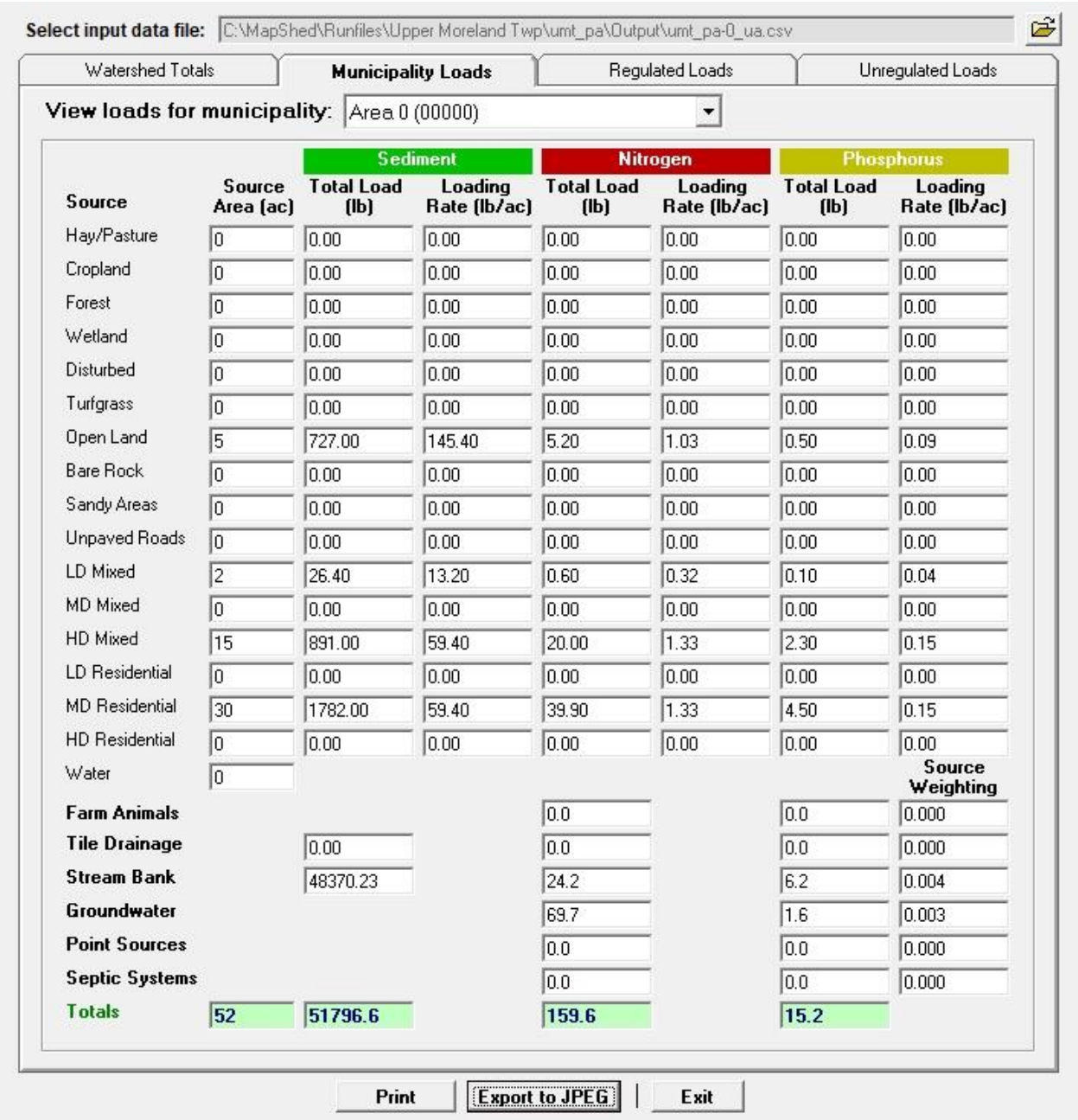
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

Source	Area (ac)	Sediment Total Load (lb)	Sediment Loading Rate (lb/ac)	Nitrogen Total Load (lb)	Nitrogen Loading Rate (lb/ac)	Phosphorus Total Load (lb)	Phosphorus Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14198971.2		7098.9		1821.0	
Groundwater				23225.7		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	**17275**	**15367068**		**54183**		**4481**	

Print | Export to JPEG | Exit

Appendix D-3: Total Loading for Planning Areas for Pennypack Creek within Upper Moreland Township



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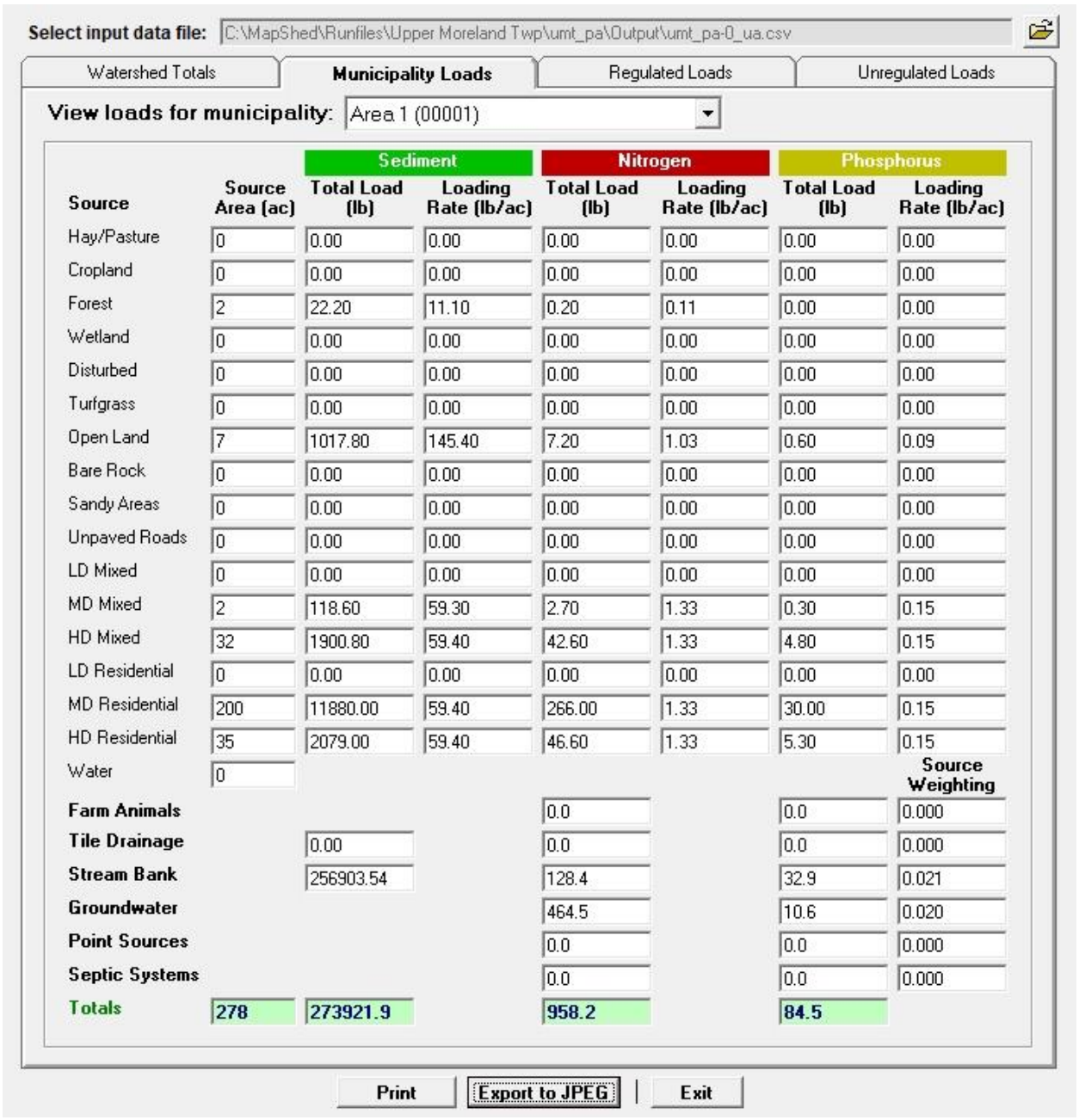
Watershed Totals | **Municipality Loads** | Regulated Loads | Unregulated Loads

View loads for municipality: Area 0 (00000)

Source	Source Area (ac)	Sediment Total Load (lb)	Sediment Loading Rate (lb/ac)	Nitrogen Total Load (lb)	Nitrogen Loading Rate (lb/ac)	Phosphorus Total Load (lb)	Phosphorus Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	0	0.00	0.00	0.00	0.00	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	5	727.00	145.40	5.20	1.03	0.50	0.09
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	2	26.40	13.20	0.60	0.32	0.10	0.04
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	15	891.00	59.40	20.00	1.33	2.30	0.15
LD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Residential	30	1782.00	59.40	39.90	1.33	4.50	0.15
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
							Source Weighting
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		48370.23		24.2		6.2	0.004
Groundwater				69.7		1.6	0.003
Point Sources				0.0		0.0	0.000
Septic Systems				0.0		0.0	0.000
Totals	52	51796.6		159.6		15.2	

Print | Export to JPEG | Exit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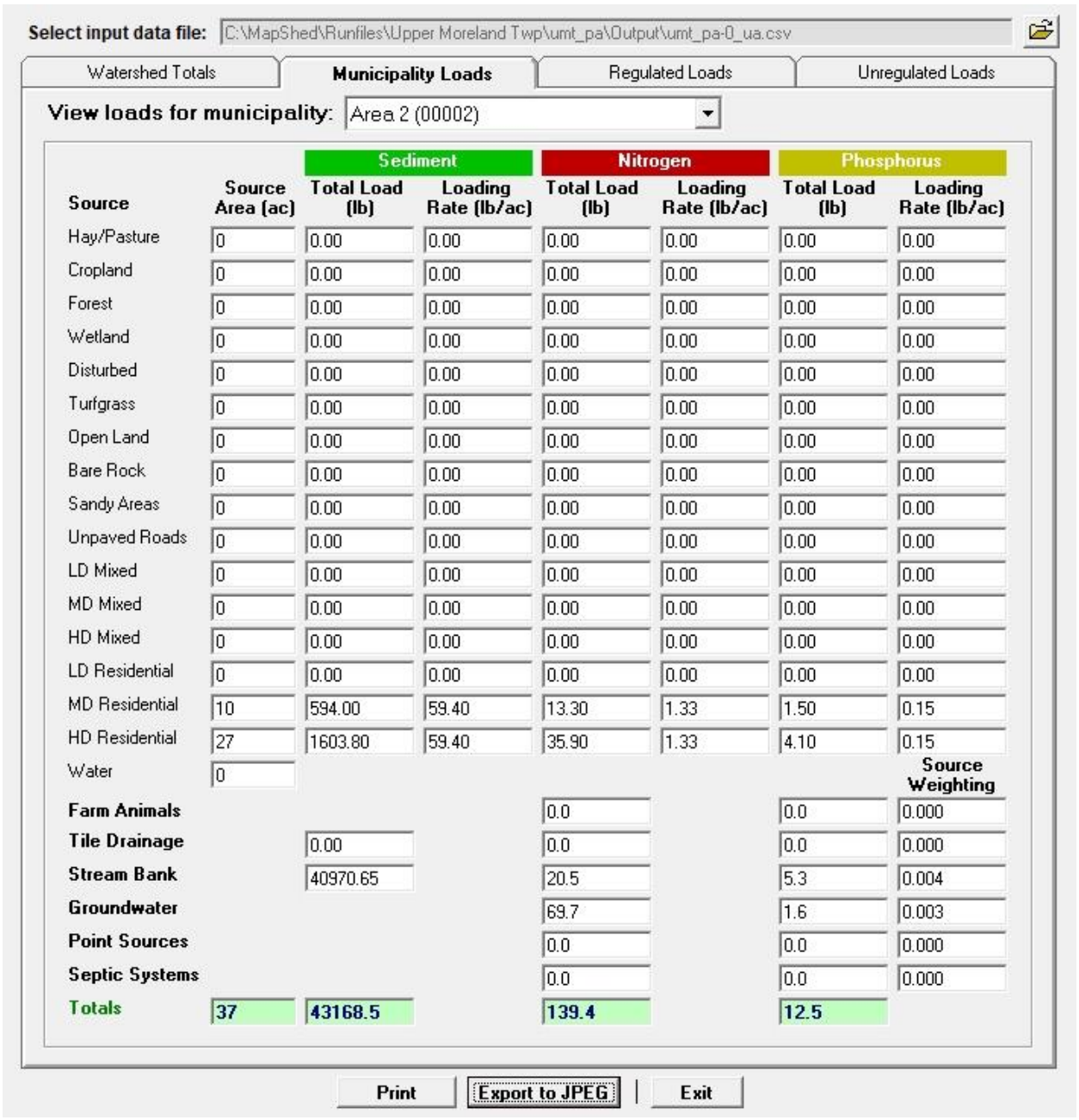
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 1 (00001)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 2 22.20 11.10 0.20 0.11 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 7 1017.80 145.40 7.20 1.03 0.60 0.09
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 2 118.60 59.30 2.70 1.33 0.30 0.15
HD Mixed 32 1900.80 59.40 42.60 1.33 4.80 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 200 11880.00 59.40 266.00 1.33 30.00 0.15
HD Residential 35 2079.00 59.40 46.60 1.33 5.30 0.15
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 256903.54 128.4 32.9 0.021
Groundwater 464.5 10.6 0.020
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 278 273921.9 958.2 84.5
Print
Export to JPEG
Exit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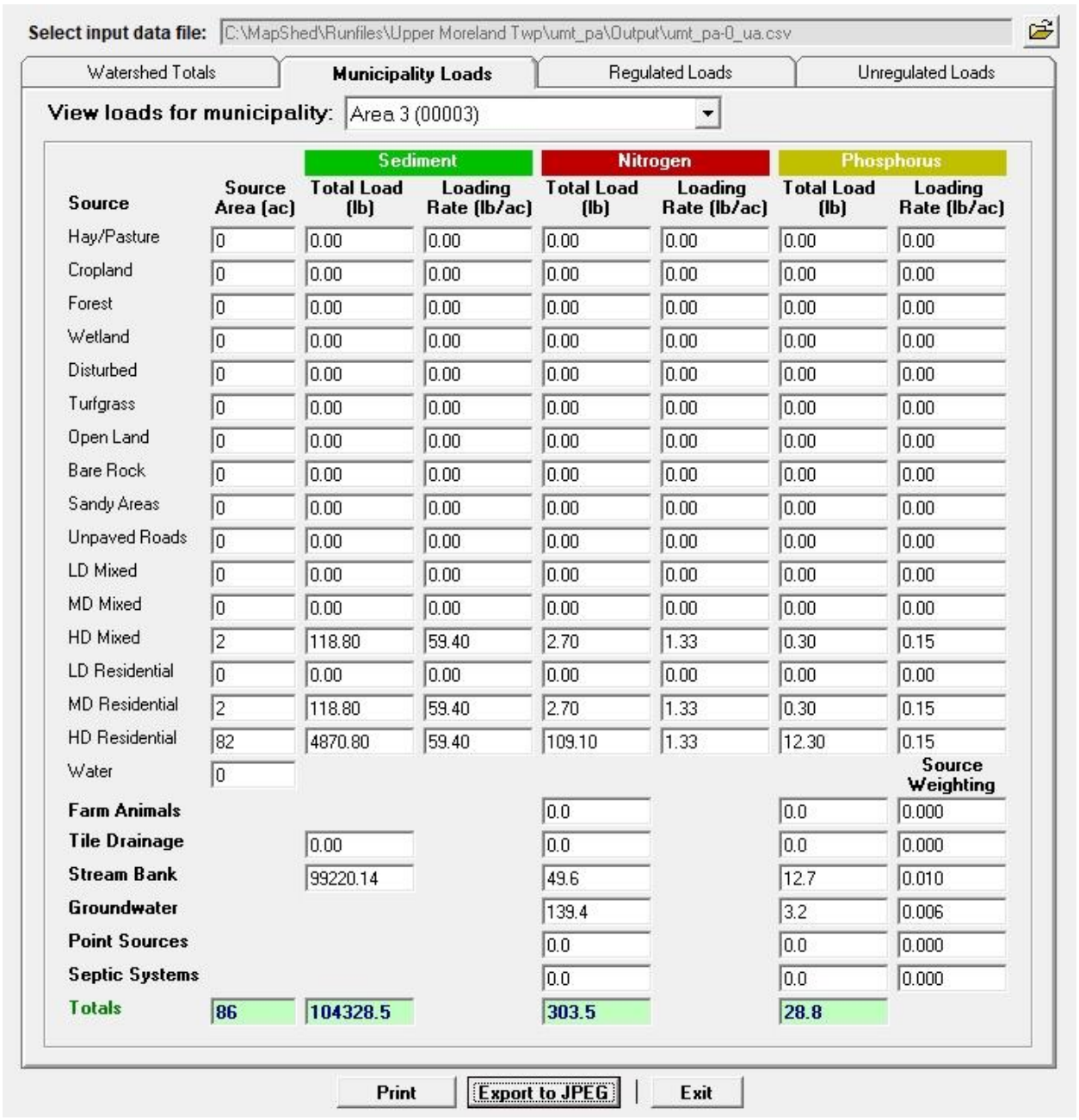
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 2 (00002)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 10 594.00 59.40 13.30 1.33 1.50 0.15
HD Residential 27 1603.80 59.40 35.90 1.33 4.10 0.15
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 40970.65 20.5 5.3 0.004
Groundwater 69.7 1.6 0.003
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 37 43168.5 139.4 12.5
Print
Export to JPEG
Exit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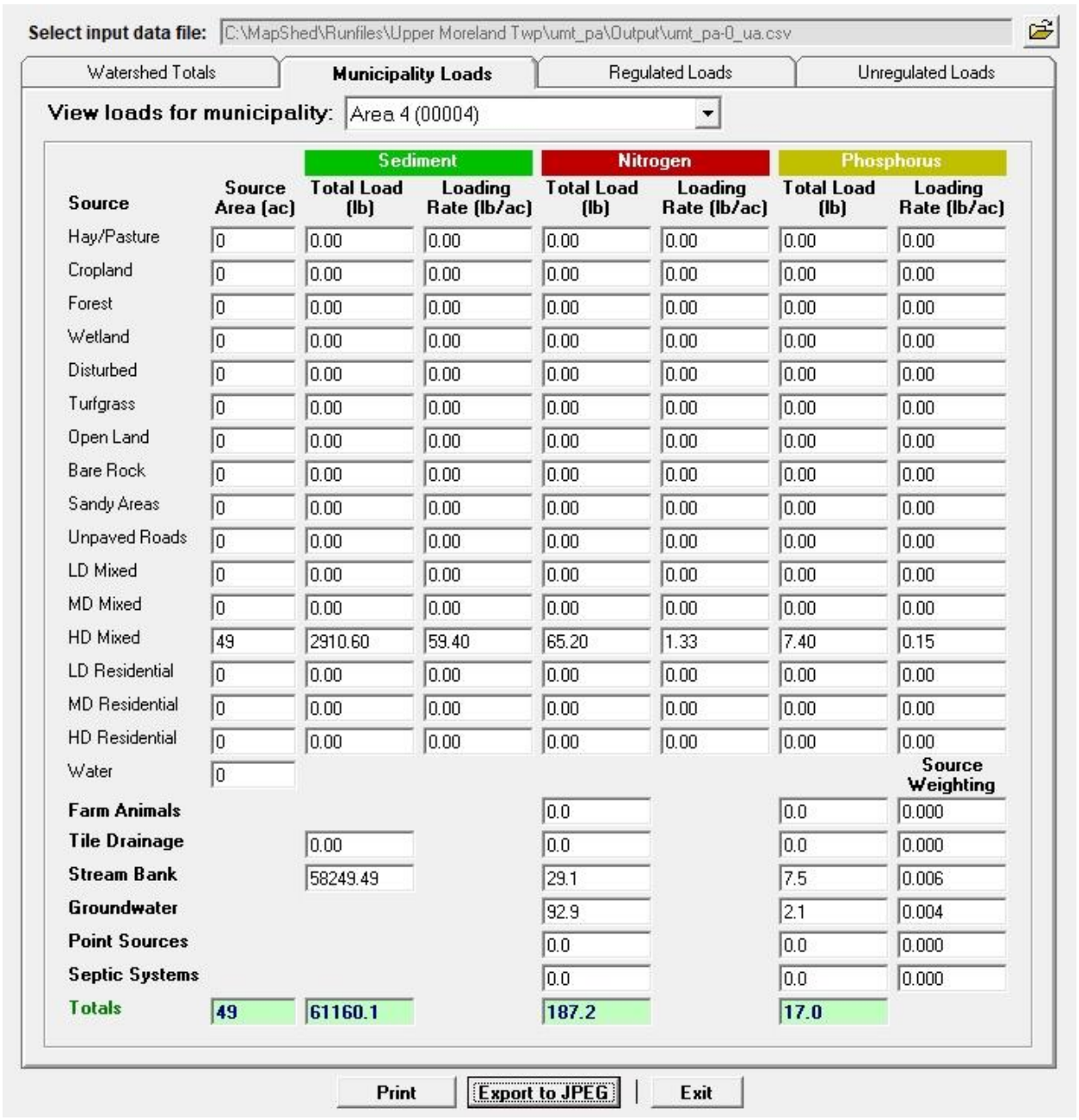
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 3 (00003)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 2 118.80 59.40 2.70 1.33 0.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 2 118.80 59.40 2.70 1.33 0.30 0.15
HD Residential 82 4870.80 59.40 109.10 1.33 12.30 0.15
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 99220.14 49.6 12.7 0.010
Groundwater 139.4 3.2 0.006
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 86 104328.5 303.5 28.8
Print
Export to JPEG
Exit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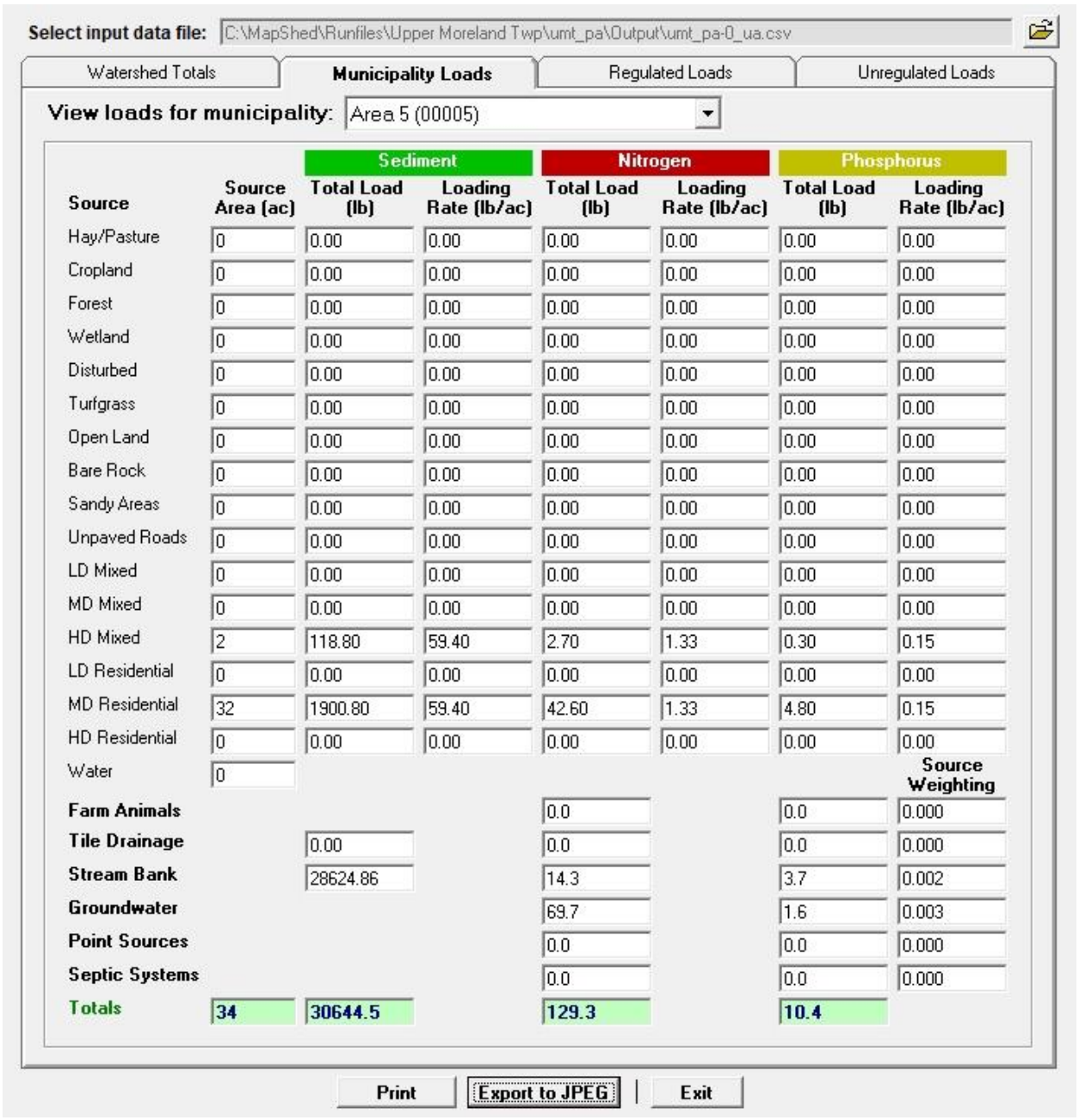
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 4 (00004)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 49 2910.60 59.40 65.20 1.33 7.40 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 58249.49 29.1 7.5 0.006
Groundwater 92.9 2.1 0.004
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 49 61160.1 187.2 17.0
Print
Export to JPEG
Exit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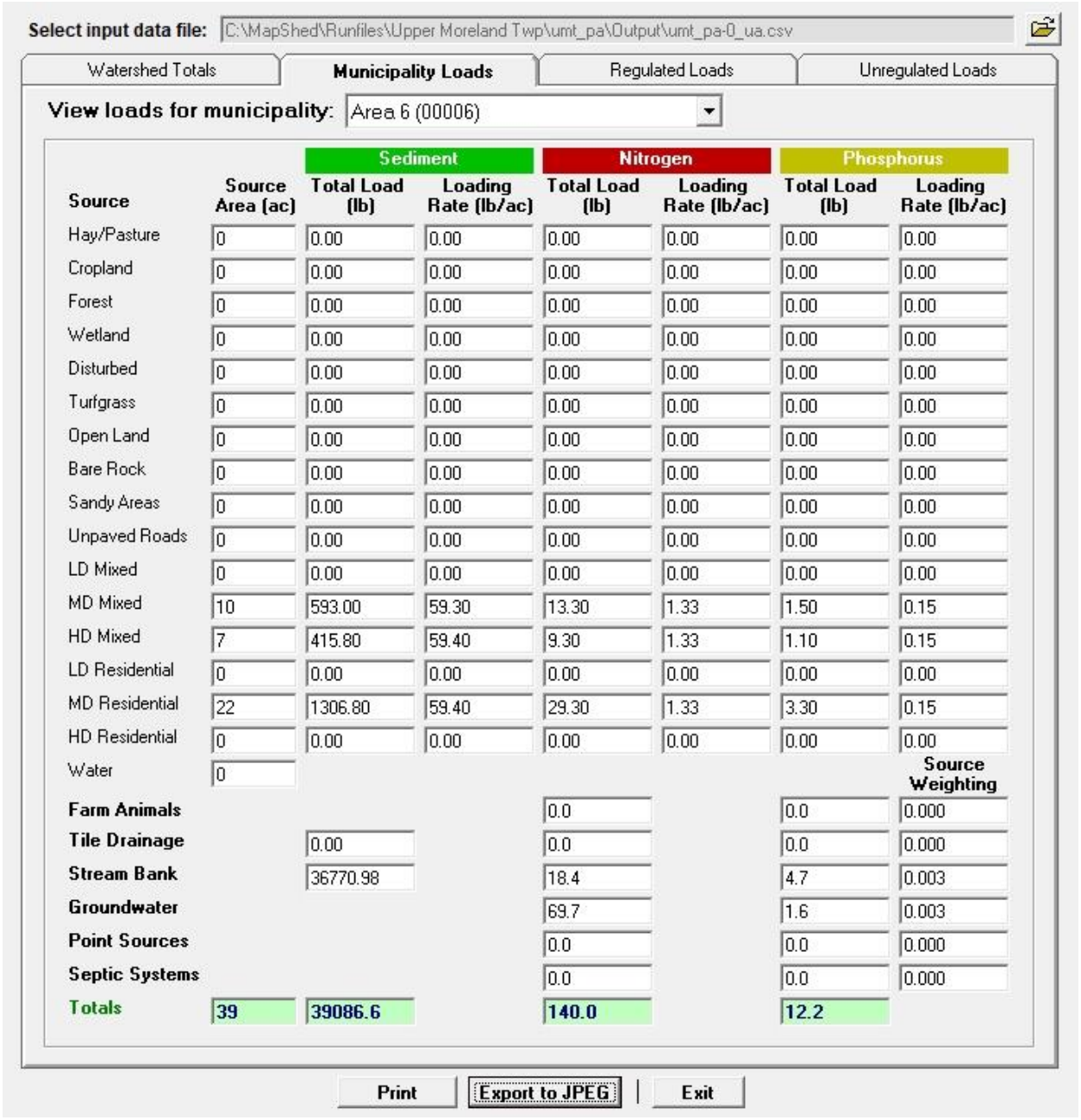
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 5 (00005)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 2 118.80 59.40 2.70 1.33 0.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 32 1900.80 59.40 42.60 1.33 4.80 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 28624.86 14.3 3.7 0.002
Groundwater 69.7 1.6 0.003
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 34 30644.5 129.3 10.4
Print
Export to JPEG
Exit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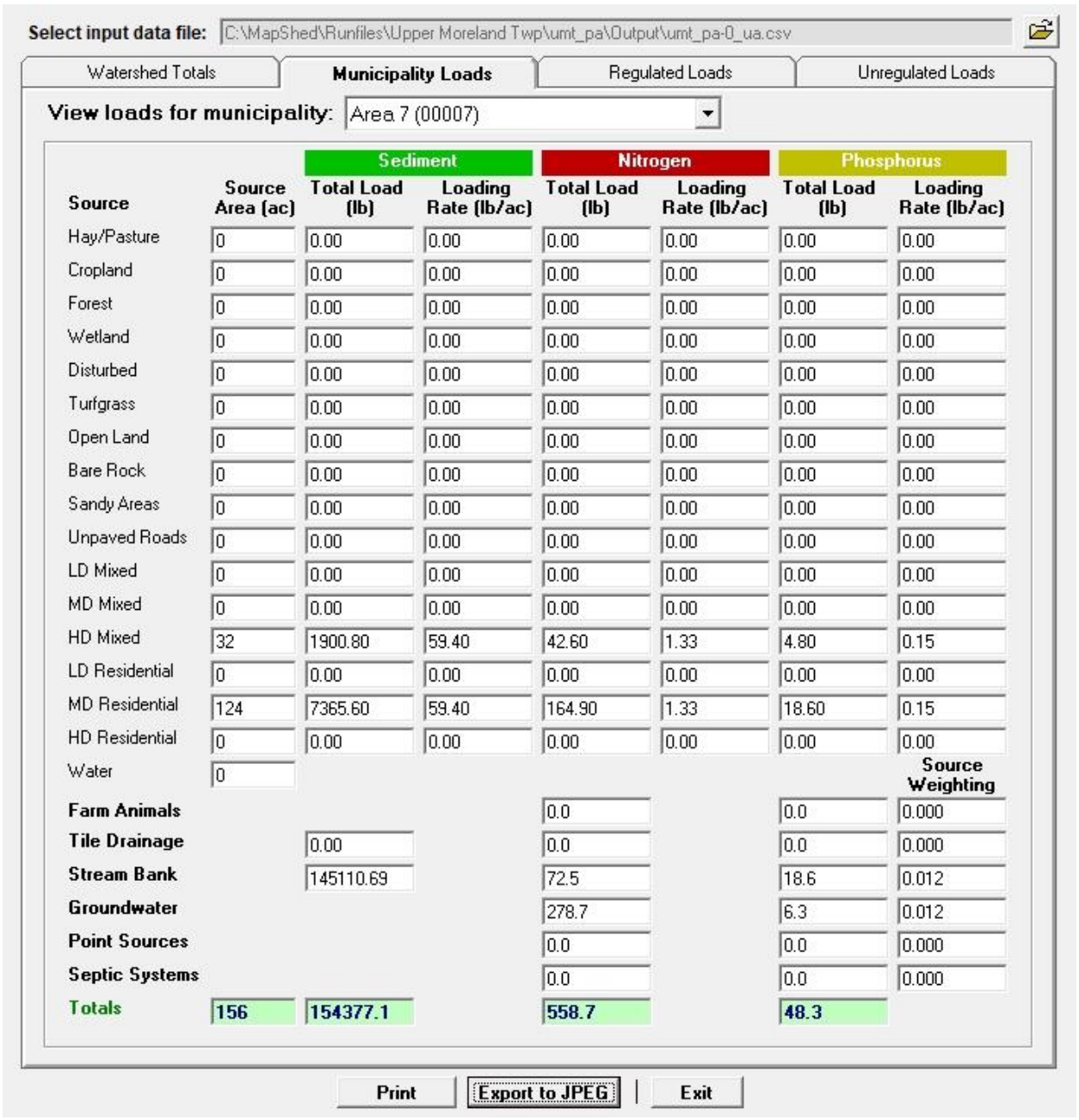
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 6 (00006)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 10 593.00 59.30 13.30 1.33 1.50 0.15
HD Mixed 7 415.80 59.40 9.30 1.33 1.10 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 22 1306.80 59.40 29.30 1.33 3.30 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 36770.98 18.4 4.7 0.003
Groundwater 69.7 1.6 0.003
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 39 39086.6 140.0 12.2
Print
Export to JPEG
Exit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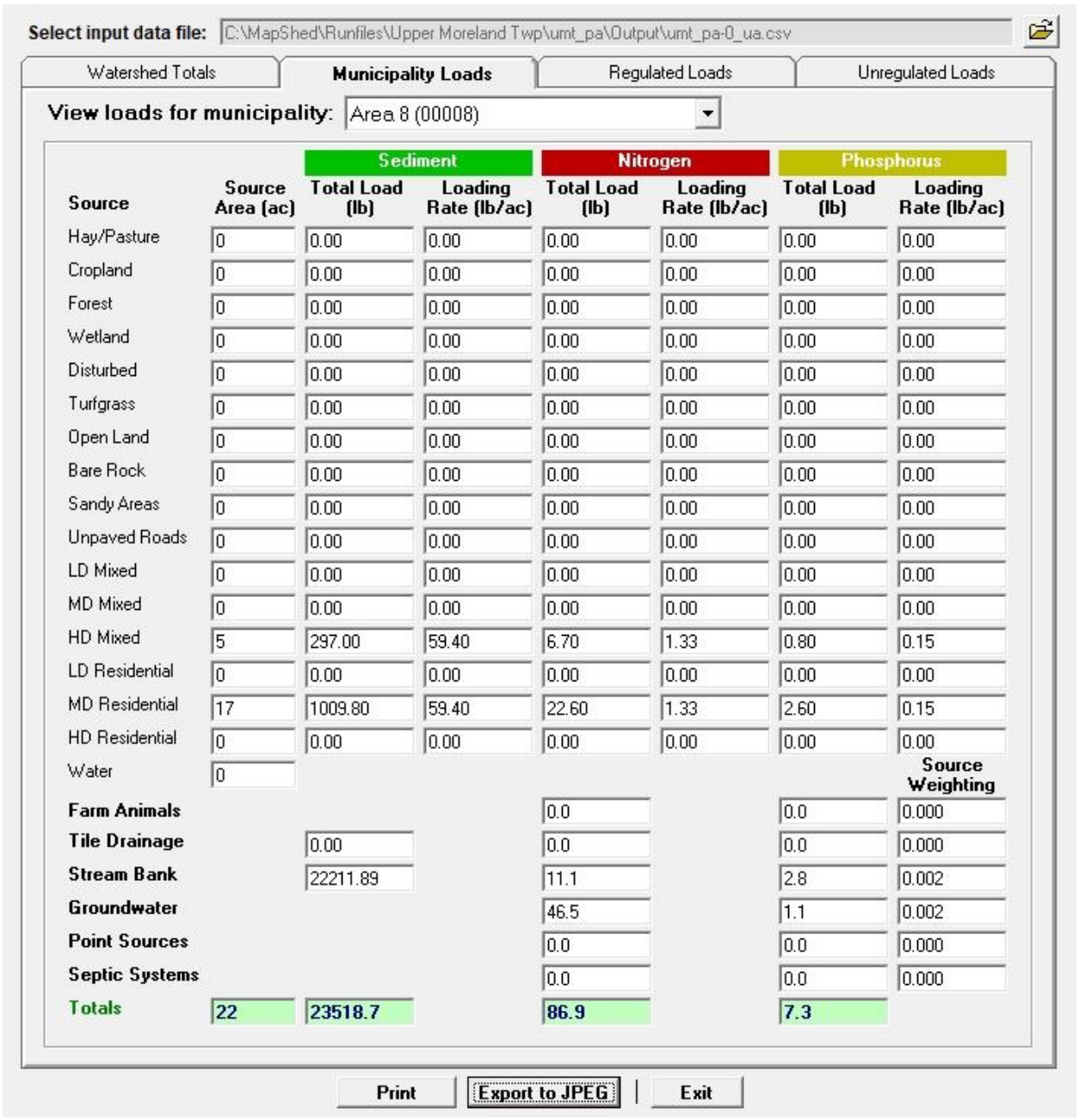
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 7 (00007)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 32 1900.80 59.40 42.60 1.33 4.80 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 124 7365.60 59.40 164.90 1.33 18.60 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 145110.69 72.5 18.6 0.012
Groundwater 278.7 6.3 0.012
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 156 154377.1 558.7 48.3
Print
Export to JPEG
Exit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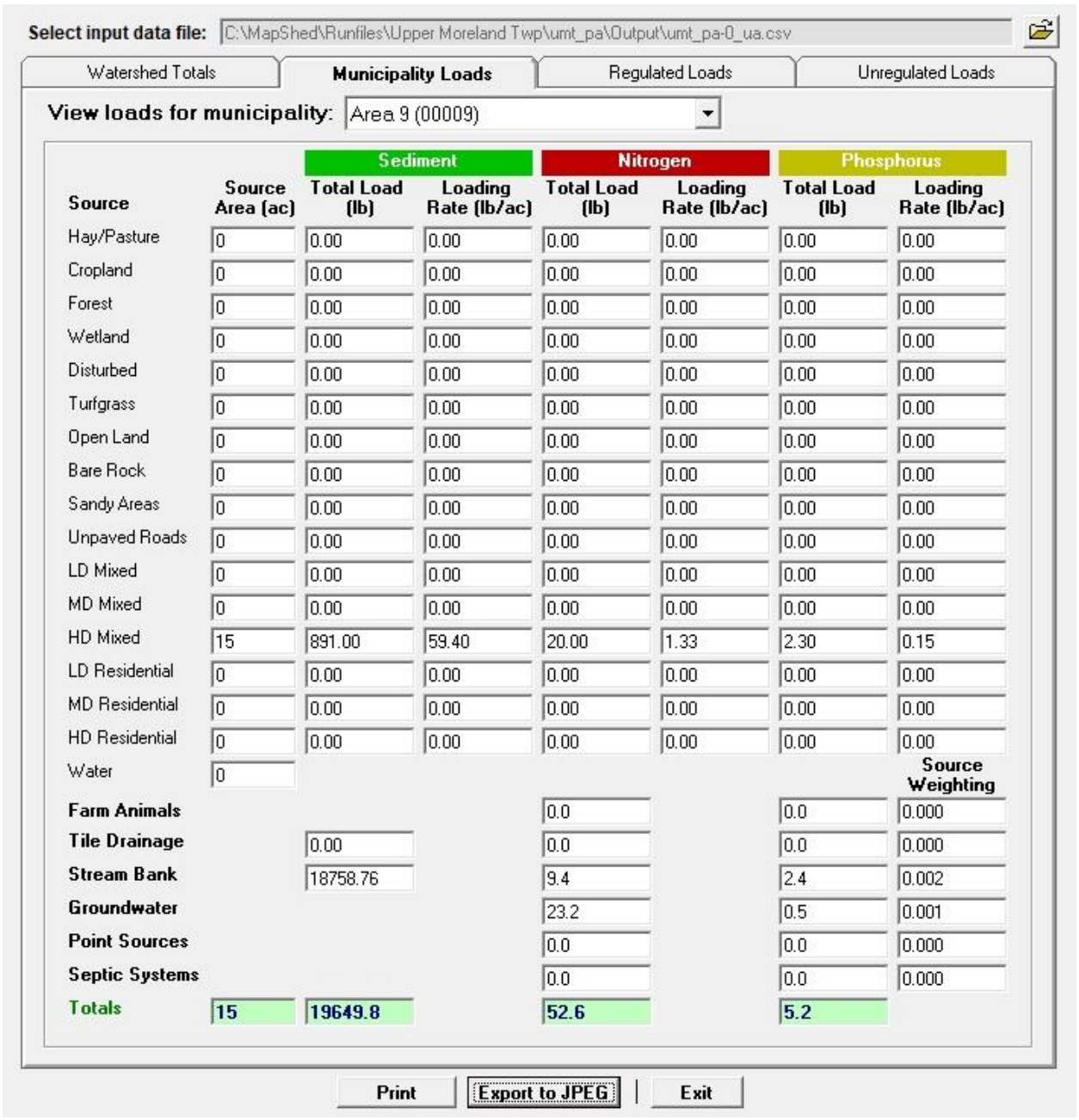
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 8 (00008)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 5 297.00 59.40 6.70 1.33 0.80 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 17 1009.80 59.40 22.60 1.33 2.60 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 22211.89 11.1 2.8 0.002
Groundwater 46.5 1.1 0.002
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 22 23518.7 86.9 7.3
Print
Export to JPEG
Exit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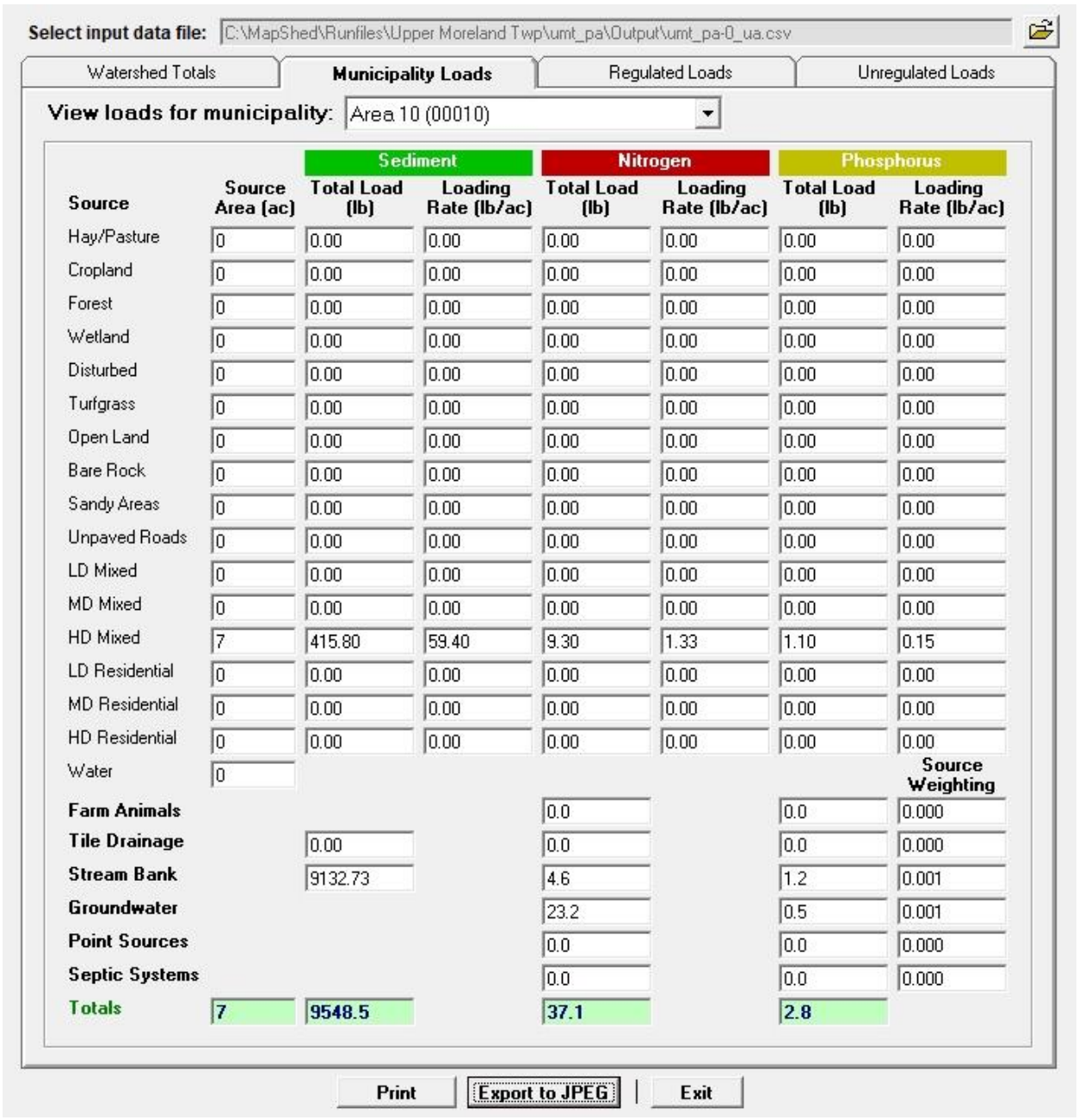
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 9 (00009)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 15 891.00 59.40 20.00 1.33 2.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 18758.76 9.4 2.4 0.002
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 15 19649.8 52.6 5.2
Print
Export to JPEG
Exit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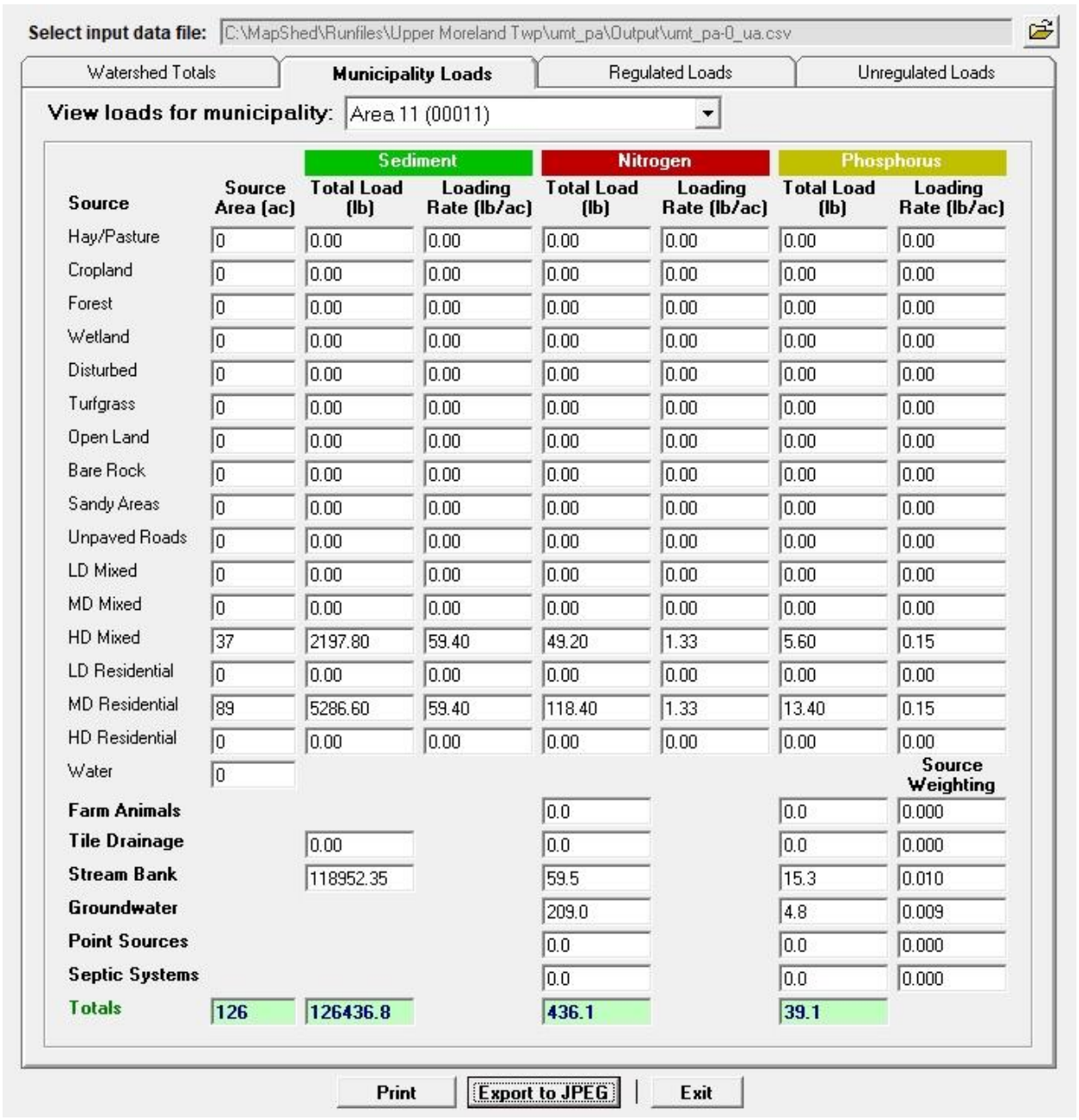
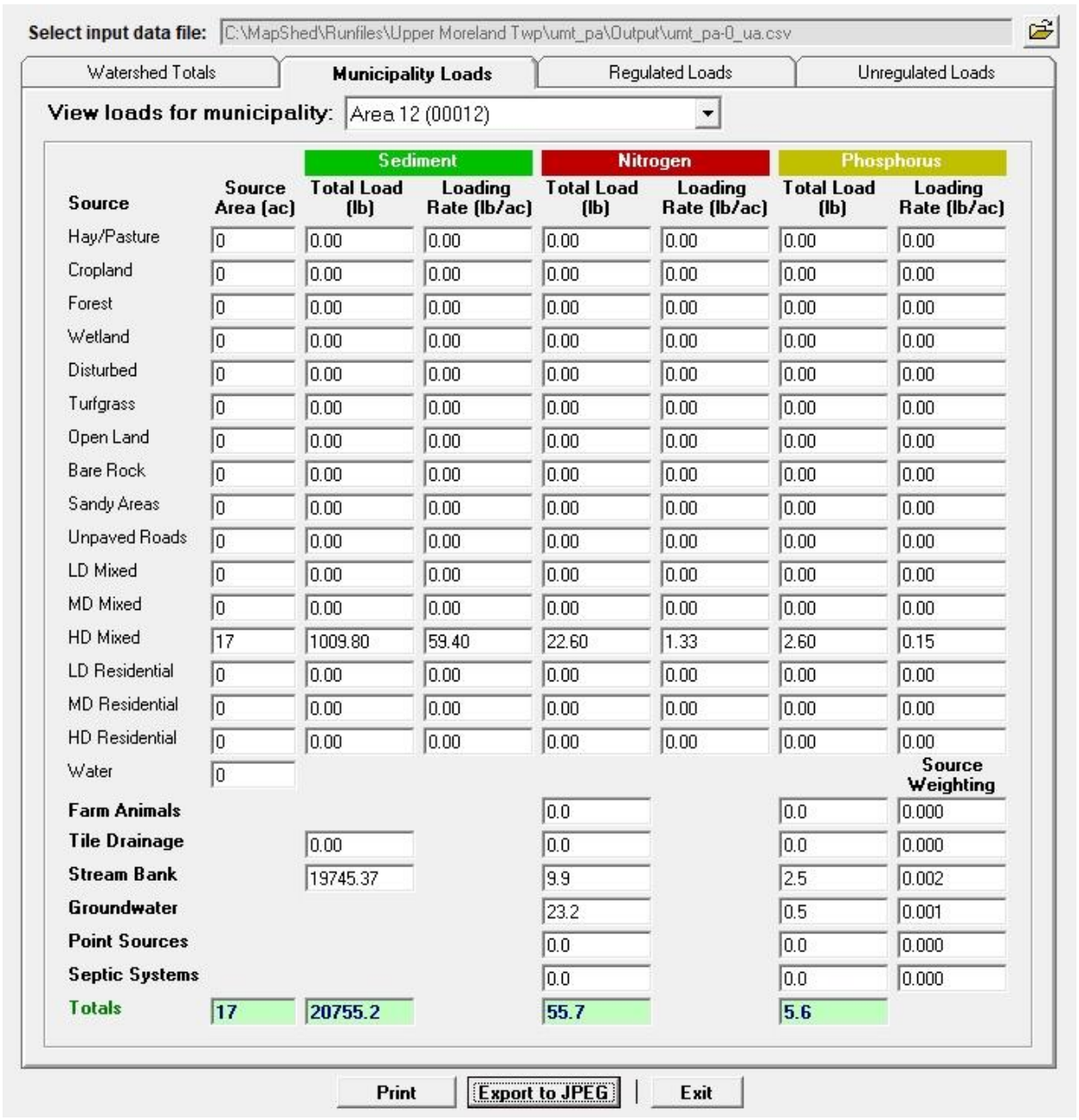
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 10 (00010)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 7 415.80 59.40 9.30 1.33 1.10 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 9132.73 4.6 1.2 0.001
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 7 9548.5 37.1 2.8
Print
Export to JPEG
Exit


Select input data file:
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 11 (00011)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 37 2197.80 59.40 49.20 1.33 5.60 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 89 5286.60 59.40 118.40 1.33 13.40 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 118952.35 59.5 15.3 0.010
Groundwater 209.0 4.8 0.009
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 126 126436.8 436.1 39.1
Print
Export to JPEG
Exit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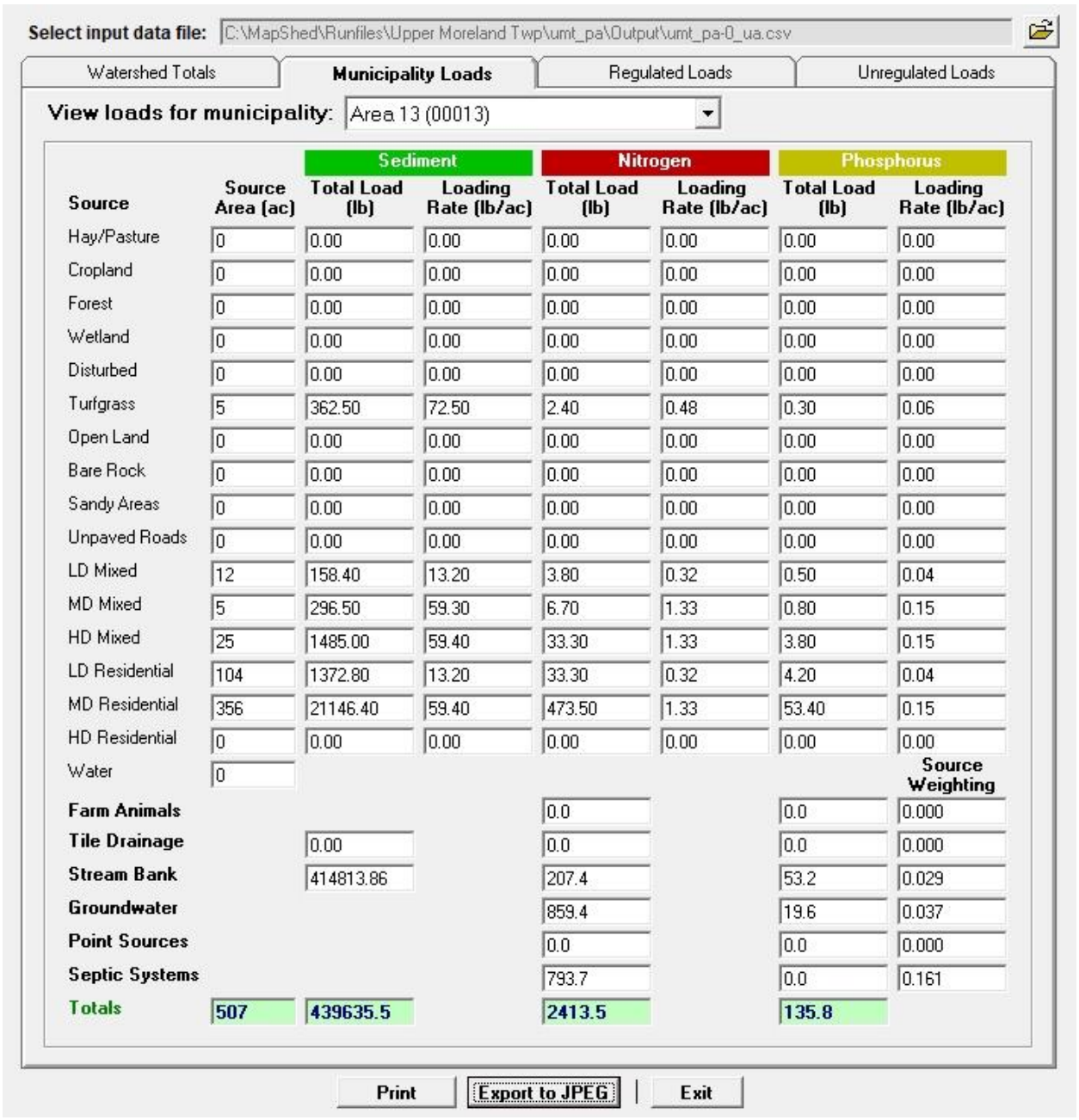
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 12 (00012)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 17 1009.80 59.40 22.60 1.33 2.60 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 19745.37 9.9 2.5 0.002
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 17 20755.2 55.7 5.6
Print
Export to JPEG
Exit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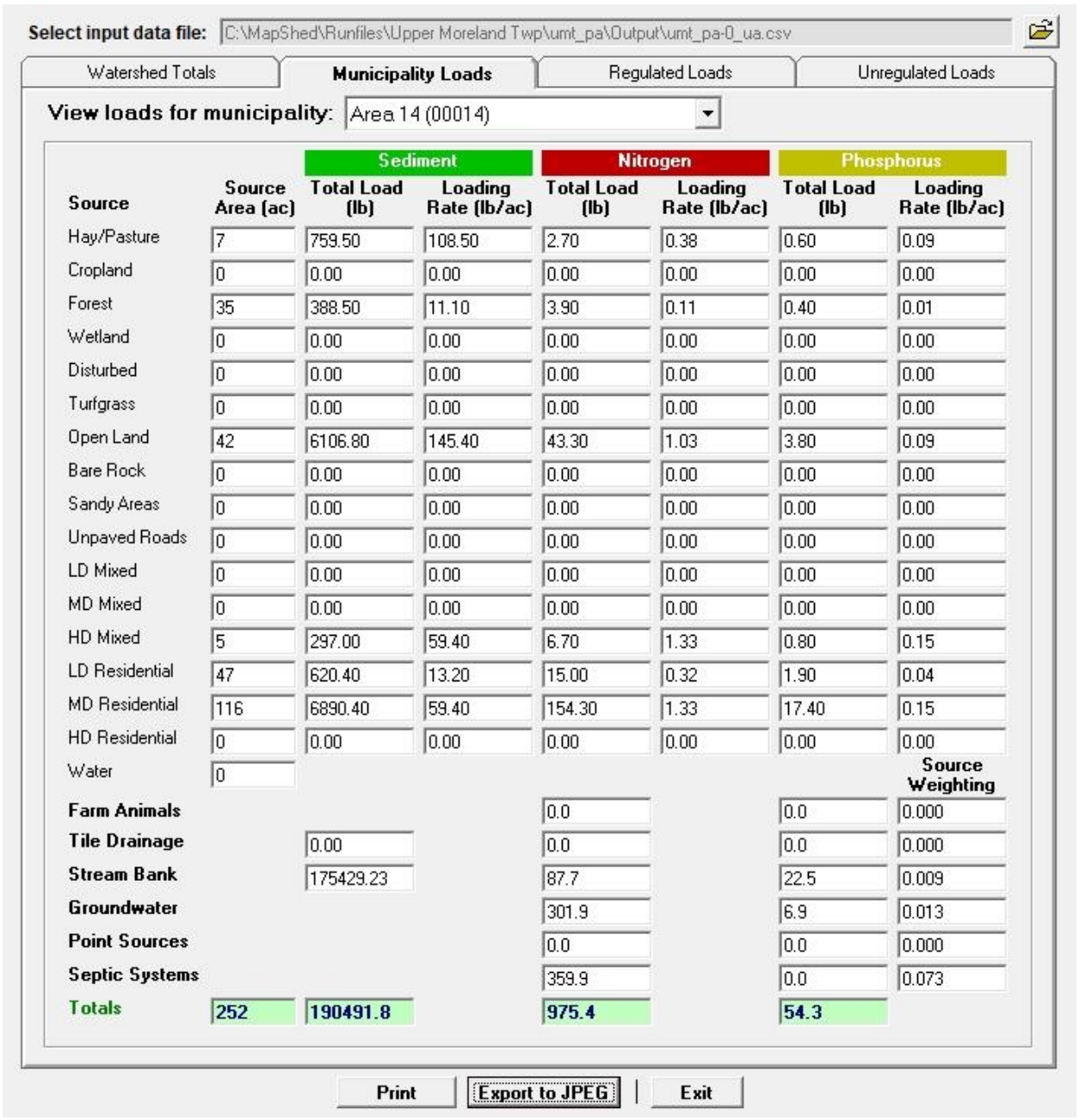
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 13 (00013)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 5 362.50 72.50 2.40 0.48 0.30 0.06
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 12 158.40 13.20 3.80 0.32 0.50 0.04
MD Mixed 5 296.50 59.30 6.70 1.33 0.80 0.15
HD Mixed 25 1485.00 59.40 33.30 1.33 3.80 0.15
LD Residential 104 1372.80 13.20 33.30 0.32 4.20 0.04
MD Residential 356 21146.40 59.40 473.50 1.33 53.40 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 414813.86 207.4 53.2 0.029
Groundwater 859.4 19.6 0.037
Point Sources 0.0 0.0 0.000
Septic Systems 793.7 0.0 0.161
Totals 507 439635.5 2413.5 135.8
Print
Export to JPEG
Exit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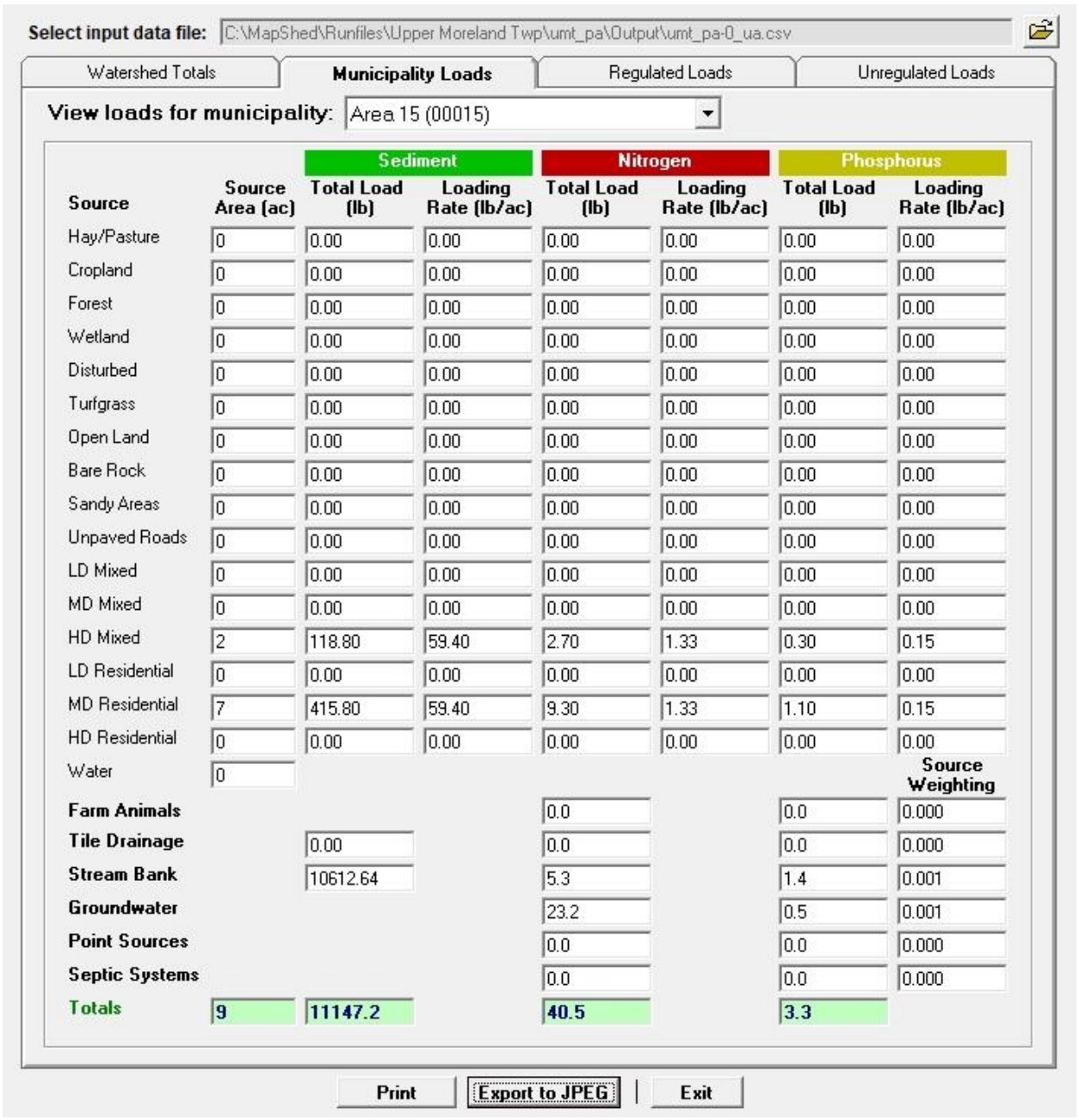
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 14 (00014)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 7 759.50 108.50 2.70 0.38 0.60 0.09
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 35 388.50 11.10 3.90 0.11 0.40 0.01
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 42 6106.80 145.40 43.30 1.03 3.80 0.09
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 5 297.00 59.40 6.70 1.33 0.80 0.15
LD Residential 47 620.40 13.20 15.00 0.32 1.90 0.04
MD Residential 116 6890.40 59.40 154.30 1.33 17.40 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 175429.23 87.7 22.5 0.009
Groundwater 301.9 6.9 0.013
Point Sources 0.0 0.0 0.000
Septic Systems 359.9 0.0 0.073
Totals 252 190491.8 975.4 54.3
Print
Export to JPEG
Exit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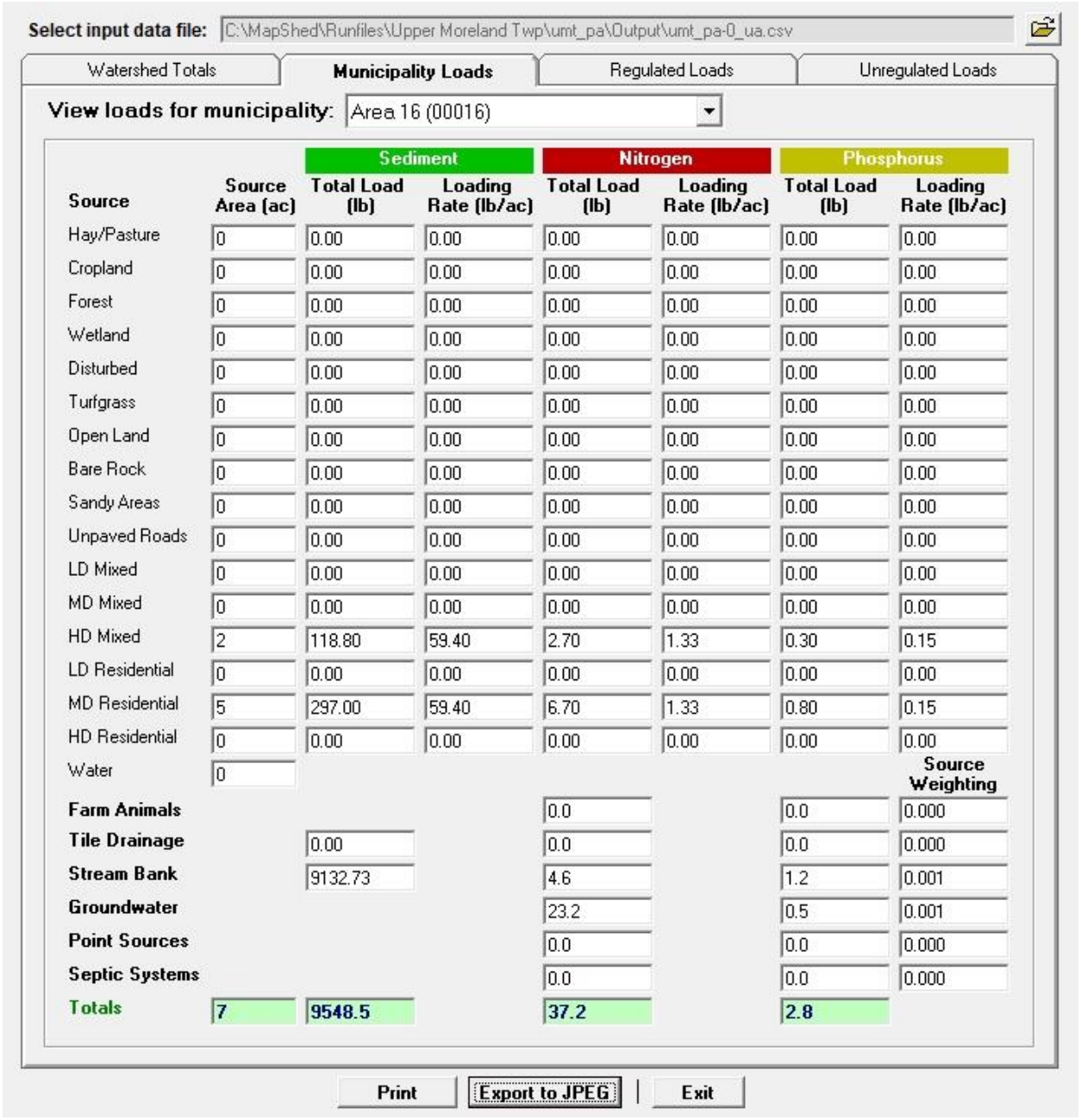
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 15 (00015)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 2 118.80 59.40 2.70 1.33 0.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 7 415.80 59.40 9.30 1.33 1.10 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 10612.64 5.3 1.4 0.001
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 9 11147.2 40.5 3.3
Print
Export to JPEG
Exit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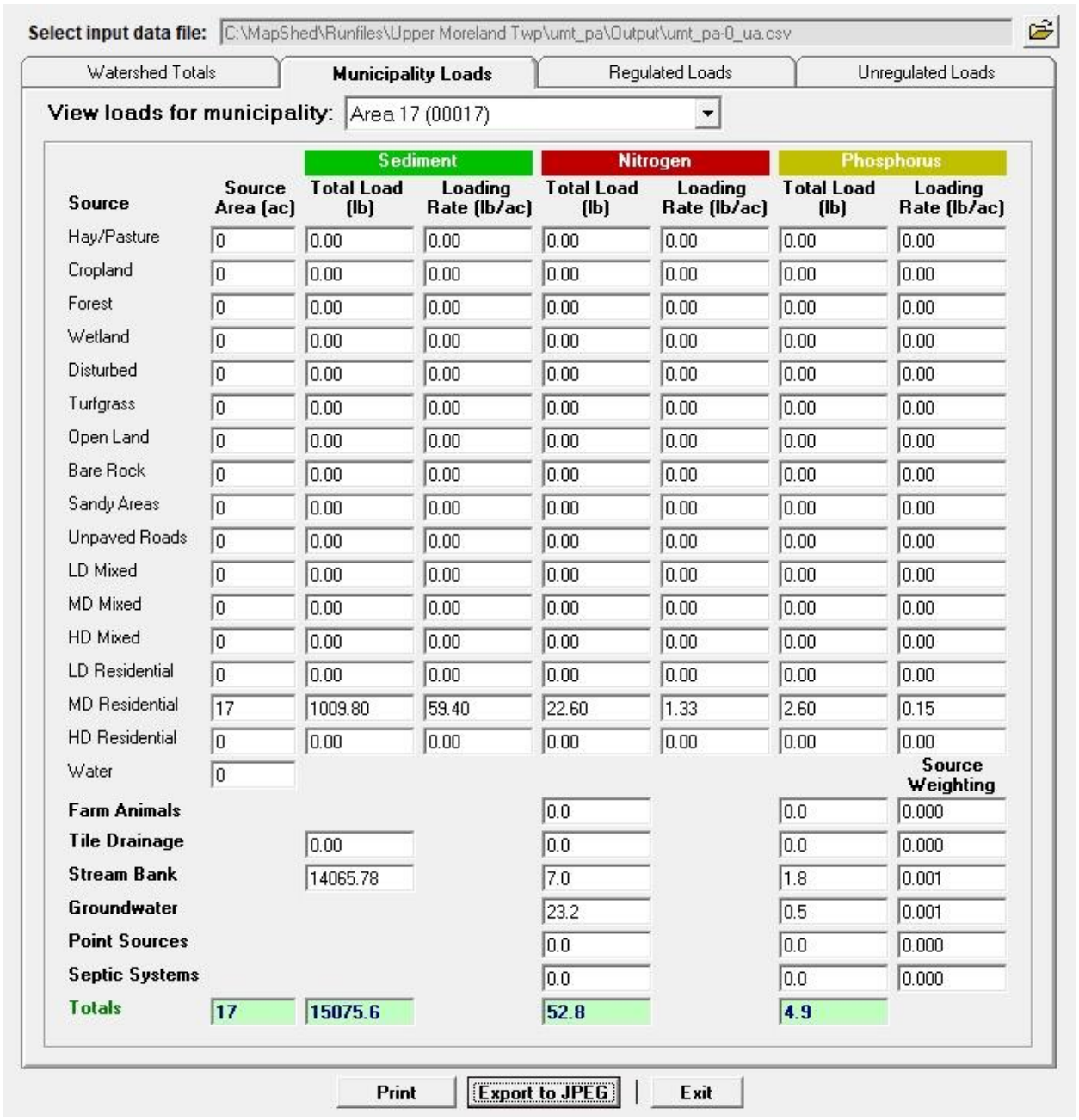
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 16 (00016)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 2 118.80 59.40 2.70 1.33 0.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 5 297.00 59.40 6.70 1.33 0.80 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 9132.73 4.6 1.2 0.001
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 7 9548.5 37.2 2.8
Print
Export to JPEG
Exit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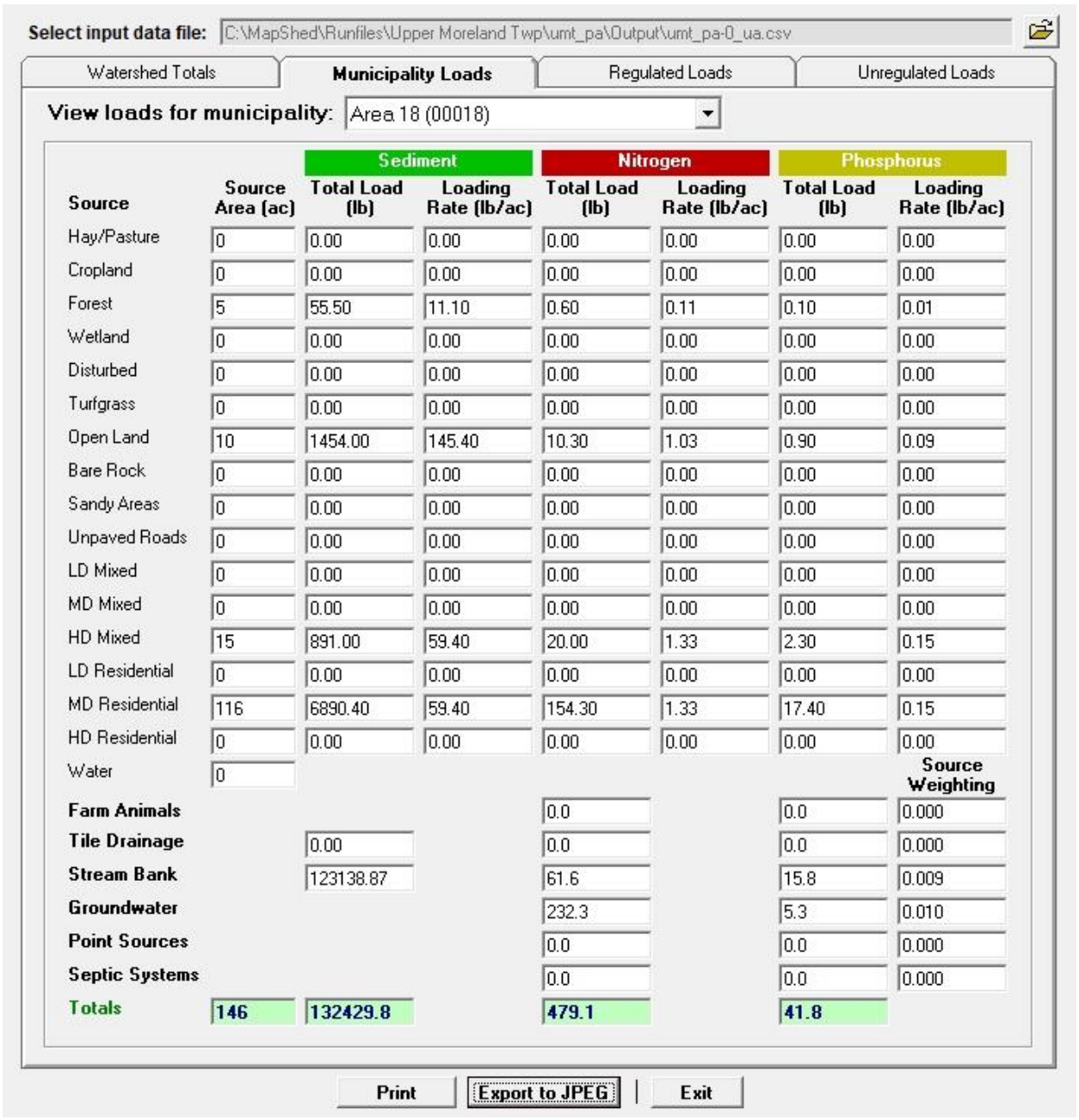
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 17 (00017)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 17 1009.80 59.40 22.60 1.33 2.60 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 14065.78 7.0 1.8 0.001
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 17 15075.6 52.8 4.9
Print
Export to JPEG
Exit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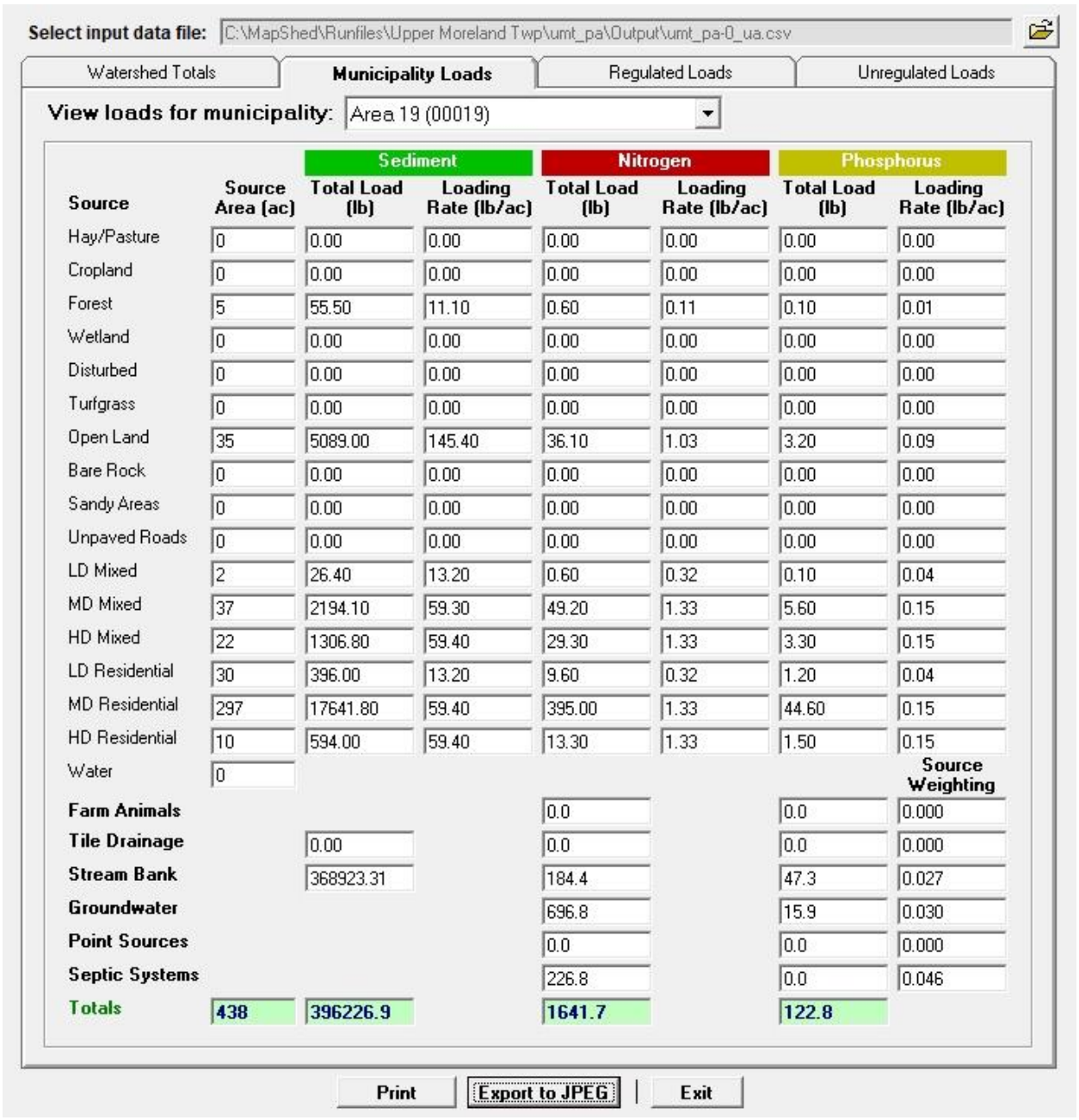
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 18 (00018)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 5 55.50 11.10 0.60 0.11 0.10 0.01
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 10 1454.00 145.40 10.30 1.03 0.90 0.09
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 15 891.00 59.40 20.00 1.33 2.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 116 6890.40 59.40 154.30 1.33 17.40 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 123138.87 61.6 15.8 0.009
Groundwater 232.3 5.3 0.010
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 146 132429.8 479.1 41.8
Print
Export to JPEG
Exit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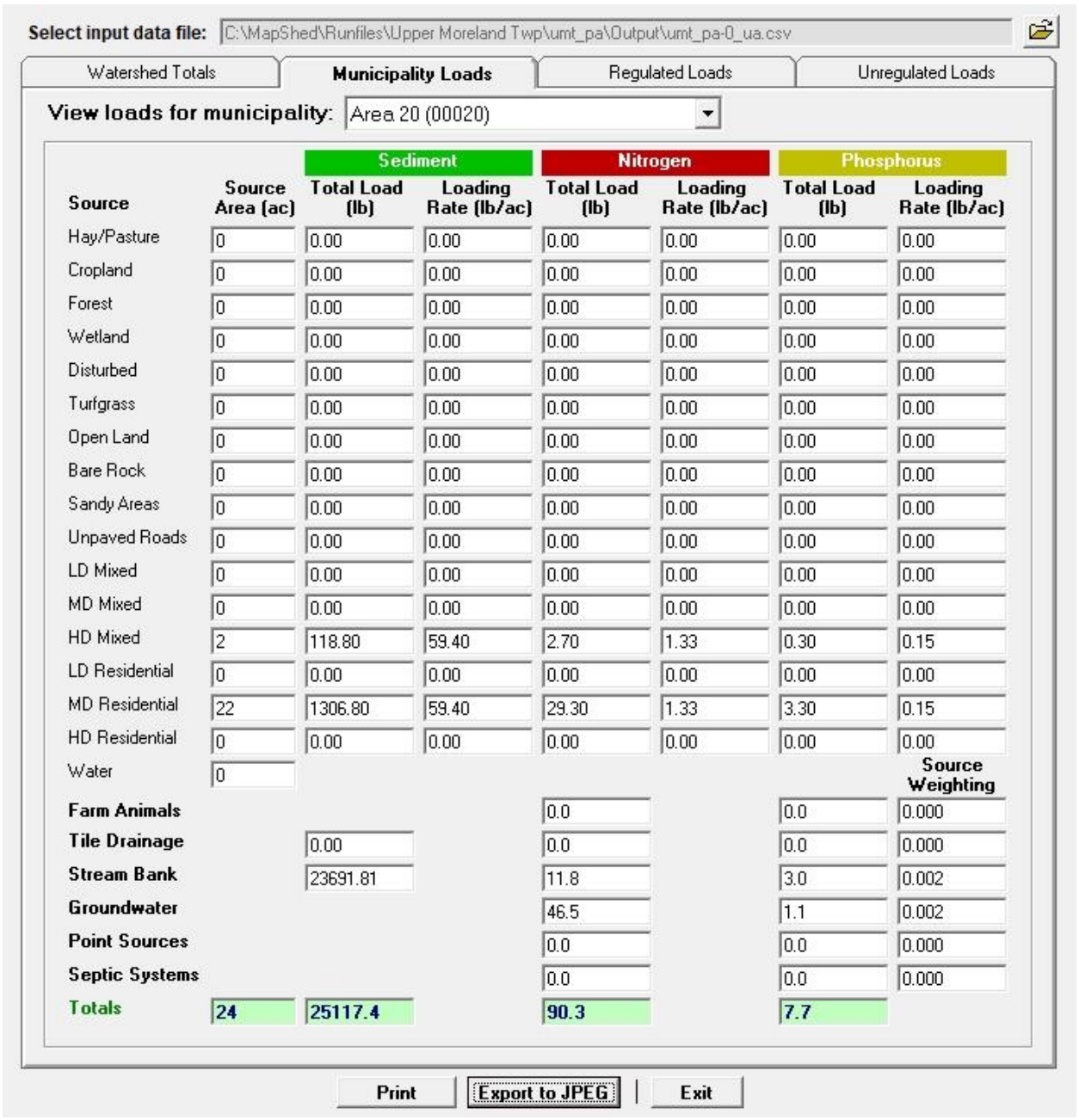
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 19 (00019)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 5 55.50 11.10 0.60 0.11 0.10 0.01
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 35 5089.00 145.40 36.10 1.03 3.20 0.09
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 2 26.40 13.20 0.60 0.32 0.10 0.04
MD Mixed 37 2194.10 59.30 49.20 1.33 5.60 0.15
HD Mixed 22 1306.80 59.40 29.30 1.33 3.30 0.15
LD Residential 30 396.00 13.20 9.60 0.32 1.20 0.04
MD Residential 297 17641.80 59.40 395.00 1.33 44.60 0.15
HD Residential 10 594.00 59.40 13.30 1.33 1.50 0.15
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 368923.31 184.4 47.3 0.027
Groundwater 696.8 15.9 0.030
Point Sources 0.0 0.0 0.000
Septic Systems 226.8 0.0 0.046
Totals 438 396226.9 1641.7 122.8
Print
Export to JPEG
Exit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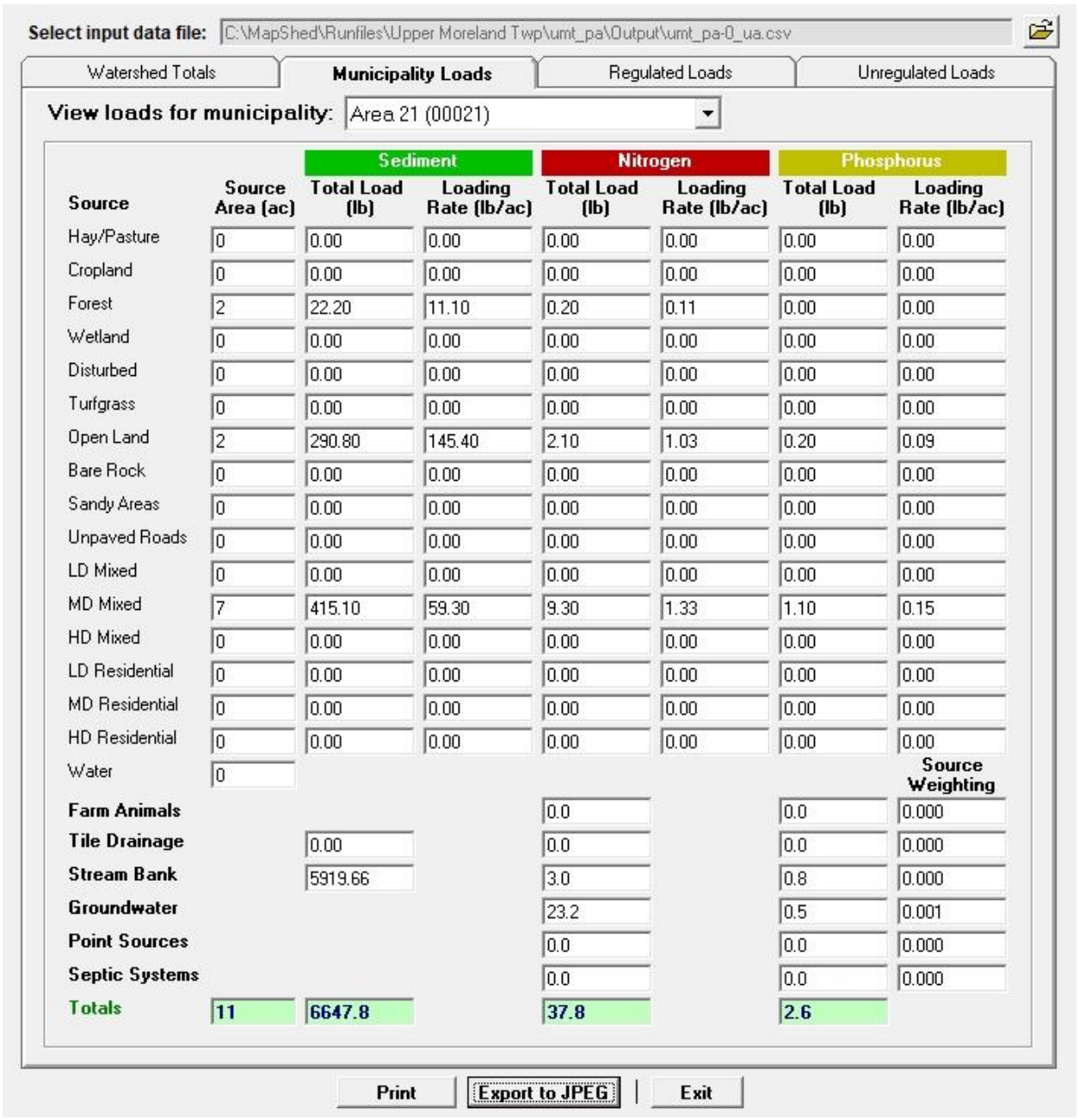
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 20 (00020)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 2 118.80 59.40 2.70 1.33 0.30 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 22 1306.80 59.40 29.30 1.33 3.30 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 23691.81 11.8 3.0 0.002
Groundwater 46.5 1.1 0.002
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 24 25117.4 90.3 7.7
Print
Export to JPEG
Exit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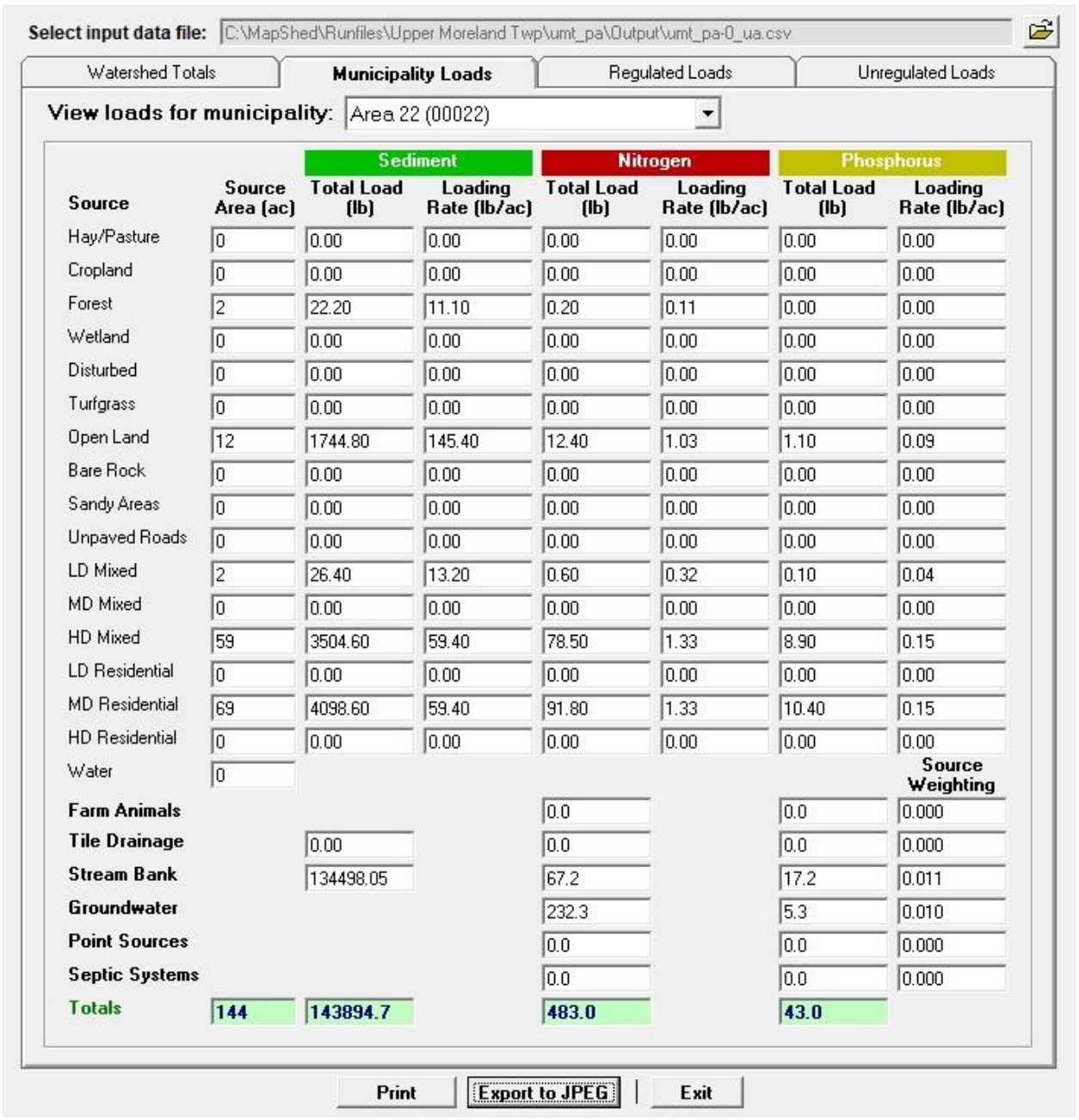
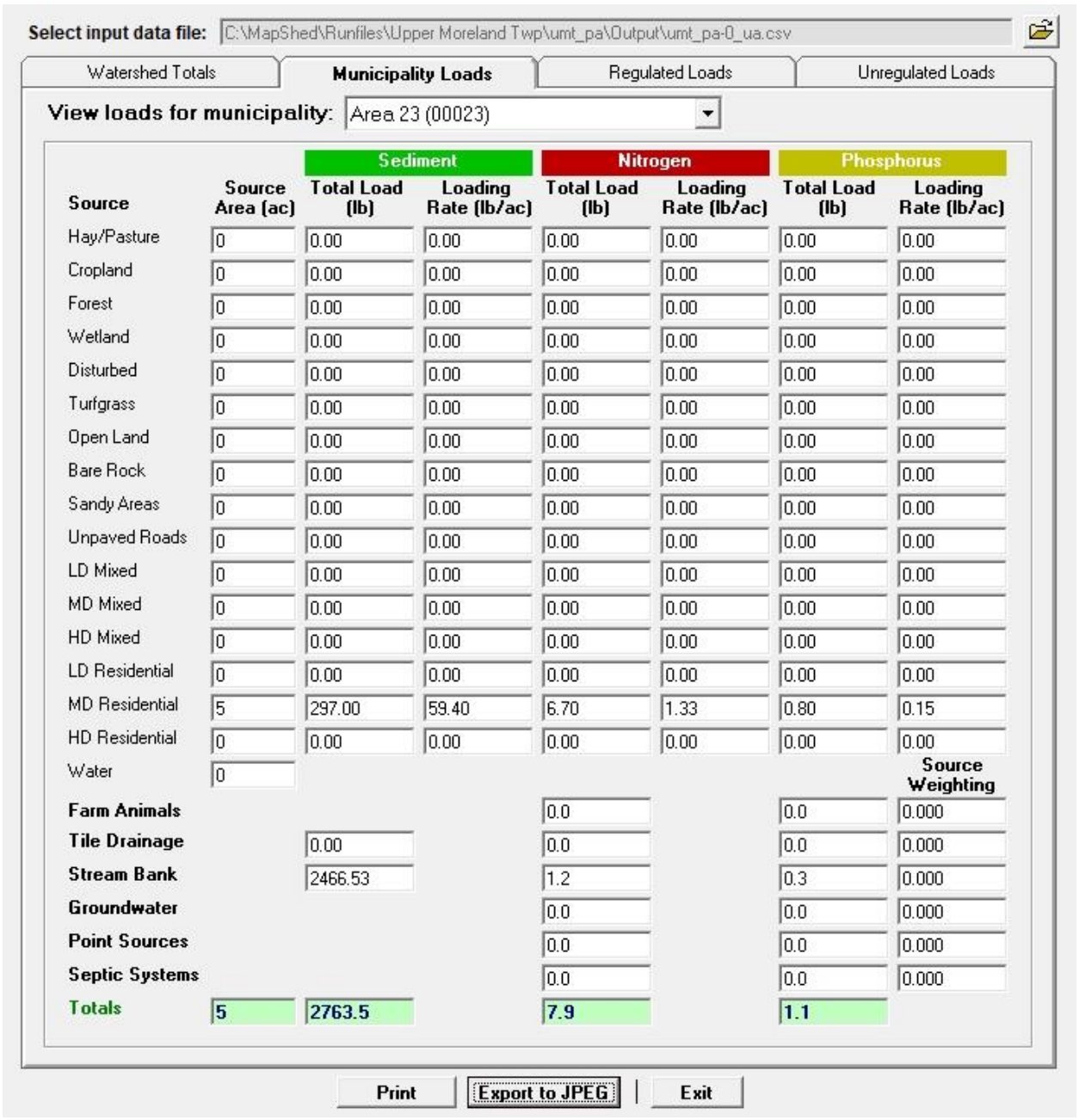
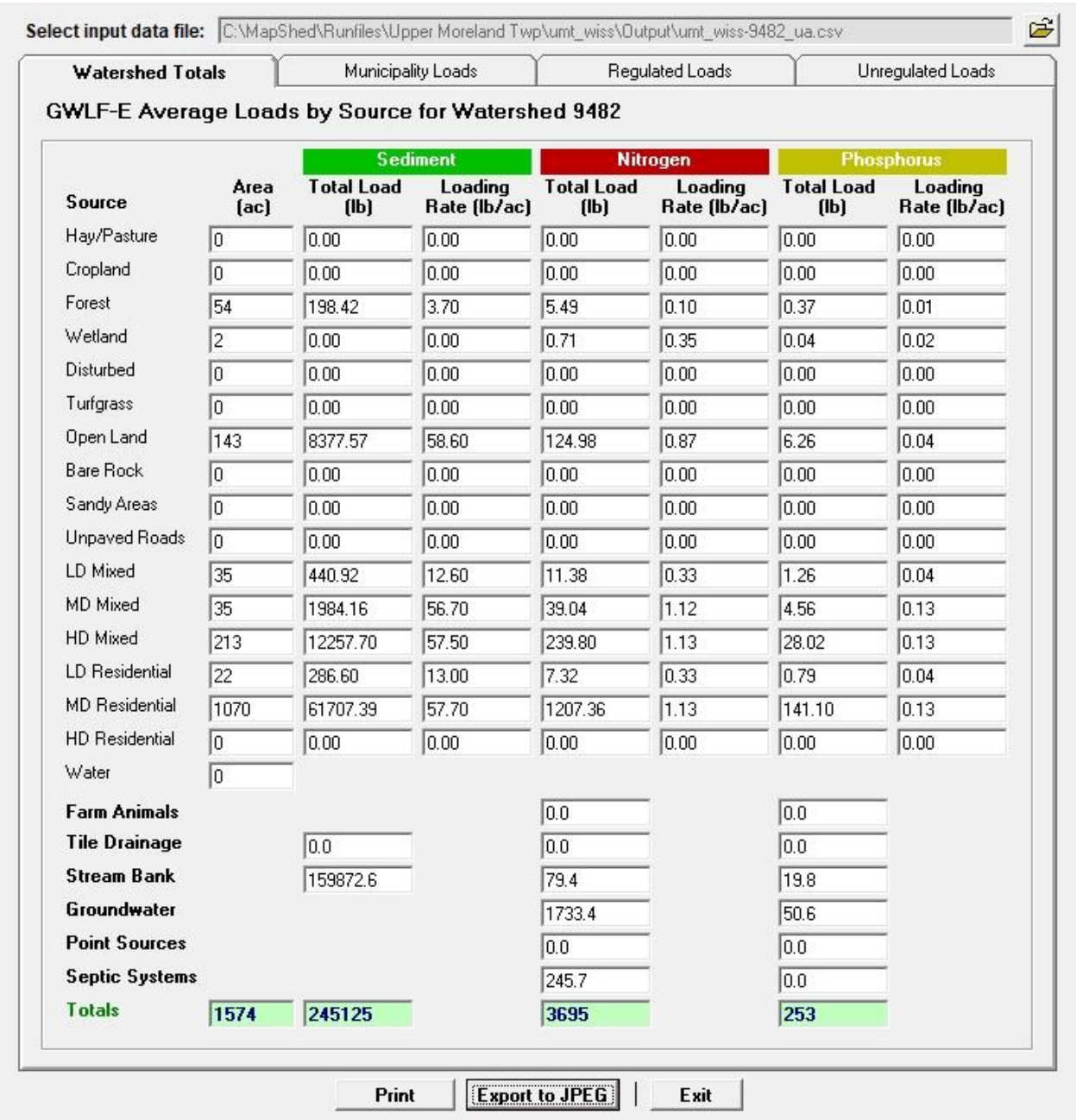
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 21 (00021)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 2 22.20 11.10 0.20 0.11 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 2 290.80 145.40 2.10 1.03 0.20 0.09
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 7 415.10 59.30 9.30 1.33 1.10 0.15
HD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 5919.66 3.0 0.8 0.000
Groundwater 23.2 0.5 0.001
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 11 6647.8 37.8 2.6
Print
Export to JPEG
Exit


Select input data file:
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 22 (00022)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 2 22.20 11.10 0.20 0.11 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 12 1744.80 145.40 12.40 1.03 1.10 0.09
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 2 26.40 13.20 0.60 0.32 0.10 0.04
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 59 3504.60 59.40 78.50 1.33 8.90 0.15
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 69 4098.60 59.40 91.80 1.33 10.40 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 134498.05 67.2 17.2 0.011
Groundwater 232.3 5.3 0.010
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 144 143894.7 483.0 43.0
Print
Export to JPEG
Exit


Select input data file:
C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\umt_pa-0_ua.csv
Watershed Totals
Municipality Loads
Regulated Loads
Unregulated Loads
View loads for municipality:
Area 23 (00023)
Sediment
Nitrogen
Phosphorus
Source
Source Area (ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Total Load (lb)
Loading Rate (lb/ac)
Hay/Pasture 0 0.00 0.00 0.00 0.00 0.00 0.00
Cropland 0 0.00 0.00 0.00 0.00 0.00 0.00
Forest 0 0.00 0.00 0.00 0.00 0.00 0.00
Wetland 0 0.00 0.00 0.00 0.00 0.00 0.00
Disturbed 0 0.00 0.00 0.00 0.00 0.00 0.00
Turfgrass 0 0.00 0.00 0.00 0.00 0.00 0.00
Open Land 0 0.00 0.00 0.00 0.00 0.00 0.00
Bare Rock 0 0.00 0.00 0.00 0.00 0.00 0.00
Sandy Areas 0 0.00 0.00 0.00 0.00 0.00 0.00
Unpaved Roads 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
HD Mixed 0 0.00 0.00 0.00 0.00 0.00 0.00
LD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
MD Residential 5 297.00 59.40 6.70 1.33 0.80 0.15
HD Residential 0 0.00 0.00 0.00 0.00 0.00 0.00
Water 0
Source Weighting
Farm Animals 0.0 0.0 0.000
Tile Drainage 0.00 0.0 0.0 0.000
Stream Bank 2466.53 1.2 0.3 0.000
Groundwater 0.0 0.0 0.000
Point Sources 0.0 0.0 0.000
Septic Systems 0.0 0.0 0.000
Totals 5 2763.5 7.9 1.1
Print
Export to JPEG
Exit

Appendix D-4: Total Watershed Loading for Wissahickon Creek



Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_wiss\Output\umt_wiss-9482_ua.csv

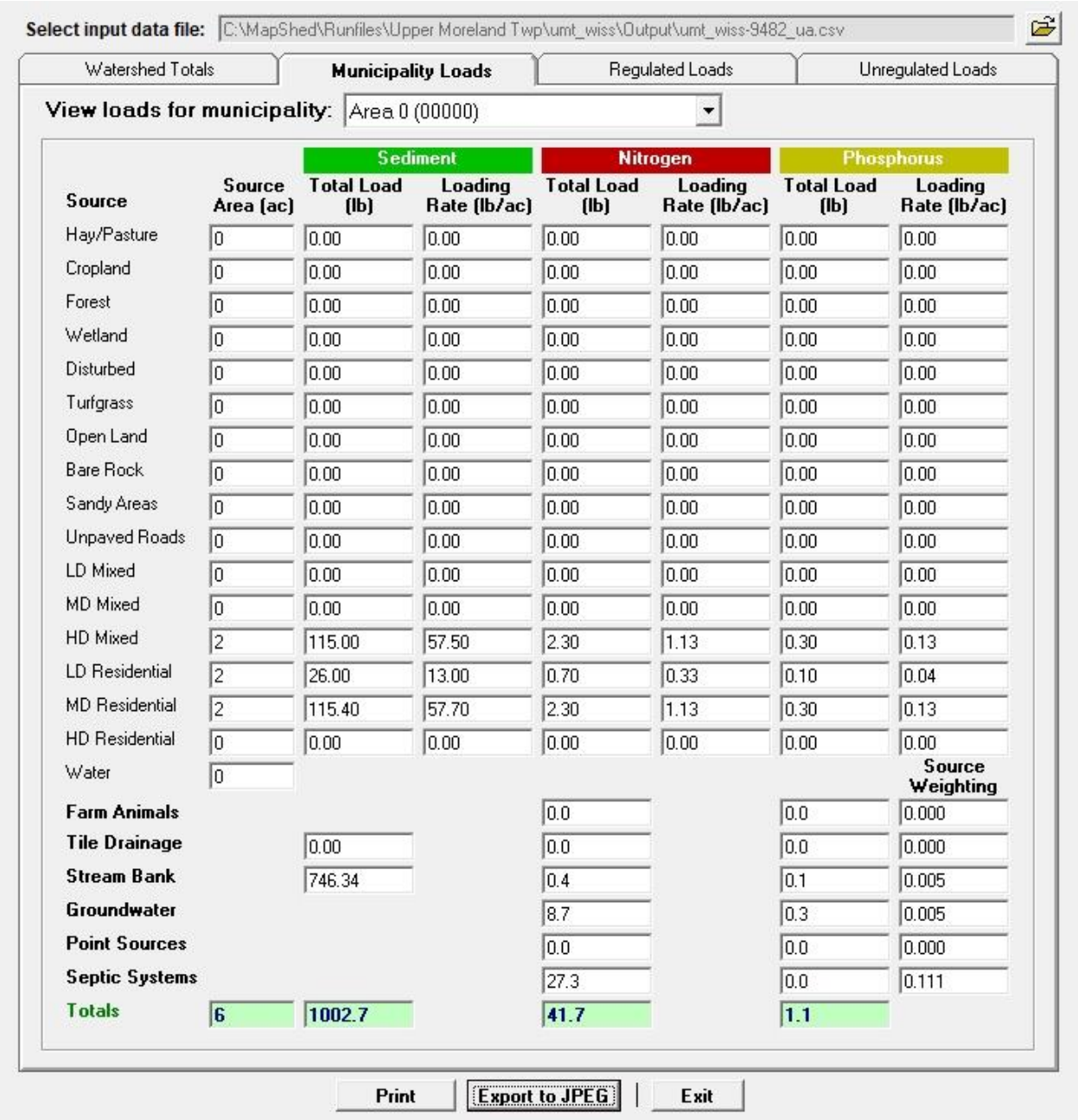
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 9482

Source	Area (ac)	Sediment Total Load (lb)	Sediment Loading Rate (lb/ac)	Nitrogen Total Load (lb)	Nitrogen Loading Rate (lb/ac)	Phosphorus Total Load (lb)	Phosphorus Loading Rate (lb/ac)
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	54	198.42	3.70	5.49	0.10	0.37	0.01
Wetland	2	0.00	0.00	0.71	0.35	0.04	0.02
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	143	8377.57	58.60	124.98	0.87	6.26	0.04
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	35	440.92	12.60	11.38	0.33	1.26	0.04
MD Mixed	35	1984.16	56.70	39.04	1.12	4.56	0.13
HD Mixed	213	12257.70	57.50	239.80	1.13	28.02	0.13
LD Residential	22	286.60	13.00	7.32	0.33	0.79	0.04
MD Residential	1070	61707.39	57.70	1207.36	1.13	141.10	0.13
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		159872.6		79.4		19.8	
Groundwater				1733.4		50.6	
Point Sources				0.0		0.0	
Septic Systems				245.7		0.0	
Totals	1574	245125		3695		253	

Print | Export to JPEG | Exit

Appendix D-5: Total Loading for Planning Areas for Wissahickon Creek within Upper Moreland Township



Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_wiss\Output\umt_wiss-9482_ua.csv

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

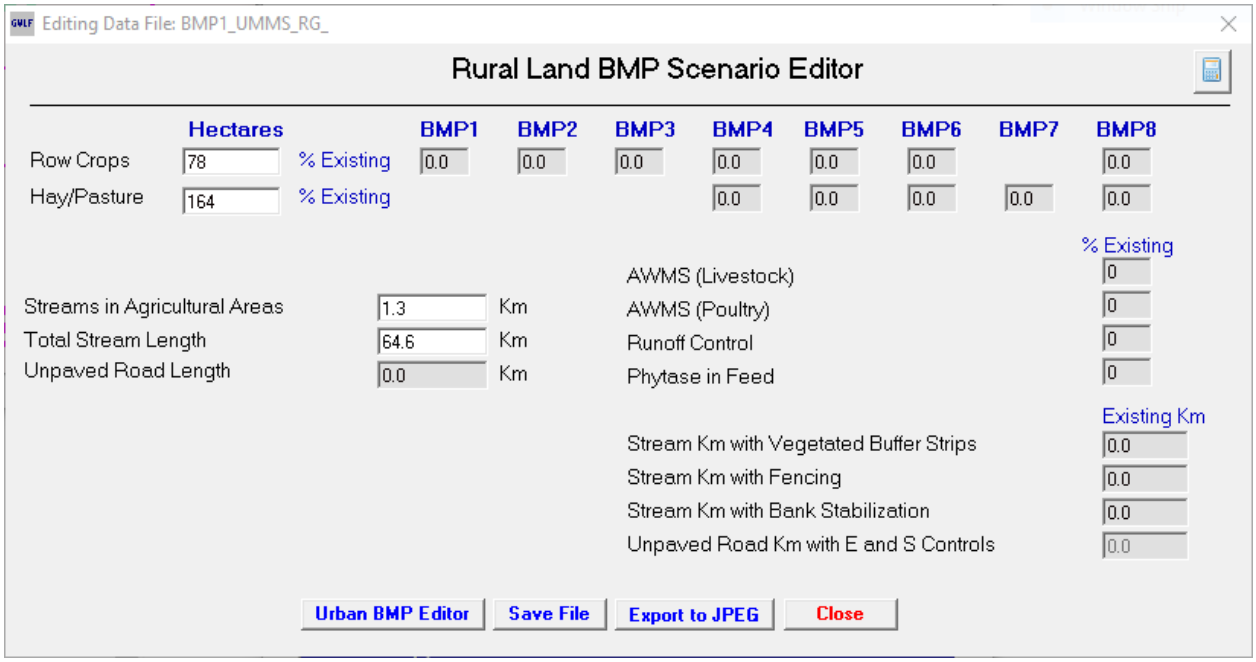
View loads for municipality: Area 0 (00000)

		Sediment		Nitrogen		Phosphorus	
Source	**Source Area (ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**
Hay/Pasture	0	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	0	0.00	0.00	0.00	0.00	0.00	0.00
Forest	0	0.00	0.00	0.00	0.00	0.00	0.00
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	0	0.00	0.00	0.00	0.00	0.00	0.00
Open Land	0	0.00	0.00	0.00	0.00	0.00	0.00
Bare Rock	0	0.00	0.00	0.00	0.00	0.00	0.00
Sandy Areas	0	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Roads	0	0.00	0.00	0.00	0.00	0.00	0.00
LD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00
HD Mixed	2	115.00	57.50	2.30	1.13	0.30	0.13
LD Residential	2	26.00	13.00	0.70	0.33	0.10	0.04
MD Residential	2	115.40	57.70	2.30	1.13	0.30	0.13
HD Residential	0	0.00	0.00	0.00	0.00	0.00	0.00
Water	0						
							Source Weighting
Farm Animals				0.0		0.0	0.000
Tile Drainage		0.00		0.0		0.0	0.000
Stream Bank		746.34		0.4		0.1	0.005
Groundwater				8.7		0.3	0.005
Point Sources				0.0		0.0	0.000
Septic Systems				27.3		0.0	0.111
Totals	6	1002.7		41.7		1.1	

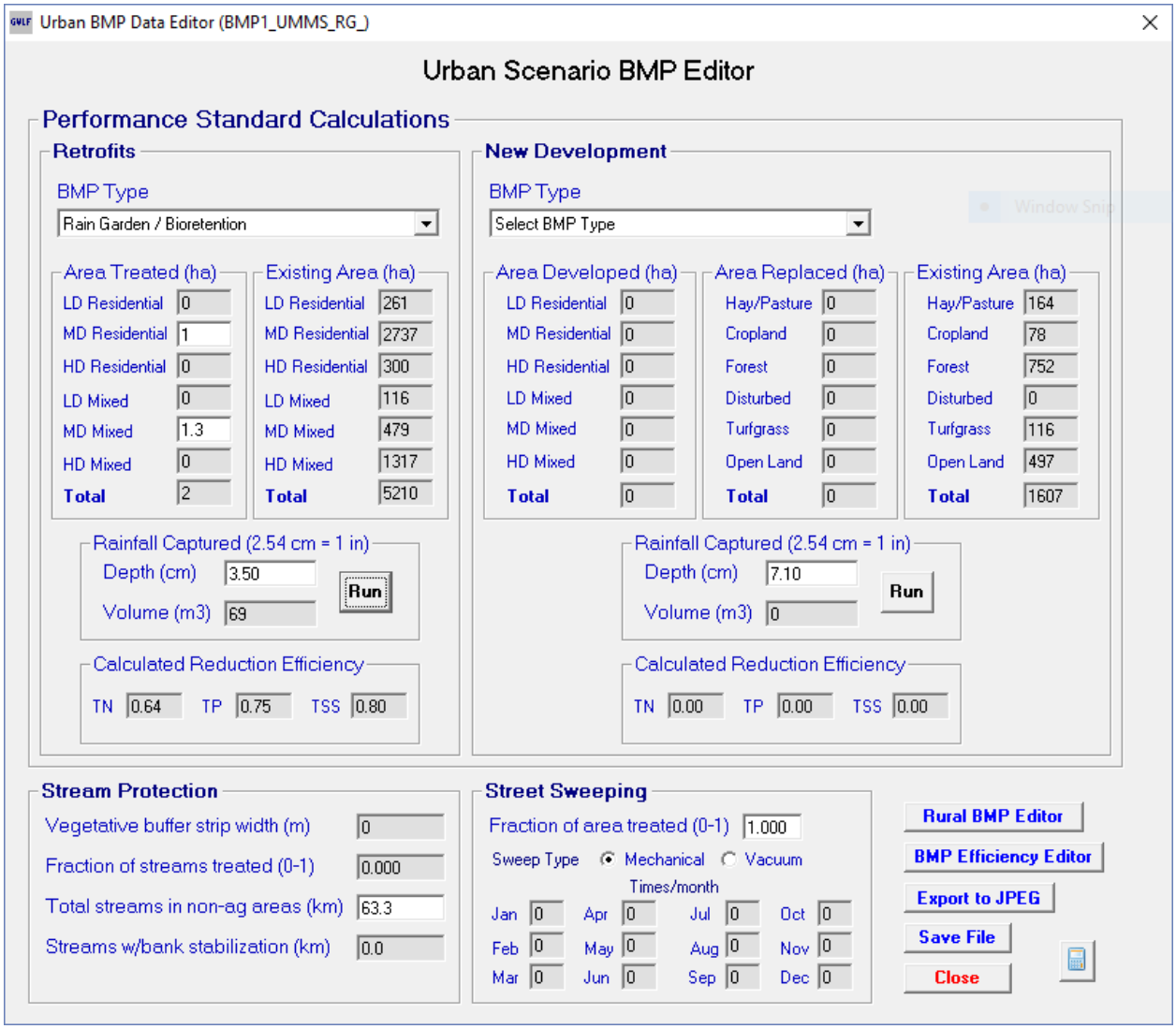
Print | Export to JPEG | Exit

Appendix E

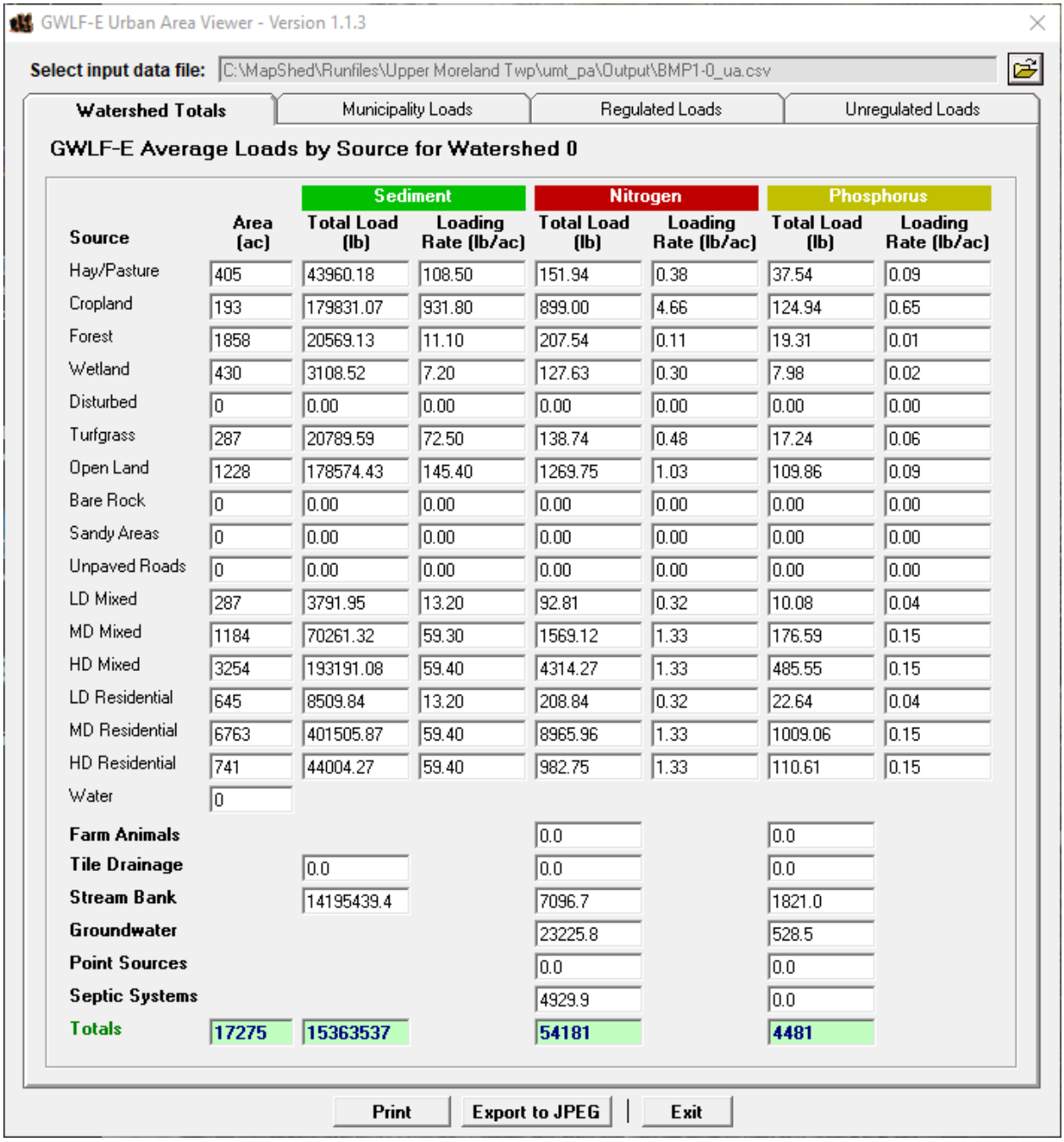
Appendix E-1.1: BMP 1 – Rain Garden Retrofit, Drainage Area Parameters



Appendix E-1.2: BMP 1 - Rain Garden Retrofit, BMP Type & Efficiency



Appendix E-1.3: BMP 1 - Rain Garden Retrofit, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP1-0_ua.csv

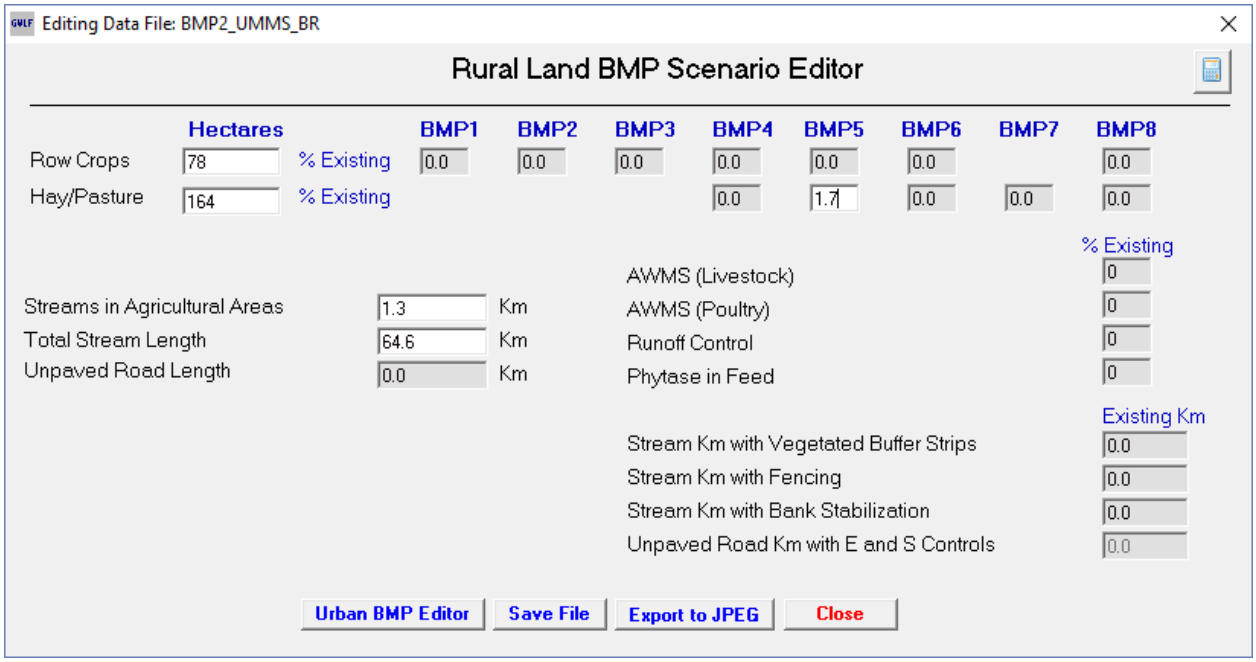
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

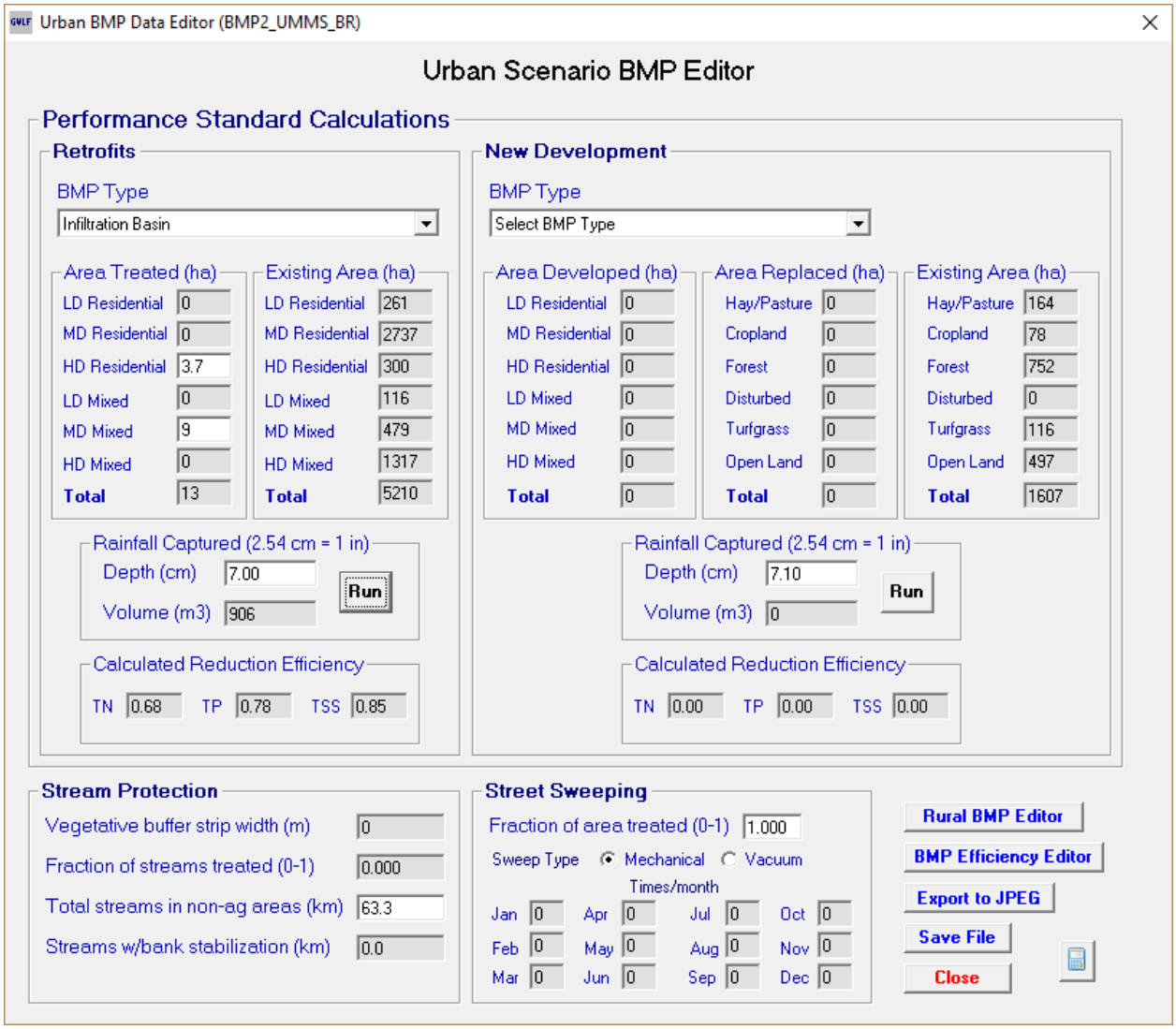
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14195439.4		7096.7		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15363537		54181		4481	

Print | Export to JPEG | Exit

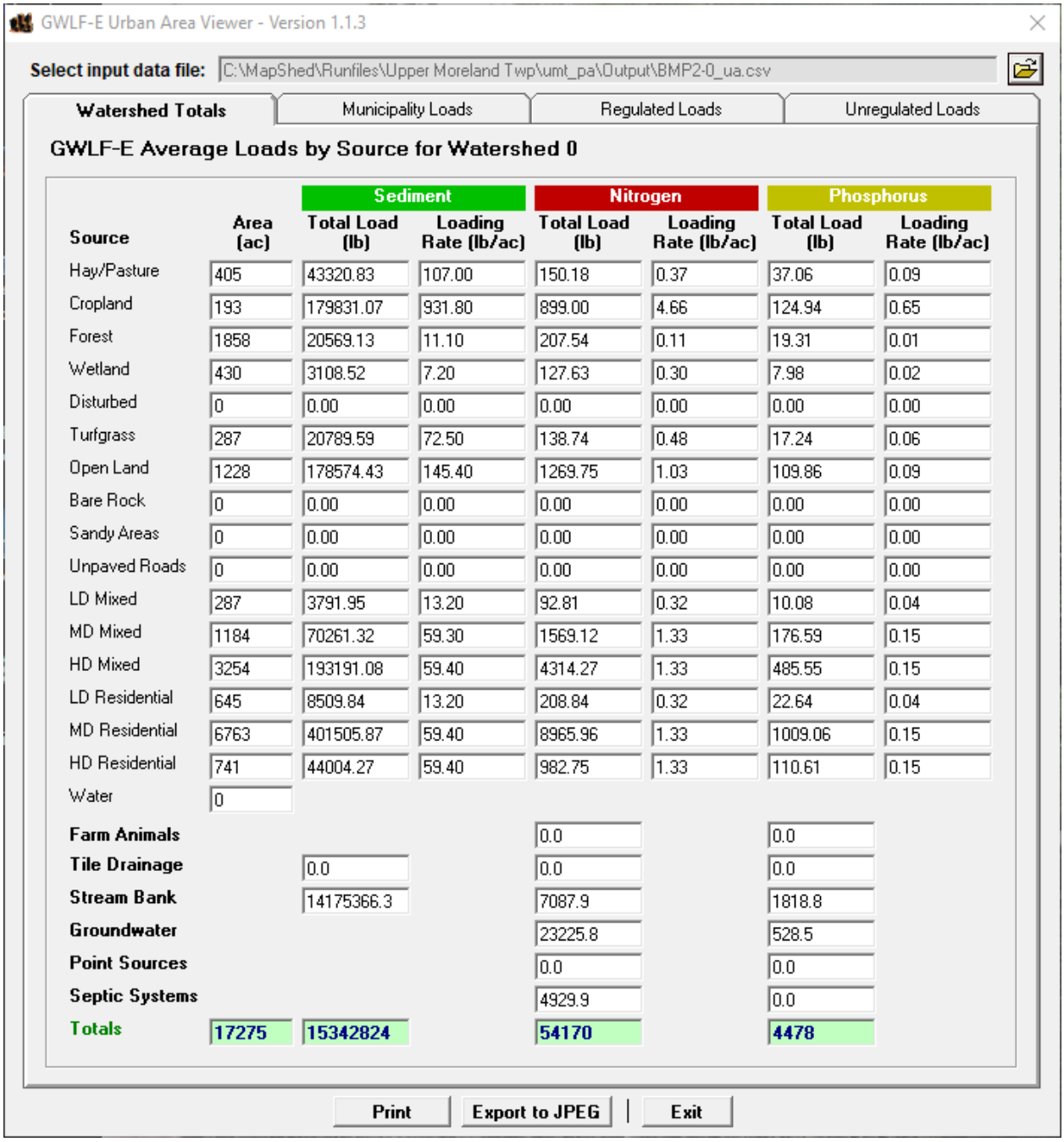
Appendix E-2.1: BMP 2 – Infiltration Basin, Drainage Area Parameters



Appendix E-2.2: BMP 2 - Infiltration Basin, BMP Type & Efficiency



Appendix E-2.3: BMP 2 - Infiltration Basin, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP2-0_ua.csv

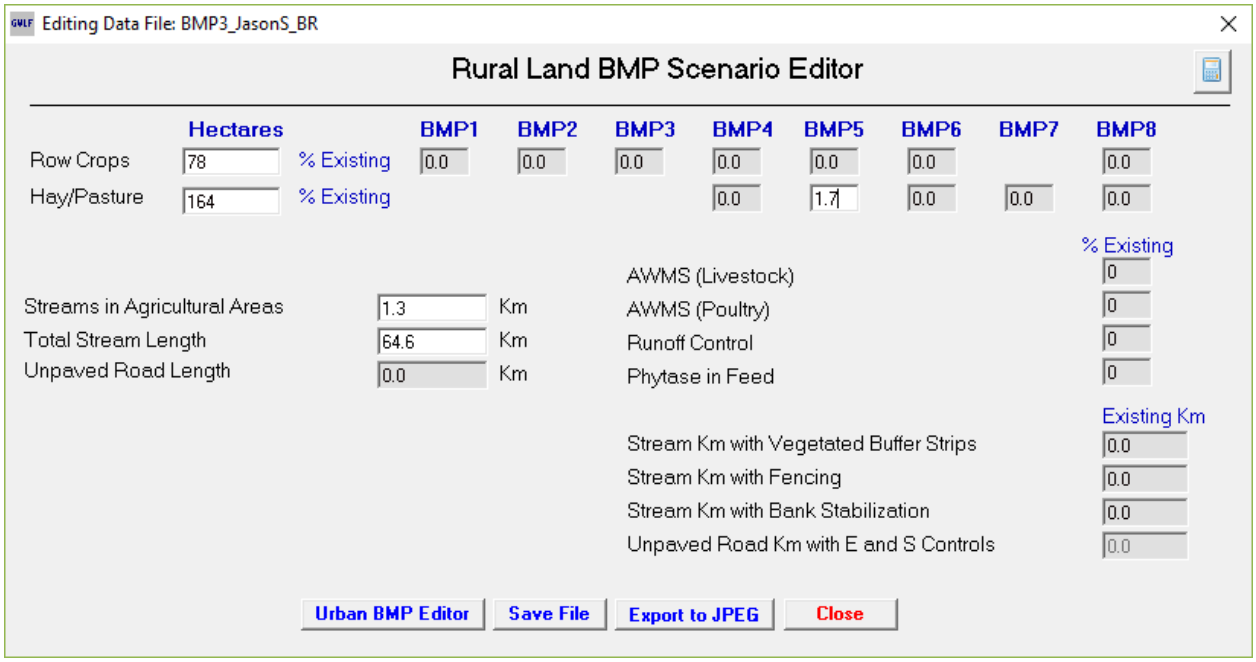
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

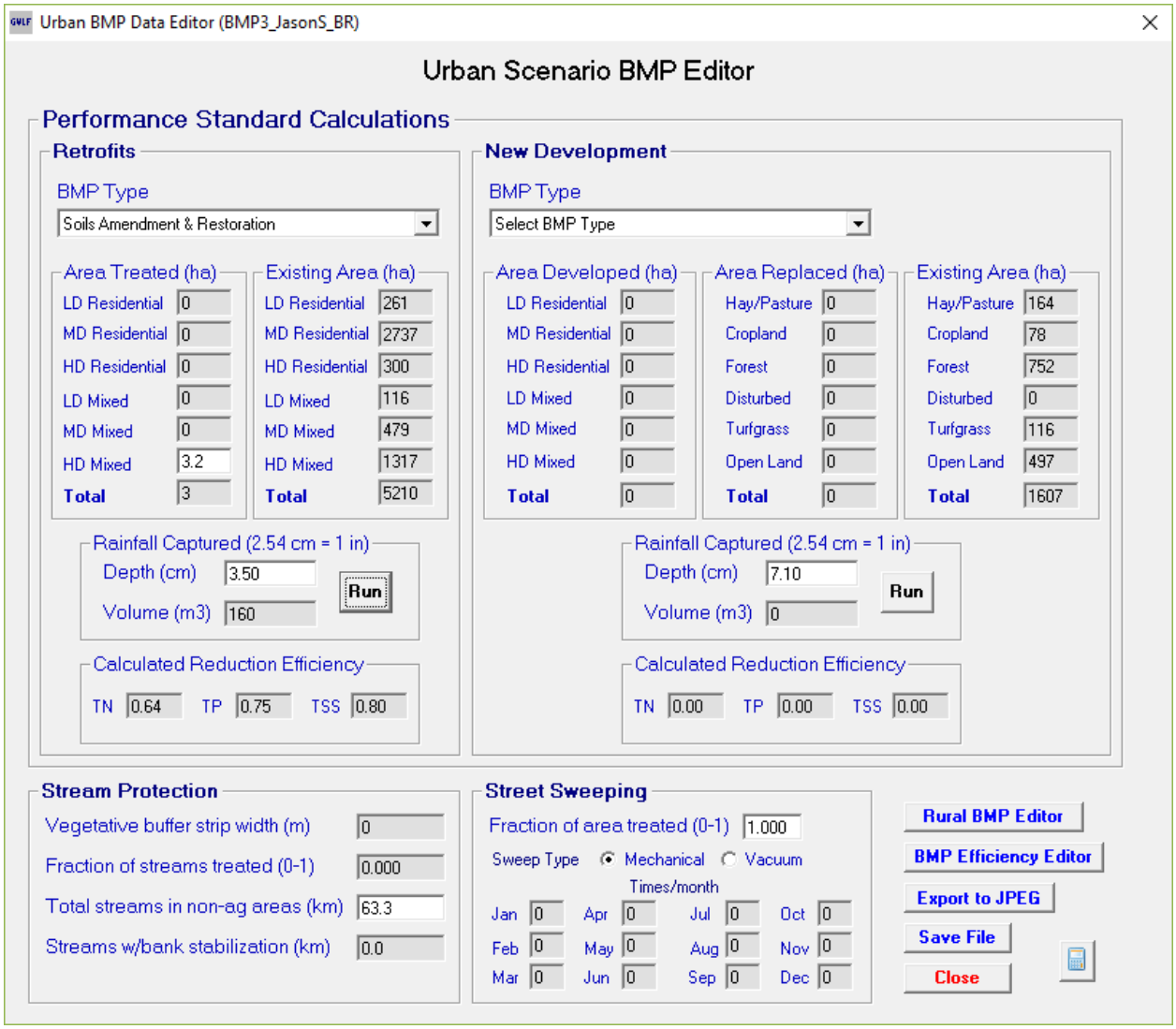
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43320.83	107.00	150.18	0.37	37.06	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14175366.3		7087.9		1818.8	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15342824		54170		4478	

Print | Export to JPEG | Exit

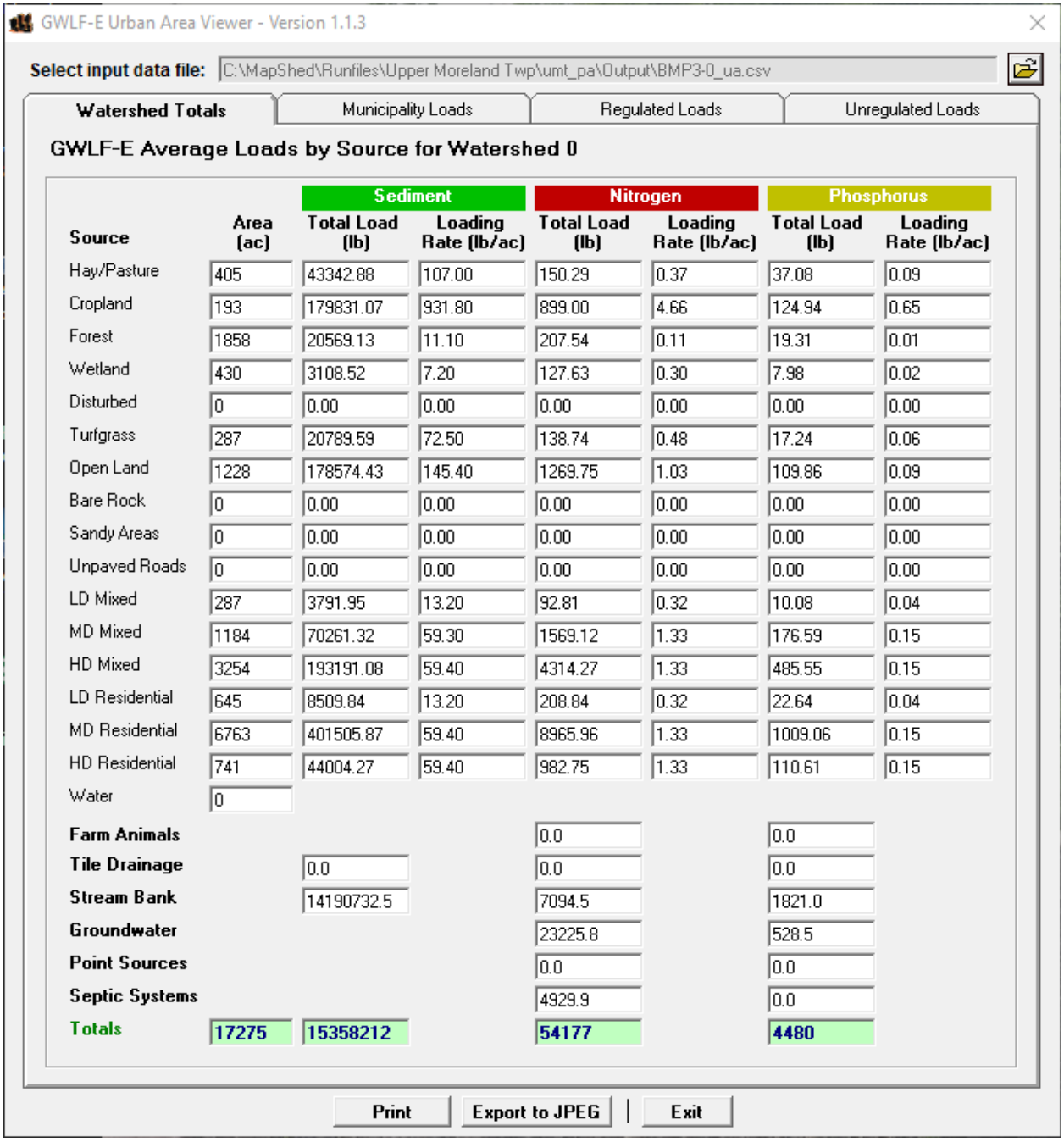
Appendix E-3.1: BMP 3 – Basin Retrofit, Drainage Area Parameters



Appendix E-3.2: BMP 3 - Basin Retrofit, BMP Type & Efficiency



Appendix E-3.3: BMP 3 - Basin Retrofit, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP3-0_ua.csv

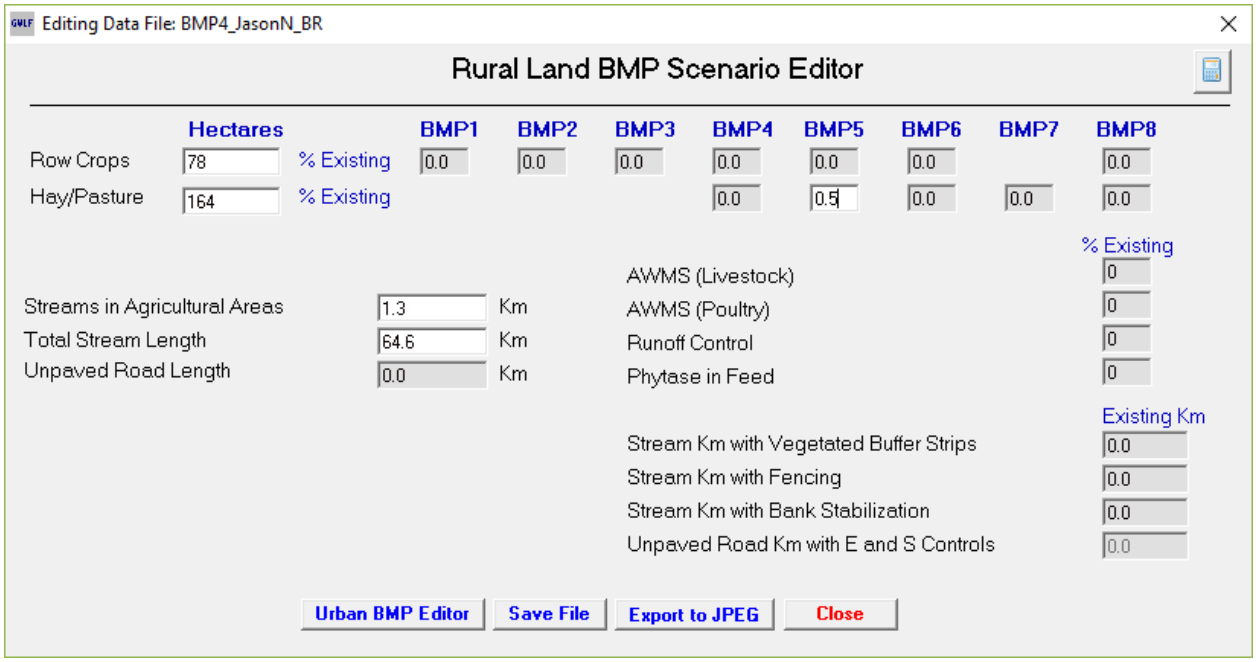
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

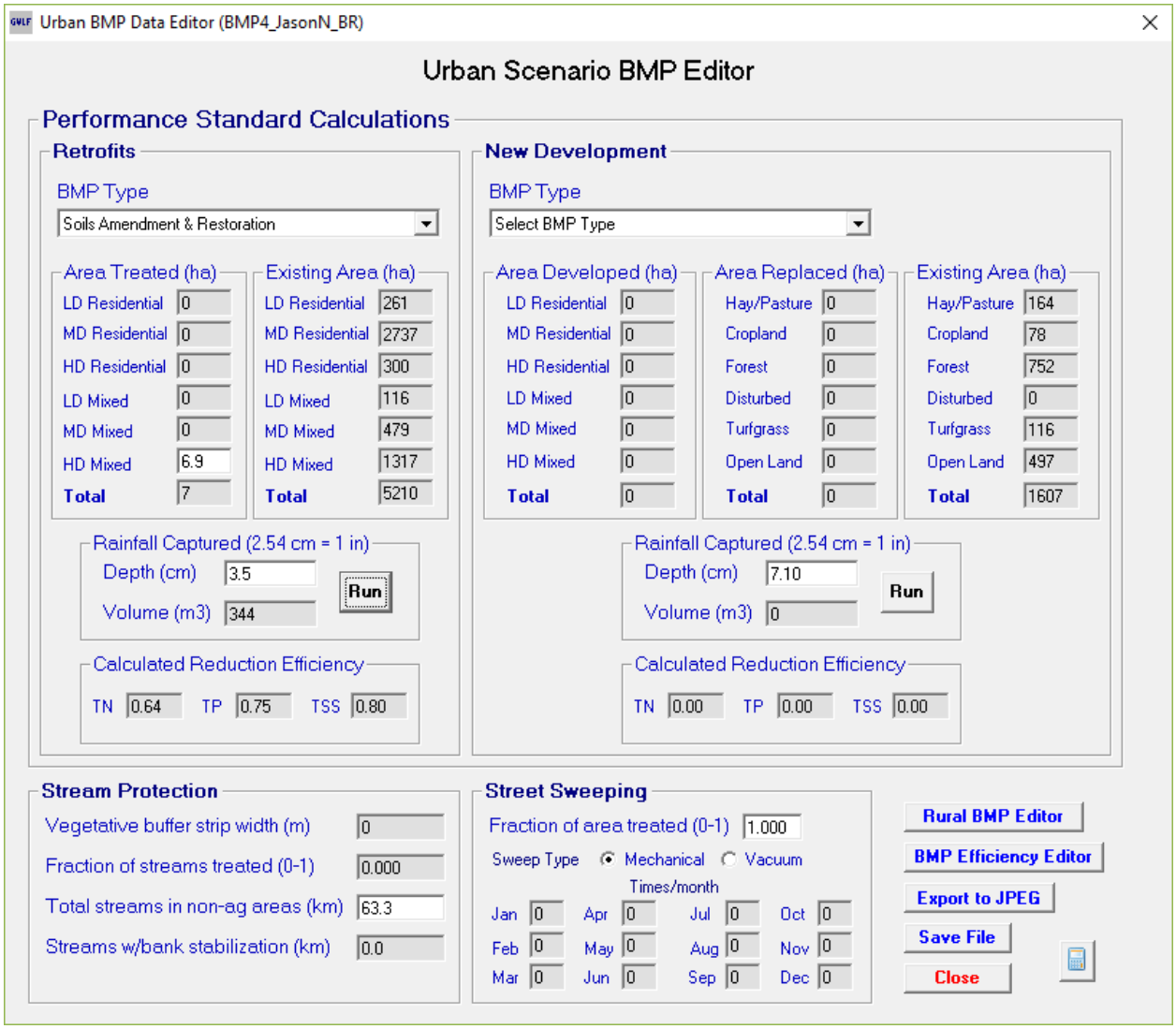
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43342.88	107.00	150.29	0.37	37.08	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14190732.5		7094.5		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15358212		54177		4480	

Print | Export to JPEG | Exit

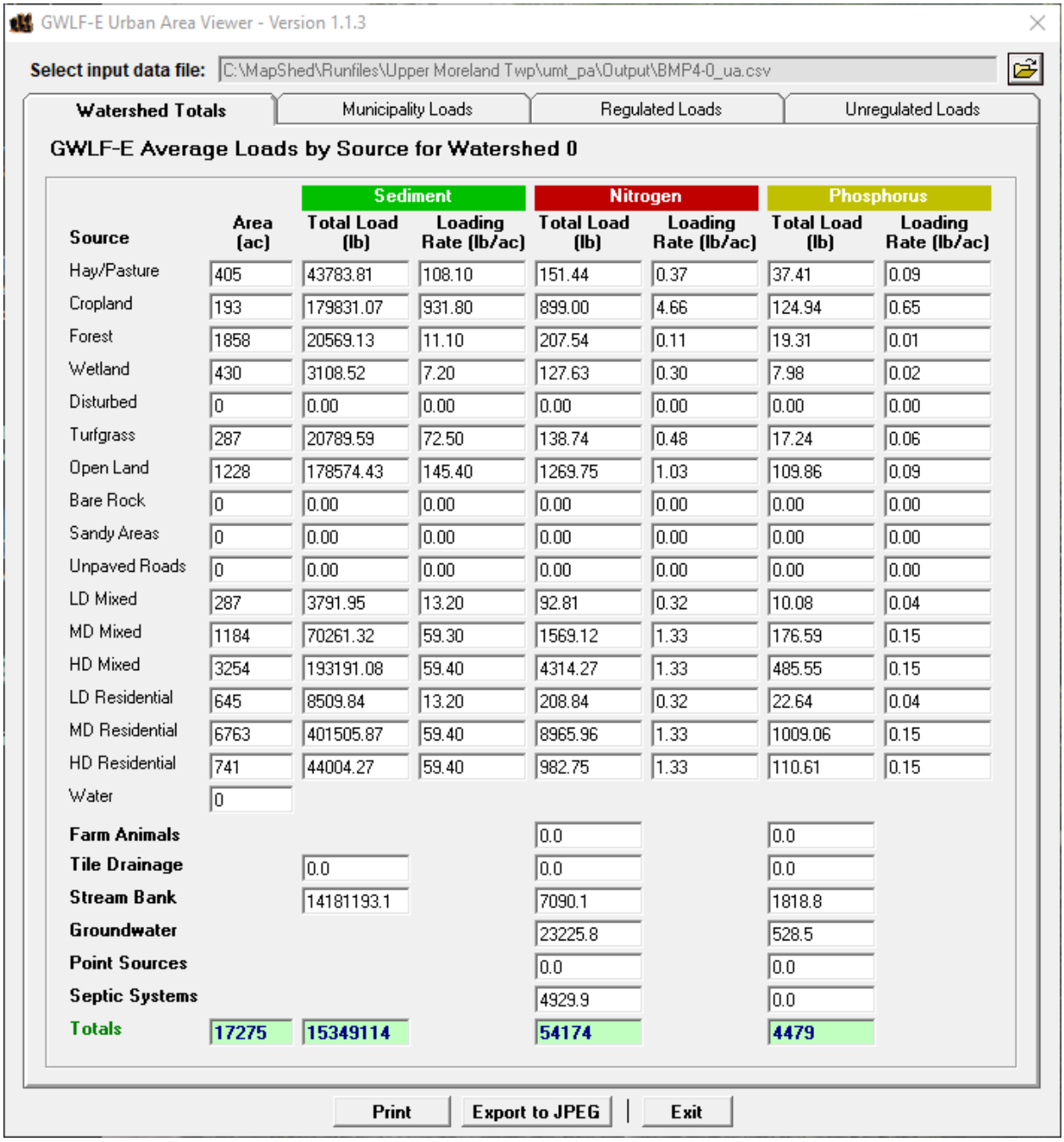
Appendix E-4.1: BMP 4 – Basin Retrofit, Drainage Area Parameters



Appendix E-4.2: BMP 4 - Basin Retrofit, BMP Type & Efficiency



Appendix E-4.3: BMP 4 - Basin Retrofit, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP4-0_ua.csv

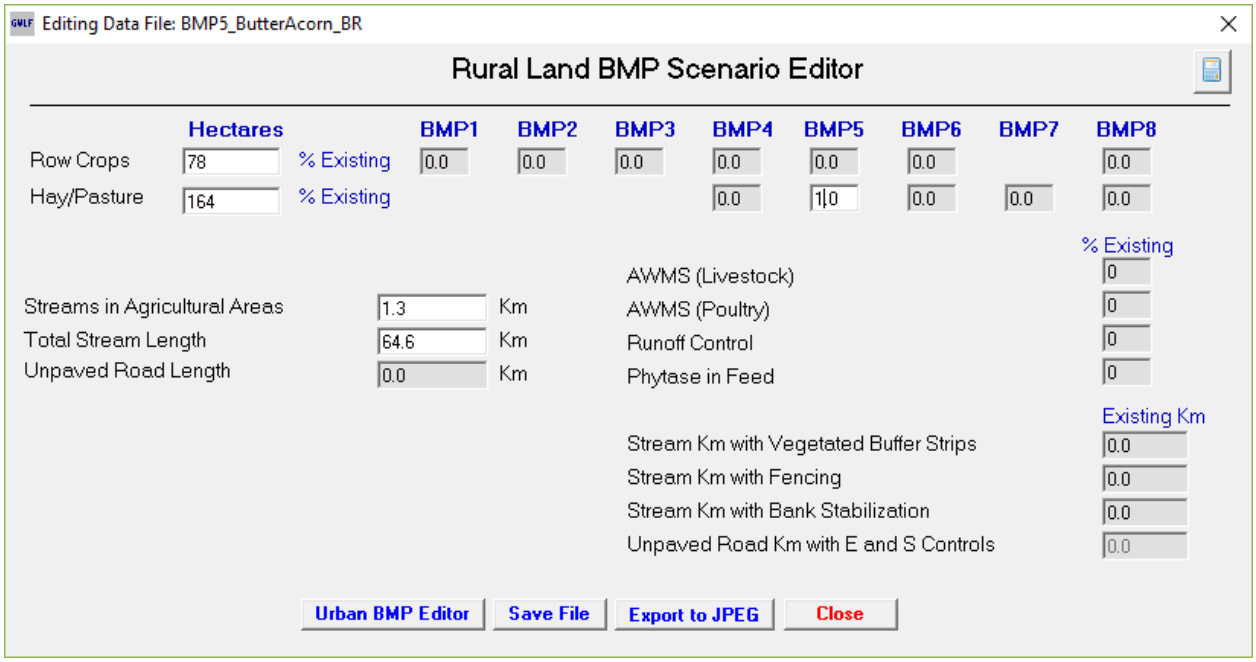
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

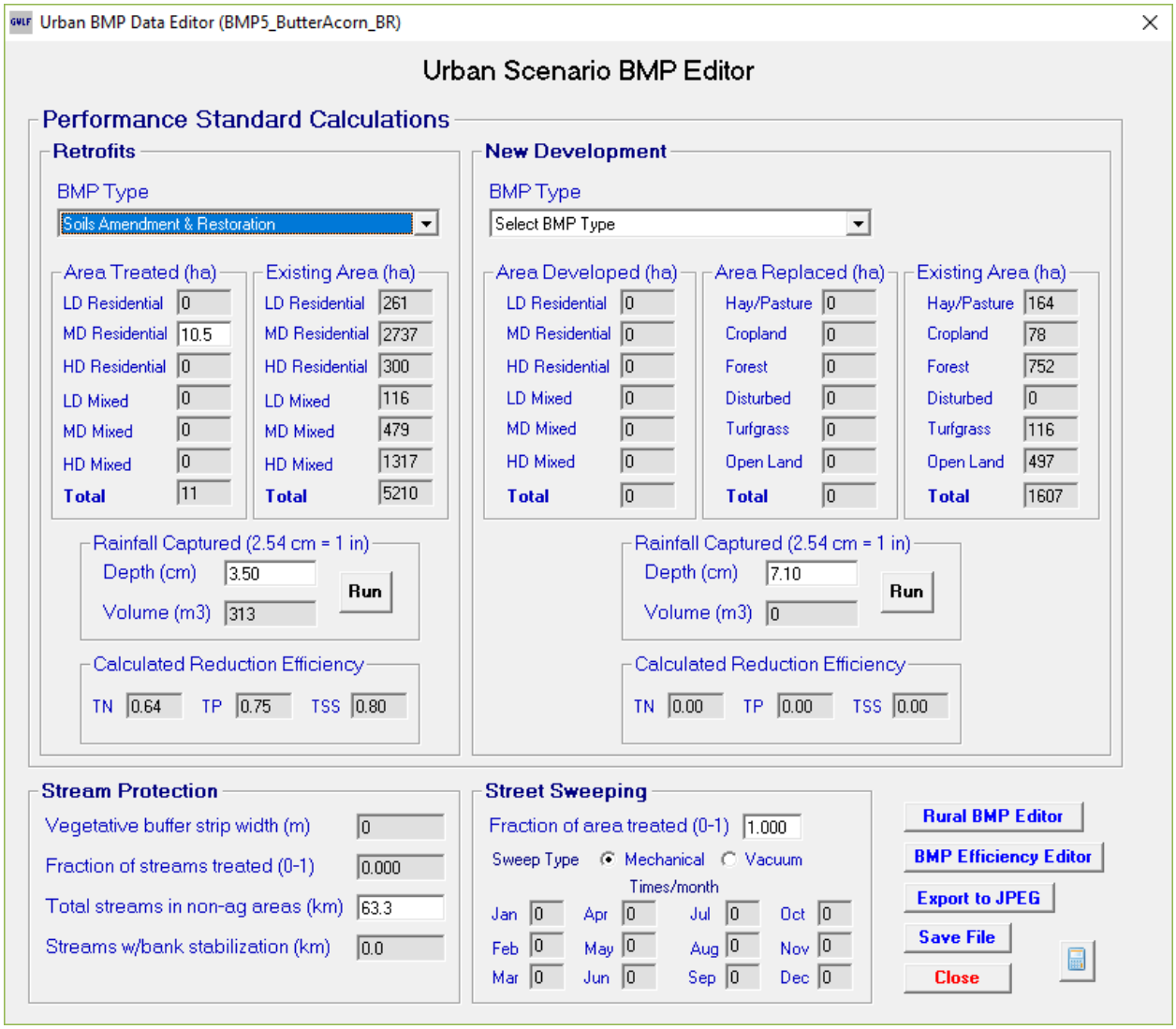
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43783.81	108.10	151.44	0.37	37.41	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14181193.1		7090.1		1818.8	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15349114		54174		4479	

Print | Export to JPEG | Exit

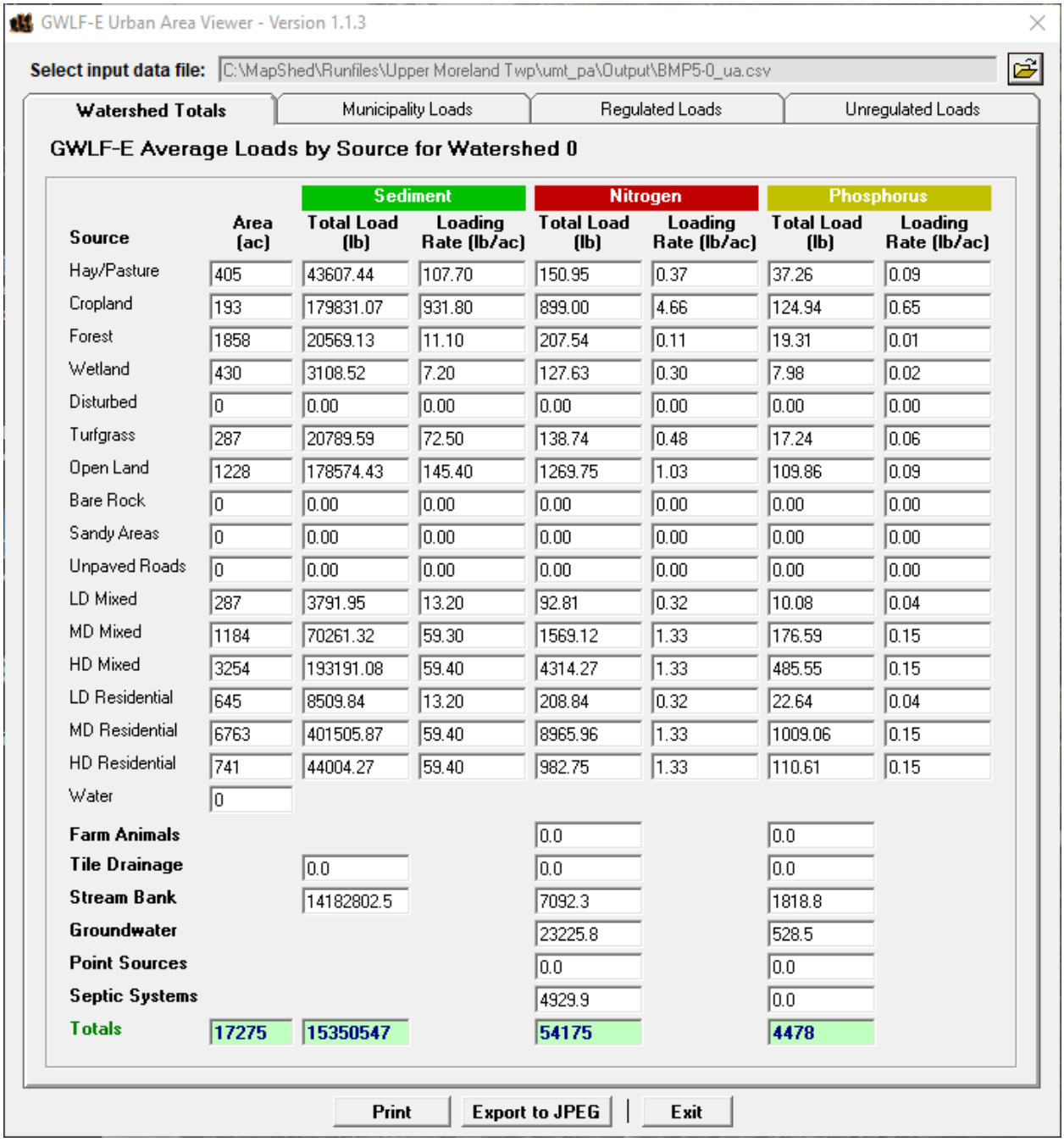
Appendix E-5.1: BMP 5 – Basin Retrofit, Drainage Area Parameters



Appendix E-5.2: BMP 5 - Basin Retrofit, BMP Type & Efficiency

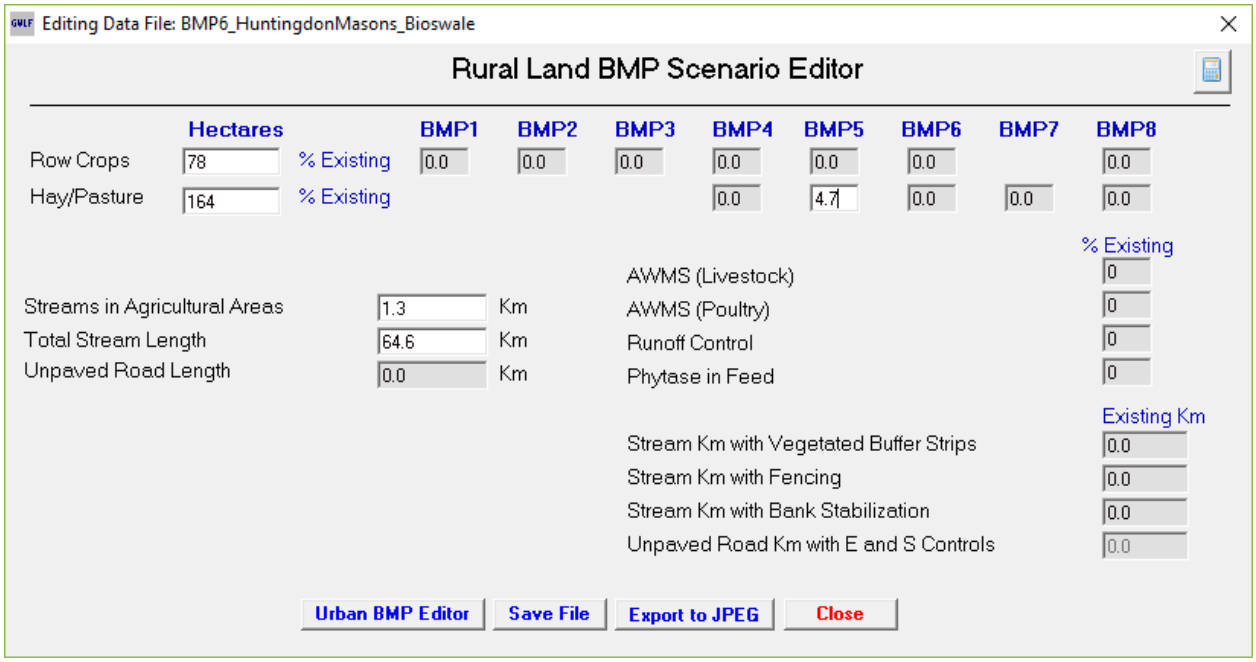


Appendix E-5.3: BMP 5 - Basin Retrofit, Watershed Loading w/ BMP

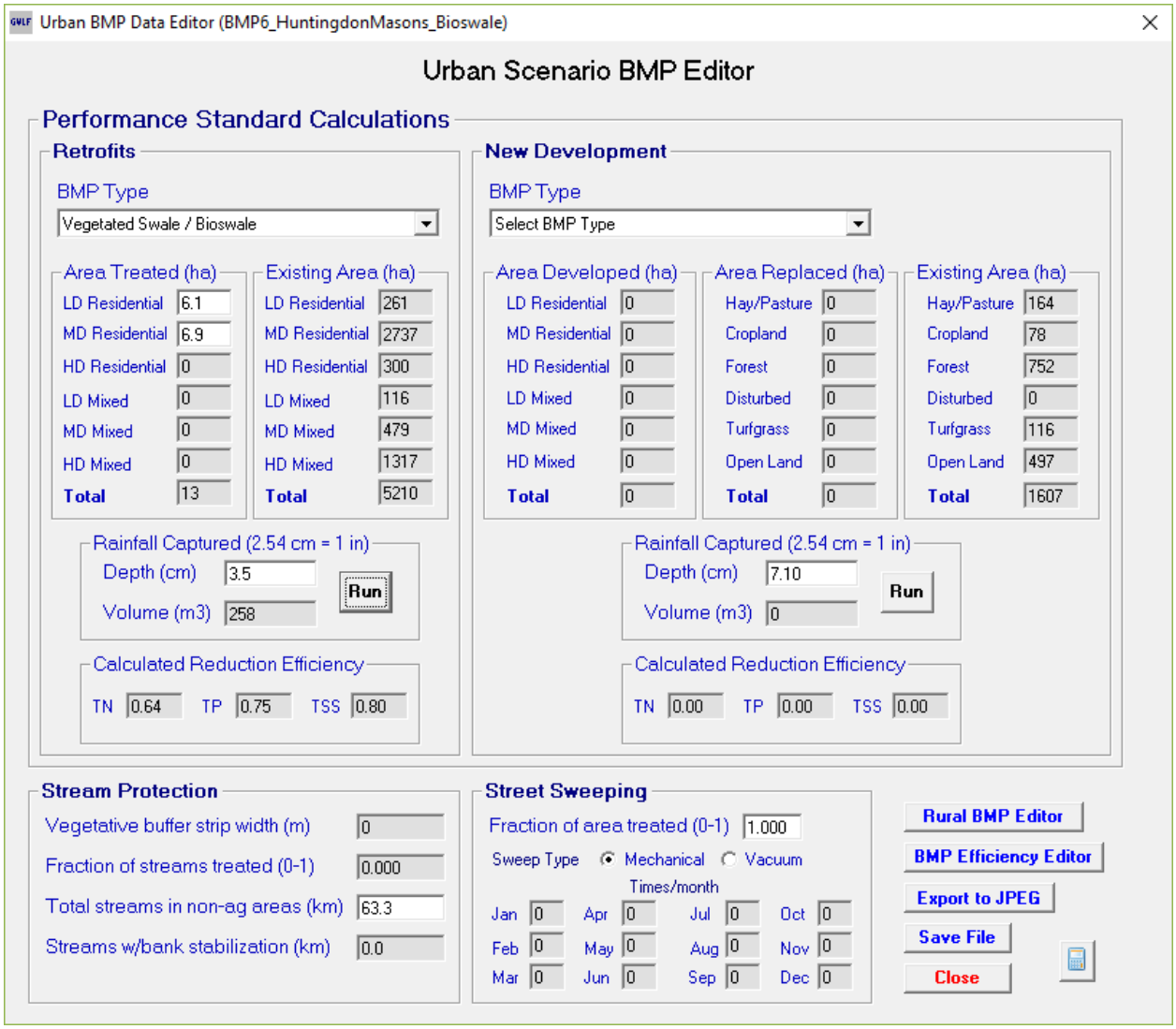


		Sediment		Nitrogen		Phosphorus	
Source	**Area (ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**
Hay/Pasture	405	43607.44	107.70	150.95	0.37	37.26	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14182802.5		7092.3		1818.8	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	**17275**	**15350547**		**54175**		**4478**	

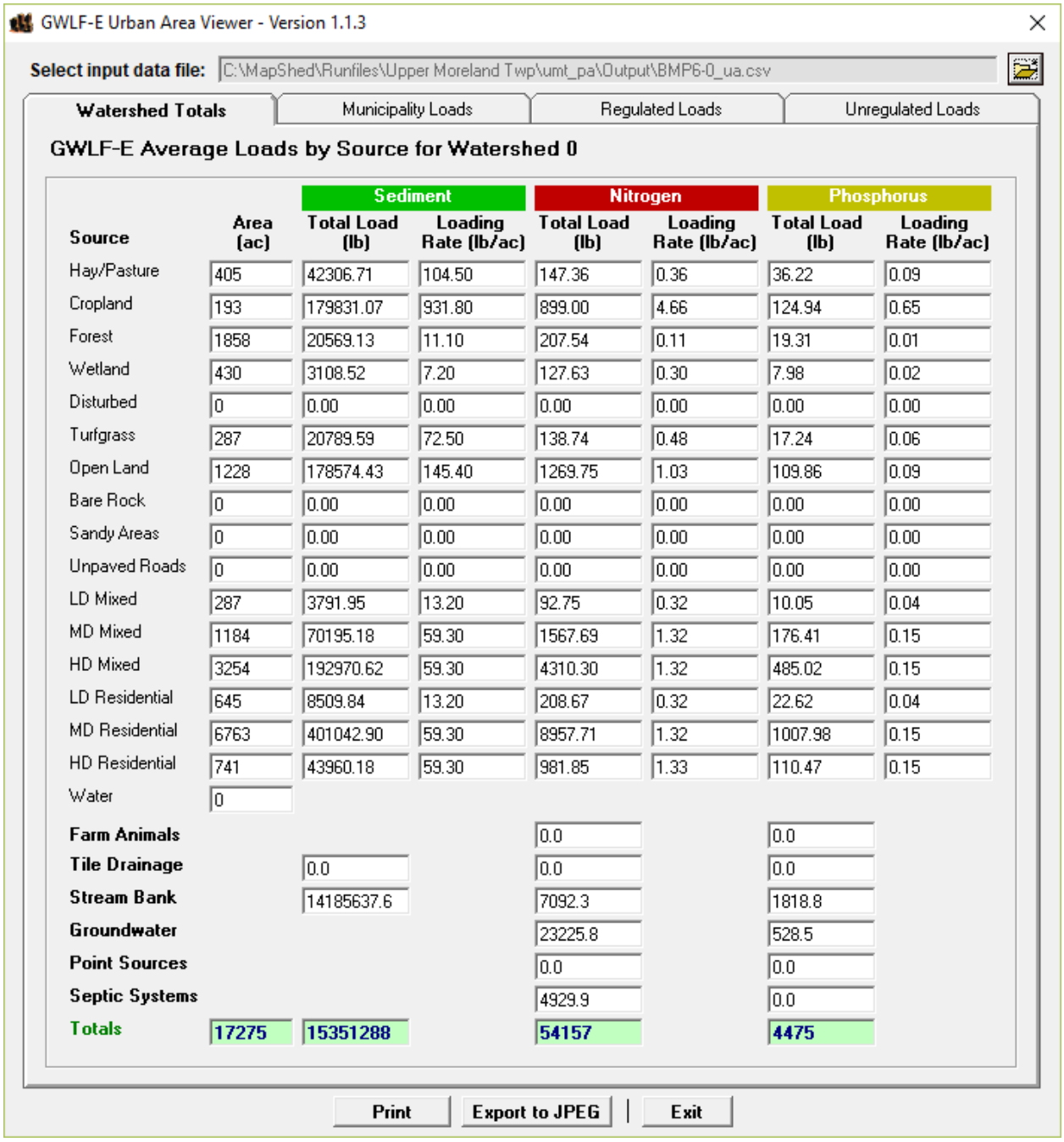
Appendix E-6.1: BMP 6 – Bioswale, Drainage Area Parameters



Appendix E-6.2: BMP 6 - Bioswale, BMP Type & Efficiency



Appendix E-6.3: BMP 6 - Bioswale, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP6-0_ua.csv

Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	42306.71	104.50	147.36	0.36	36.22	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.75	0.32	10.05	0.04
MD Mixed	1184	70195.18	59.30	1567.69	1.32	176.41	0.15
HD Mixed	3254	192970.62	59.30	4310.30	1.32	485.02	0.15
LD Residential	645	8509.84	13.20	208.67	0.32	22.62	0.04
MD Residential	6763	401042.90	59.30	8957.71	1.32	1007.98	0.15
HD Residential	741	43960.18	59.30	981.85	1.33	110.47	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14185637.6		7092.3		1818.8	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15351288		54157		4475	

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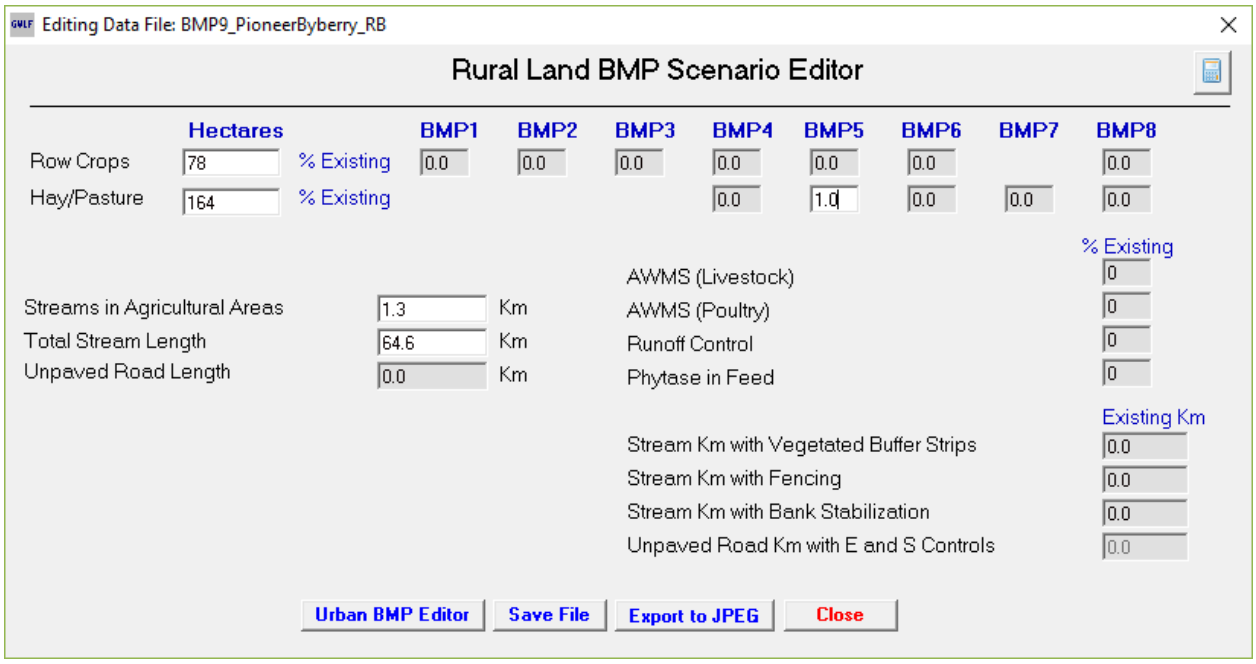
Appendix E-7.1: BMP 7 – Streambank Stabilization

Streambank Restoration	
Streambank Length (ft)	500
TSS Removal Rate (lbs/ft/yr)	115
Potential Reduction (lbs)	57,500

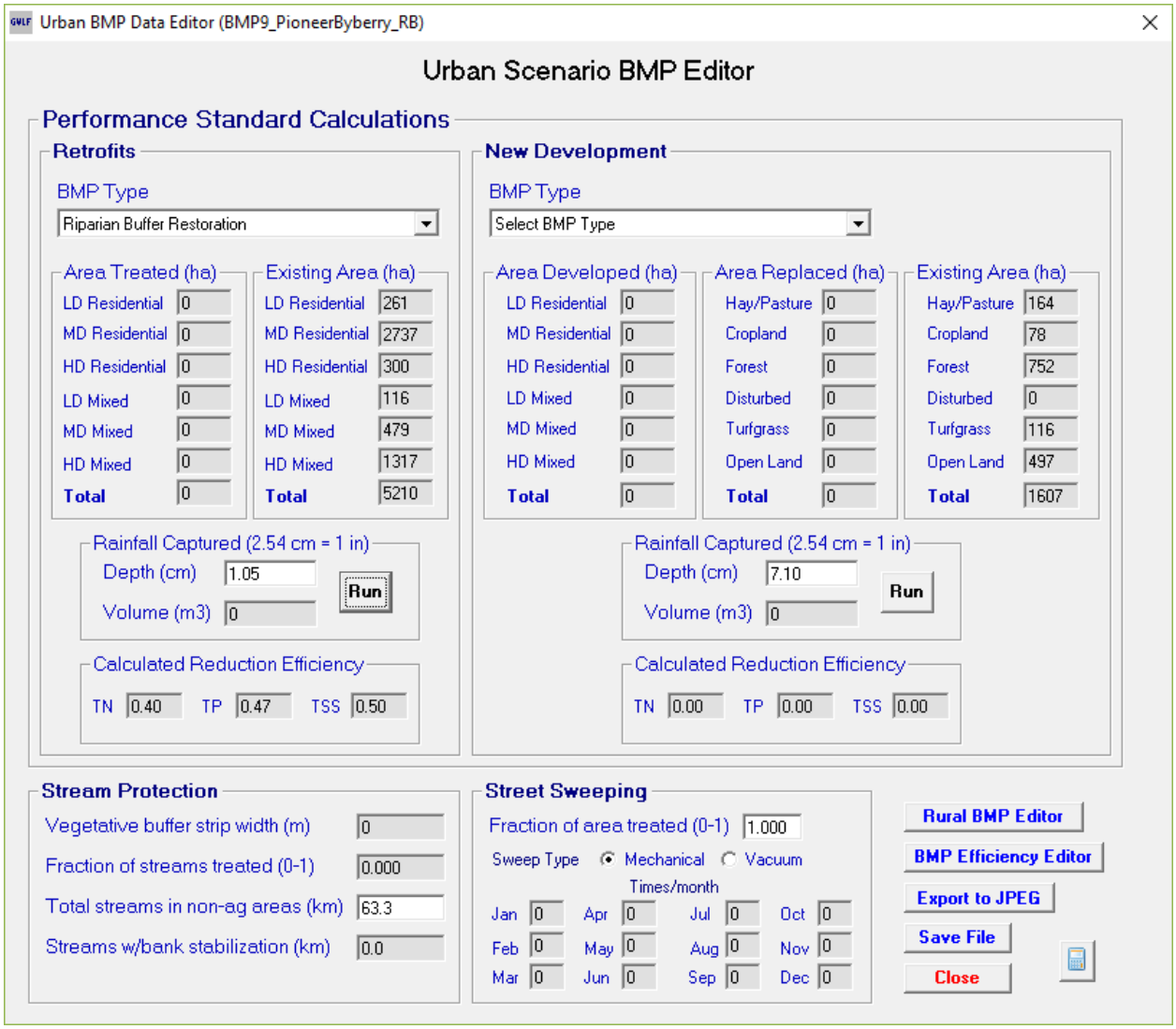
Appendix E-8.1: BMP 8 – Streambank Stabilization

Streambank Restoration	
Streambank Length (ft)	500
TSS Removal Rate (lbs/ft/yr)	115
Potential Reduction (lbs)	57,500

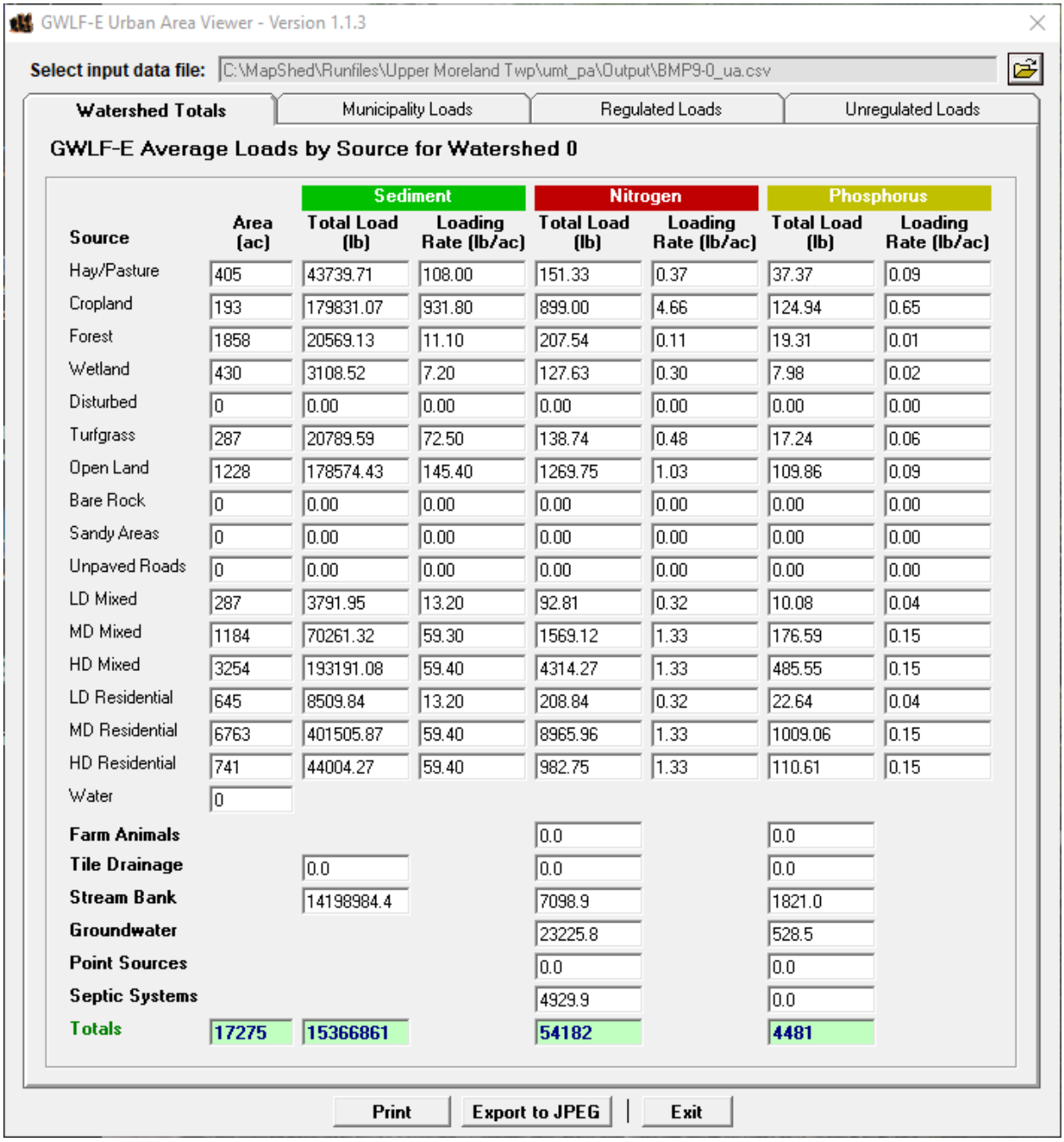
Appendix E-9.1: BMP 9 – Riparian Buffer, Drainage Area Parameters



Appendix E-9.2: BMP 9 – Riparian Buffer, BMP Type & Efficiency



Appendix E-9.3: BMP 9 – Riparian Buffer, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP9-0_ua.csv

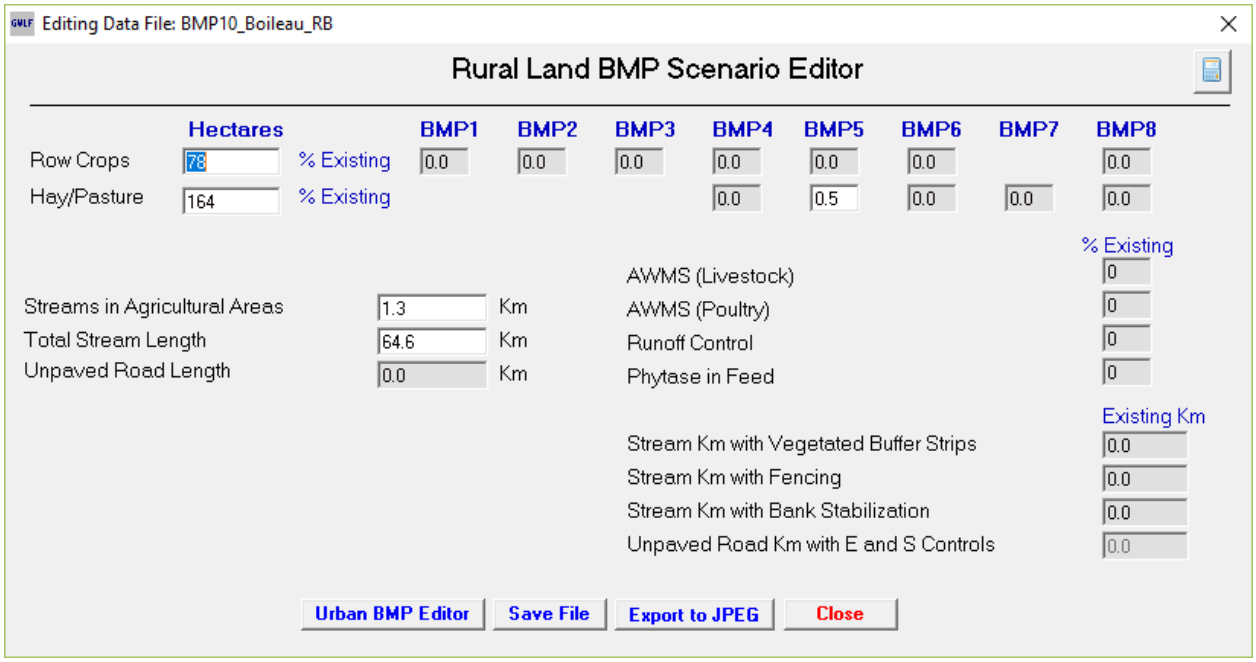
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

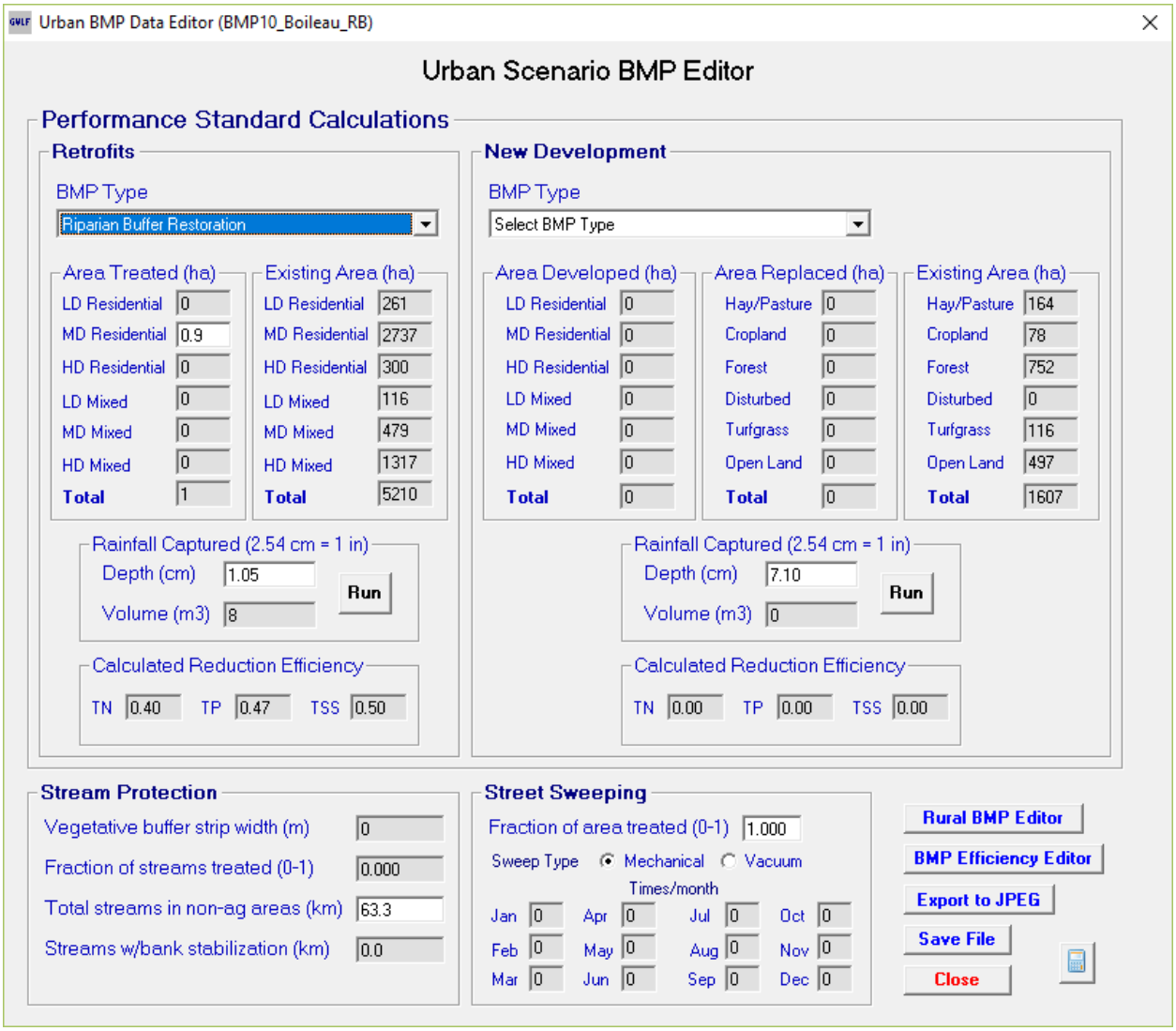
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43739.71	108.00	151.33	0.37	37.37	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14198984.4		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15366861		54182		4481	

Print | Export to JPEG | Exit

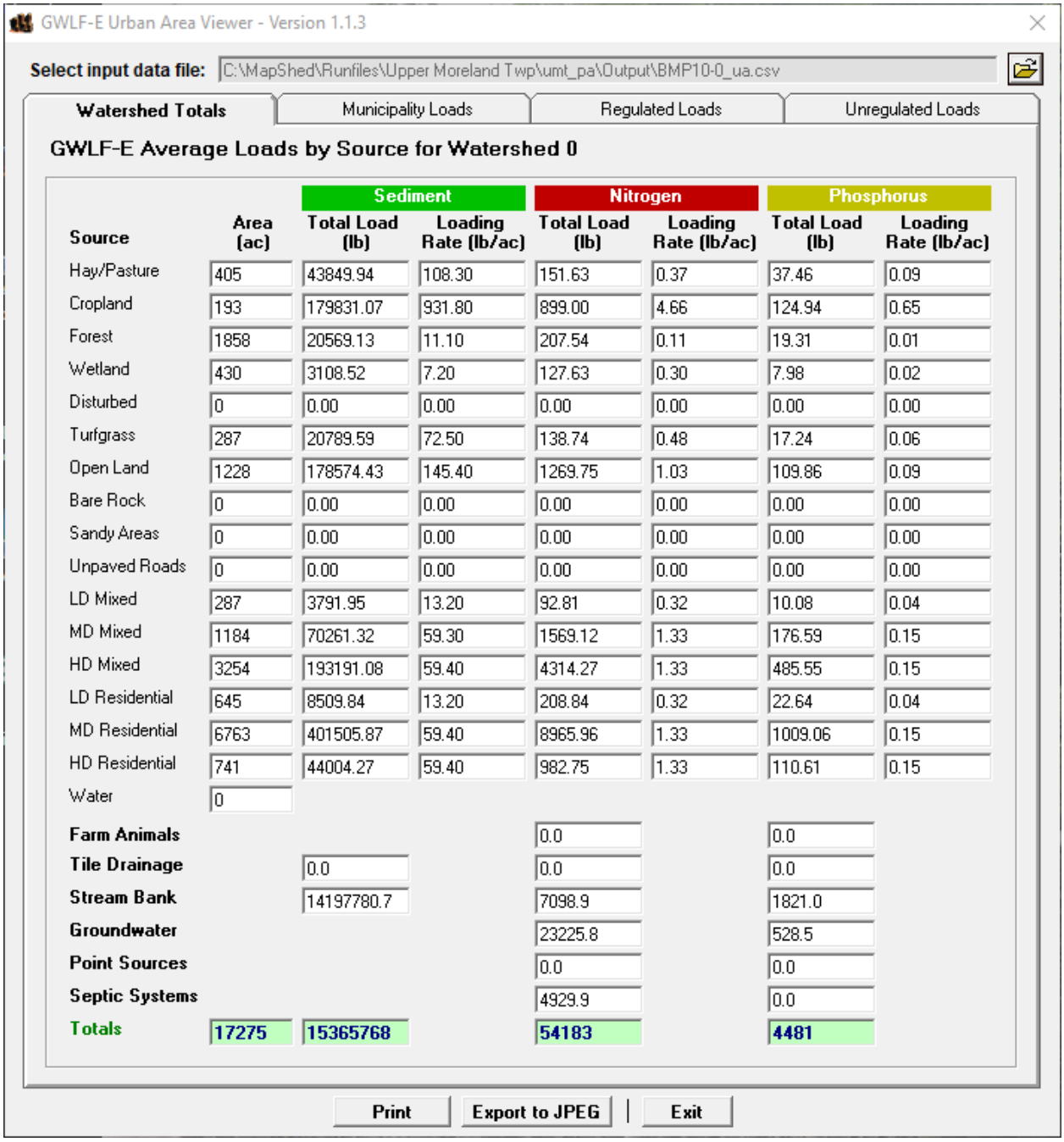
Appendix E-10.1: BMP 10 – Riparian Buffer, Drainage Area Parameters



Appendix E-10.2: BMP 10 - Riparian Buffer, BMP Type & Efficiency

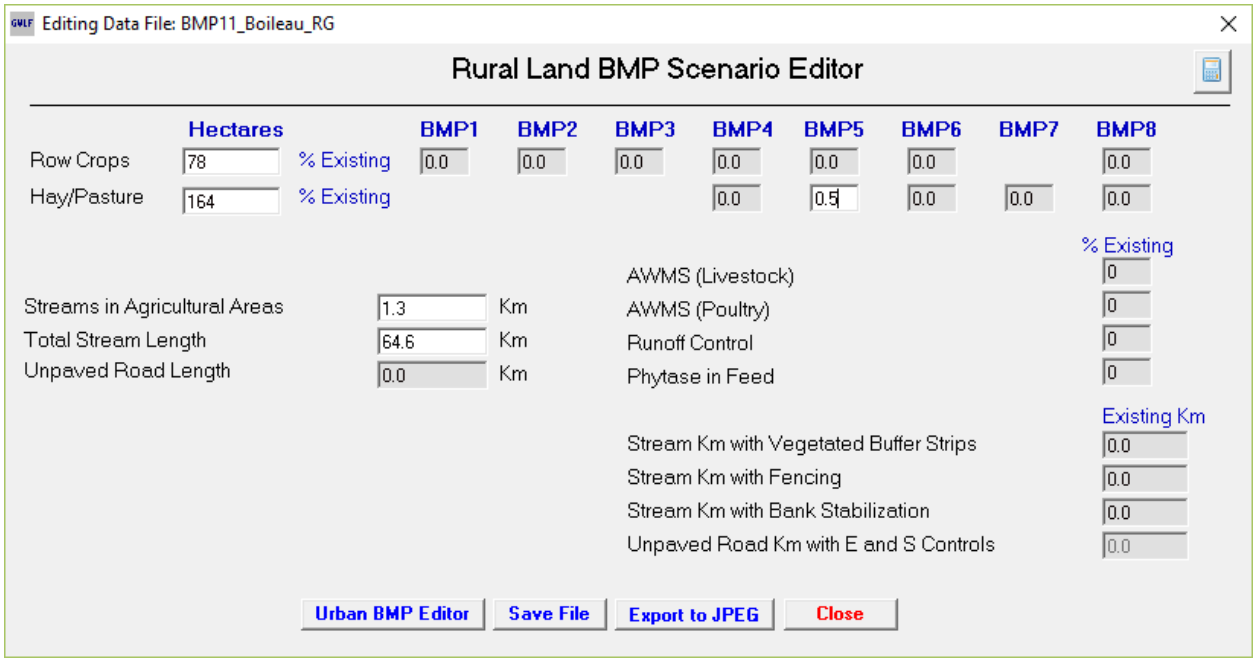


Appendix E-10.3: BMP 10 - Riparian Buffer, Watershed Loading w/ BMP

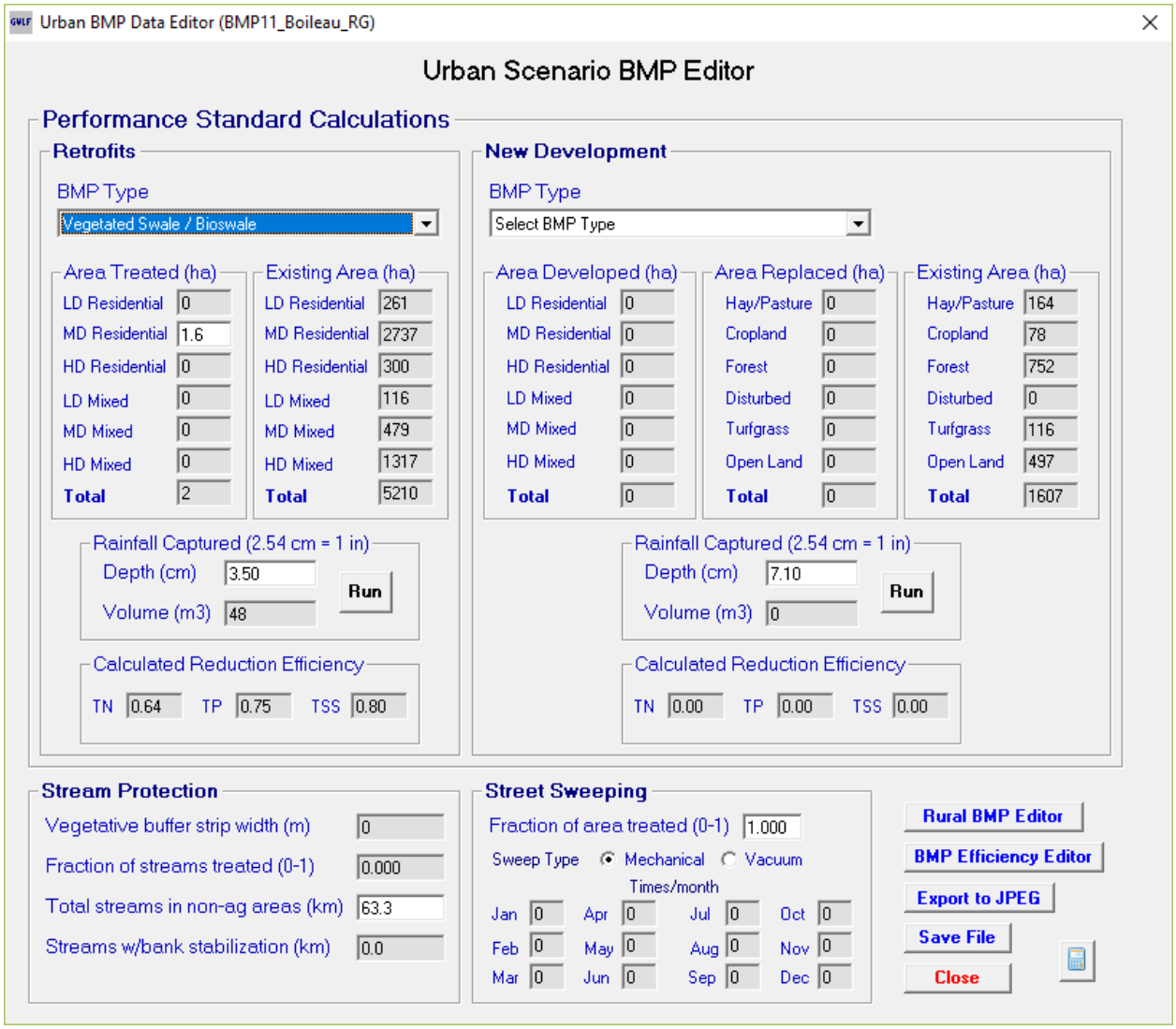


		Sediment		Nitrogen		Phosphorus	
Source	**Area (ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**
Hay/Pasture	405	43849.94	108.30	151.63	0.37	37.46	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14197780.7		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	**17275**	**15365768**		**54183**		**4481**	

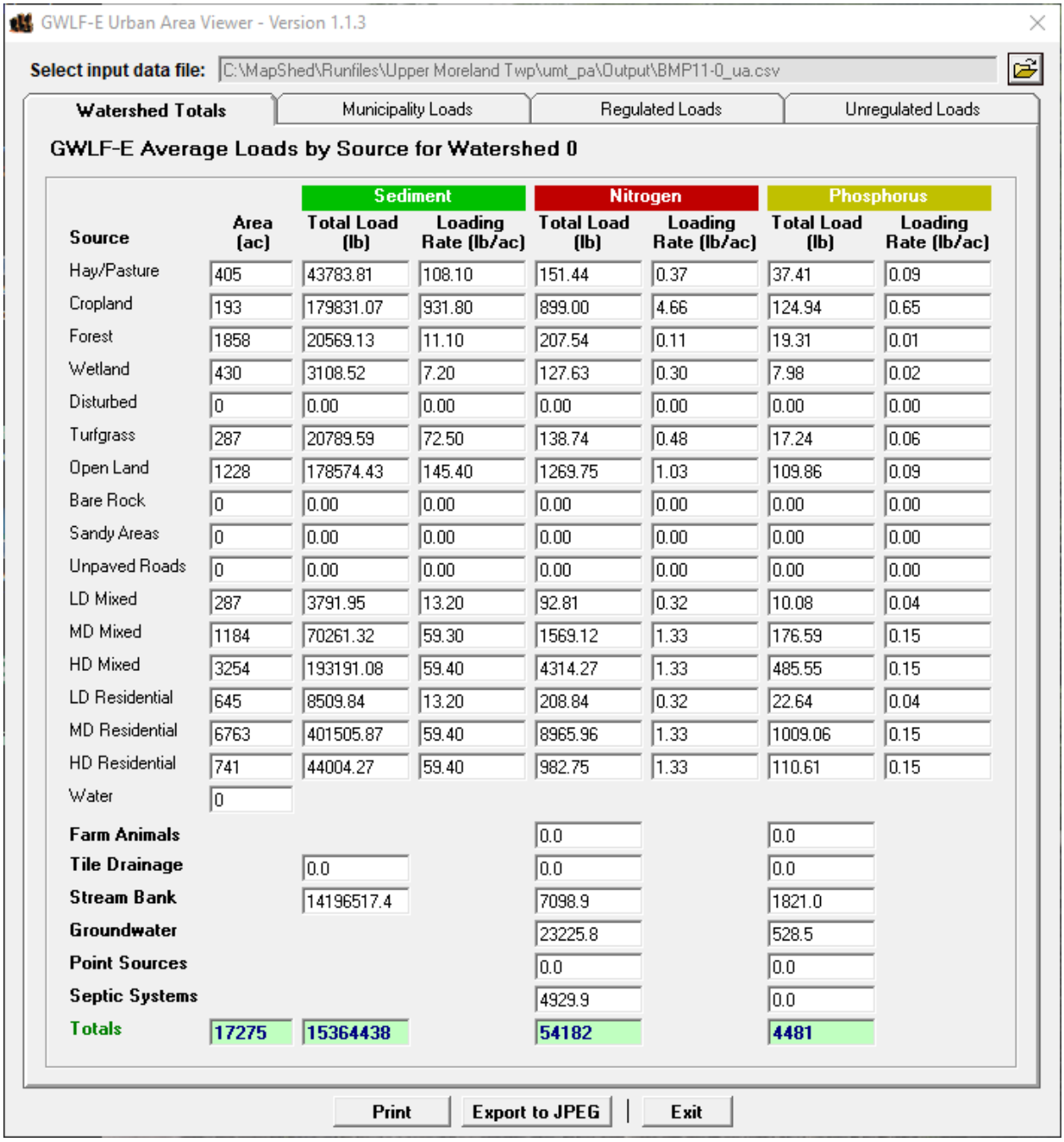
Appendix E-11.1: BMP 11 – Bioswale, Drainage Area Parameters



Appendix E-11.2: BMP 11 - Bioswale, BMP Type & Efficiency



Appendix E-11.3: BMP 11 - Bioswale, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP11-0_ua.csv

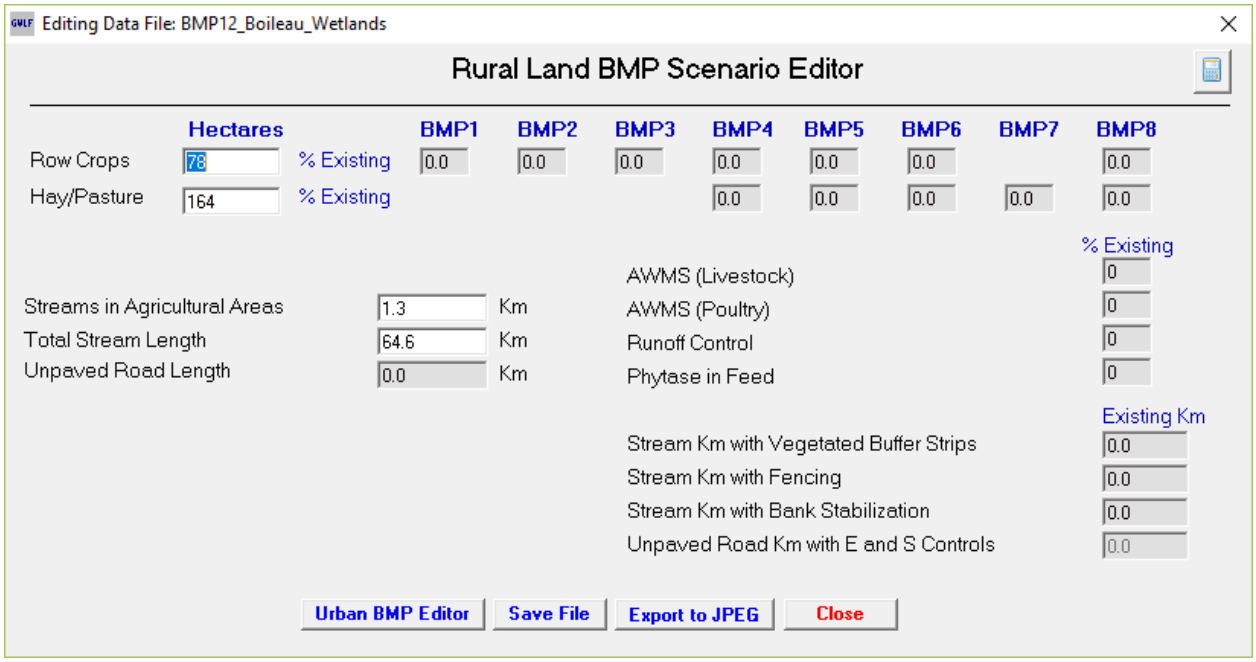
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

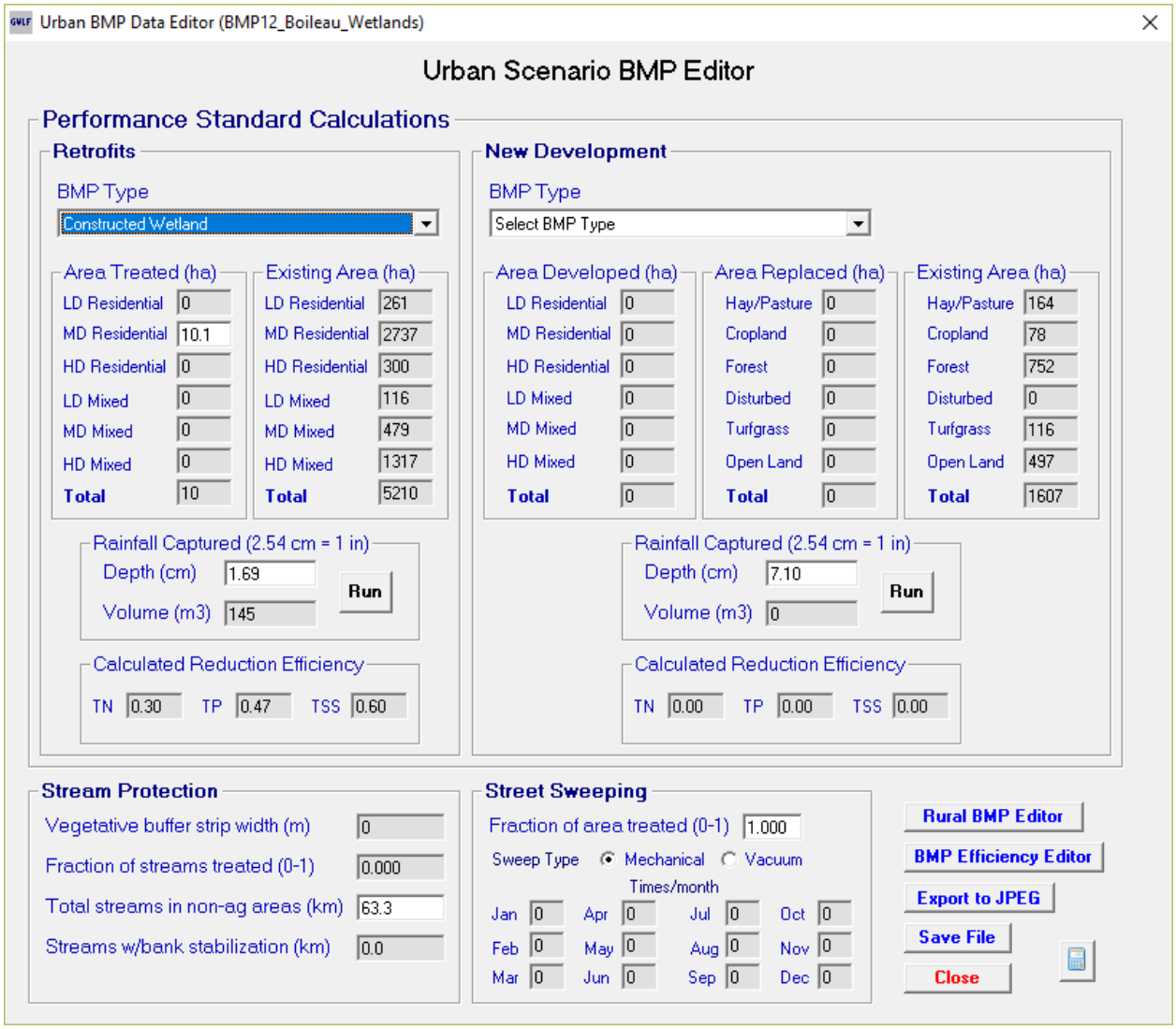
Source	Area (ac)	Sediment Total Load (lb)	Sediment Loading Rate (lb/ac)	Nitrogen Total Load (lb)	Nitrogen Loading Rate (lb/ac)	Phosphorus Total Load (lb)	Phosphorus Loading Rate (lb/ac)
Hay/Pasture	405	43783.81	108.10	151.44	0.37	37.41	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14196517.4		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15364438		54182		4481	

Print | Export to JPEG | Exit

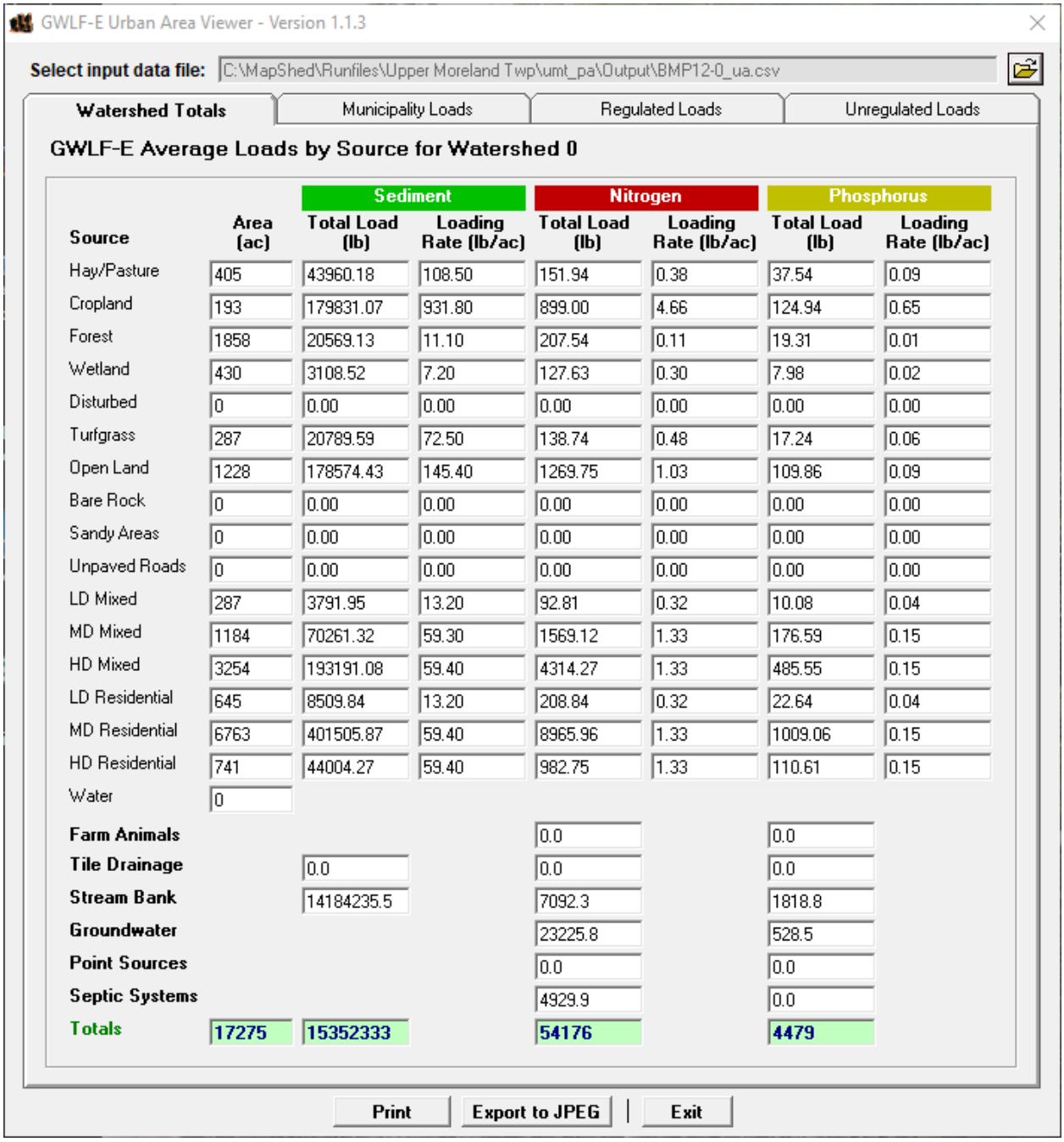
Appendix E-12.1: BMP 12 – Constructed Wetlands, Drainage Area Parameters



Appendix E-12.2: BMP 12 - Constructed Wetlands, BMP Type & Efficiency



Appendix E-12.3: BMP 12 - Constructed Wetlands, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP12-0_ua.csv

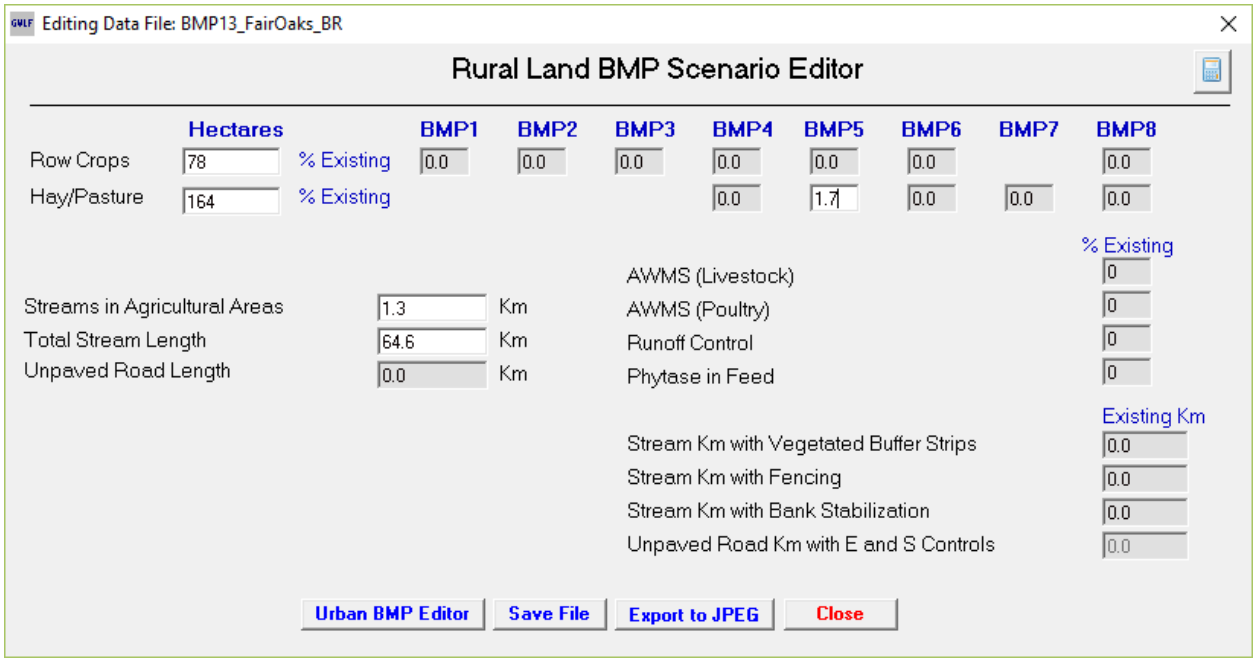
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

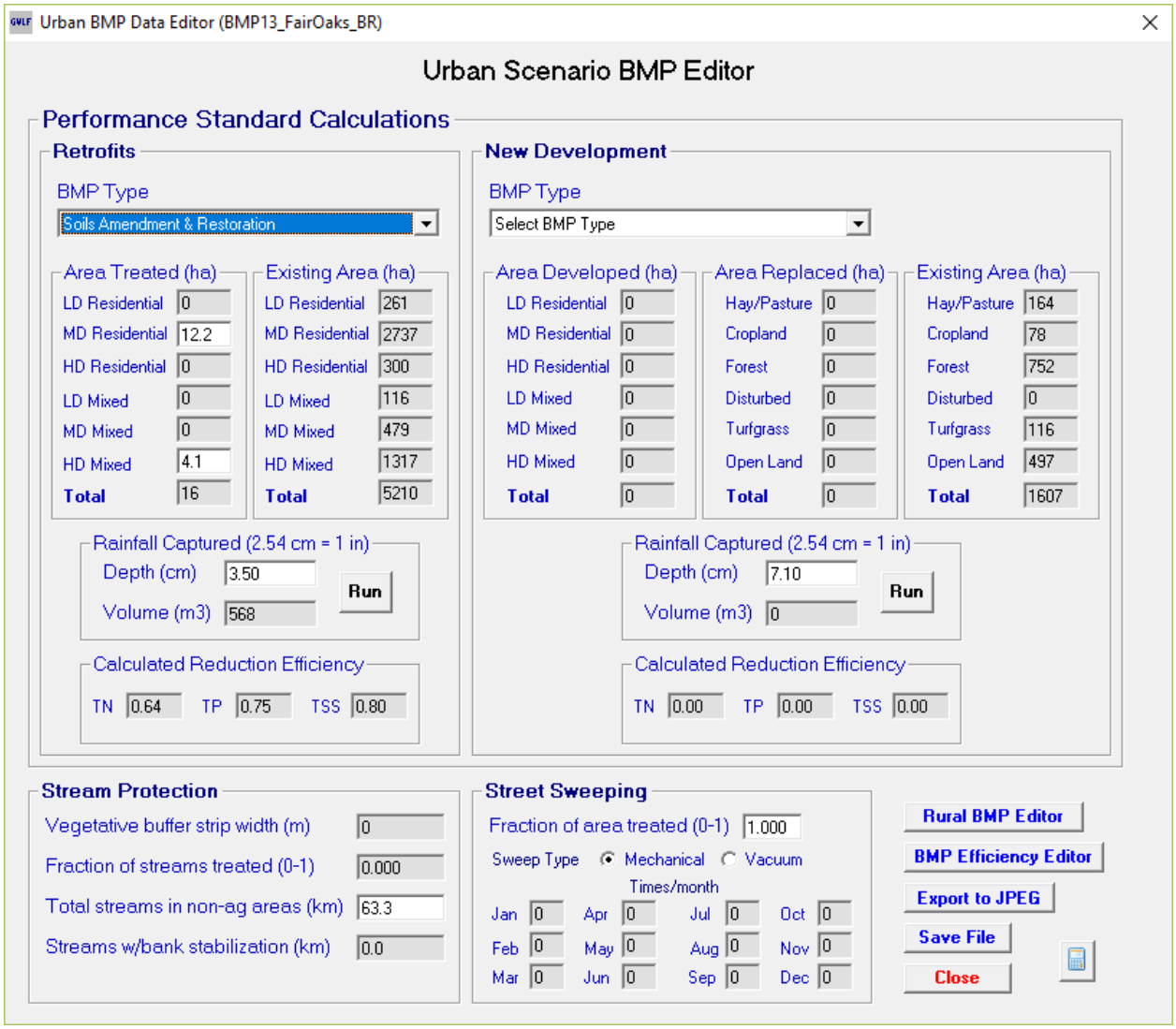
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14184235.5		7092.3		1818.8	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15352333		54176		4479	

Print | Export to JPEG | Exit

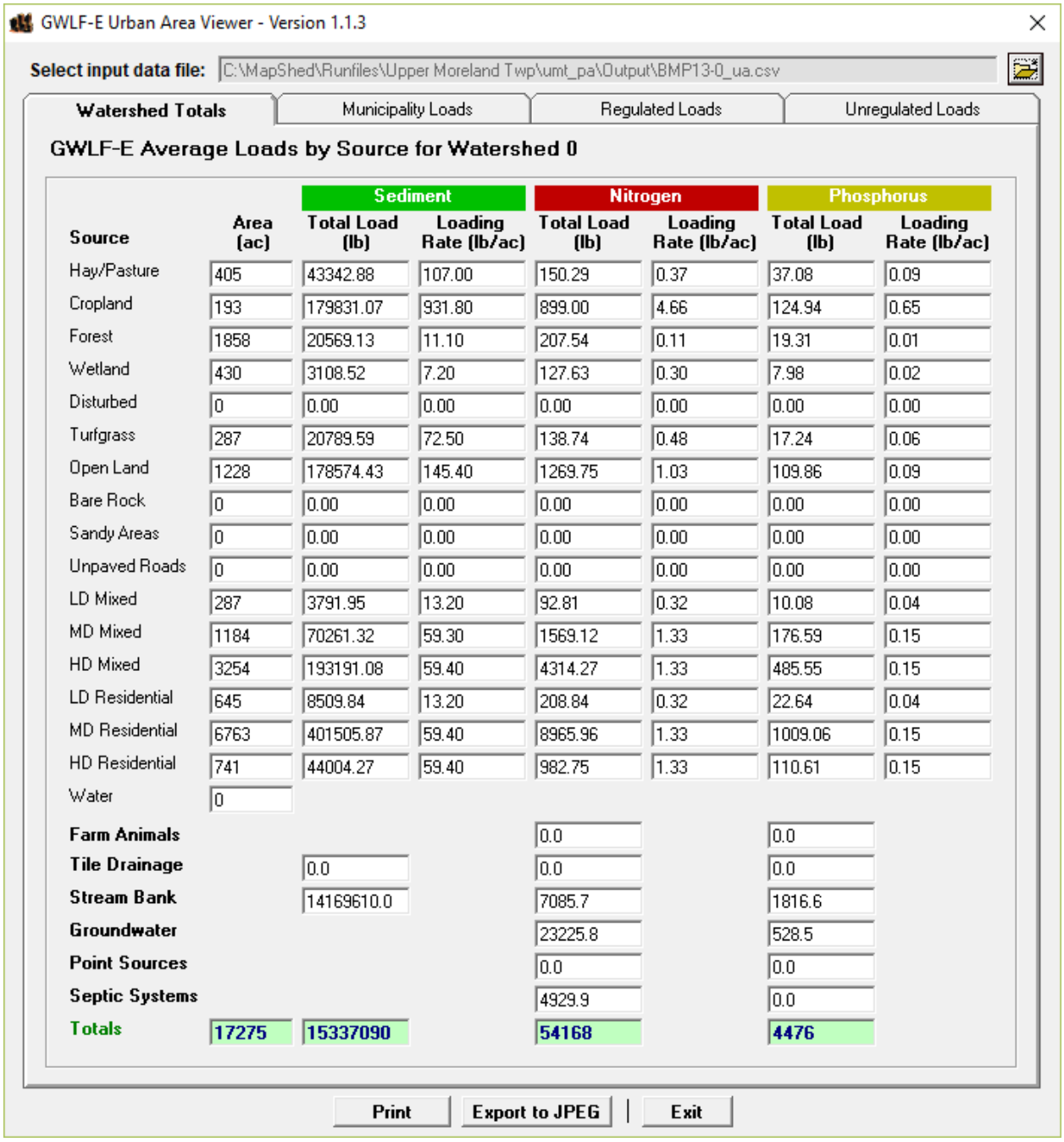
Appendix E-13.1: BMP 13 – New Basin, Drainage Area Parameters



Appendix E-13.2: BMP 13 - New Basin, BMP Type & Efficiency



Appendix E-13.3: BMP 13 - New Basin, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP13-0_ua.csv

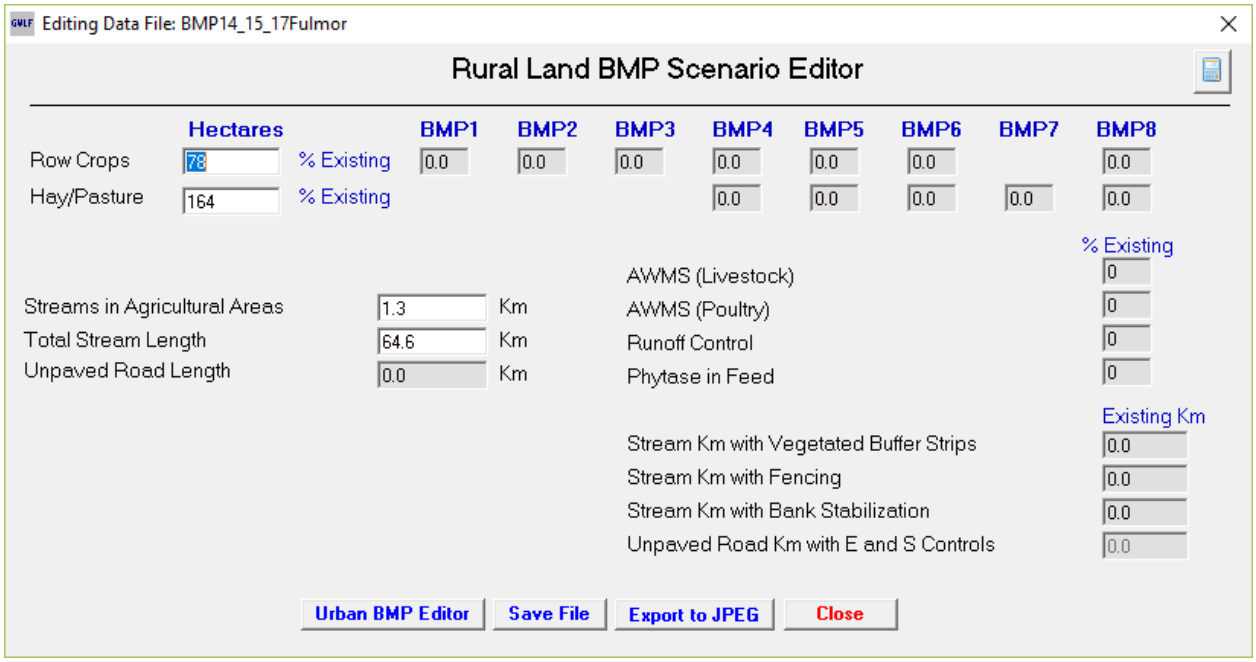
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

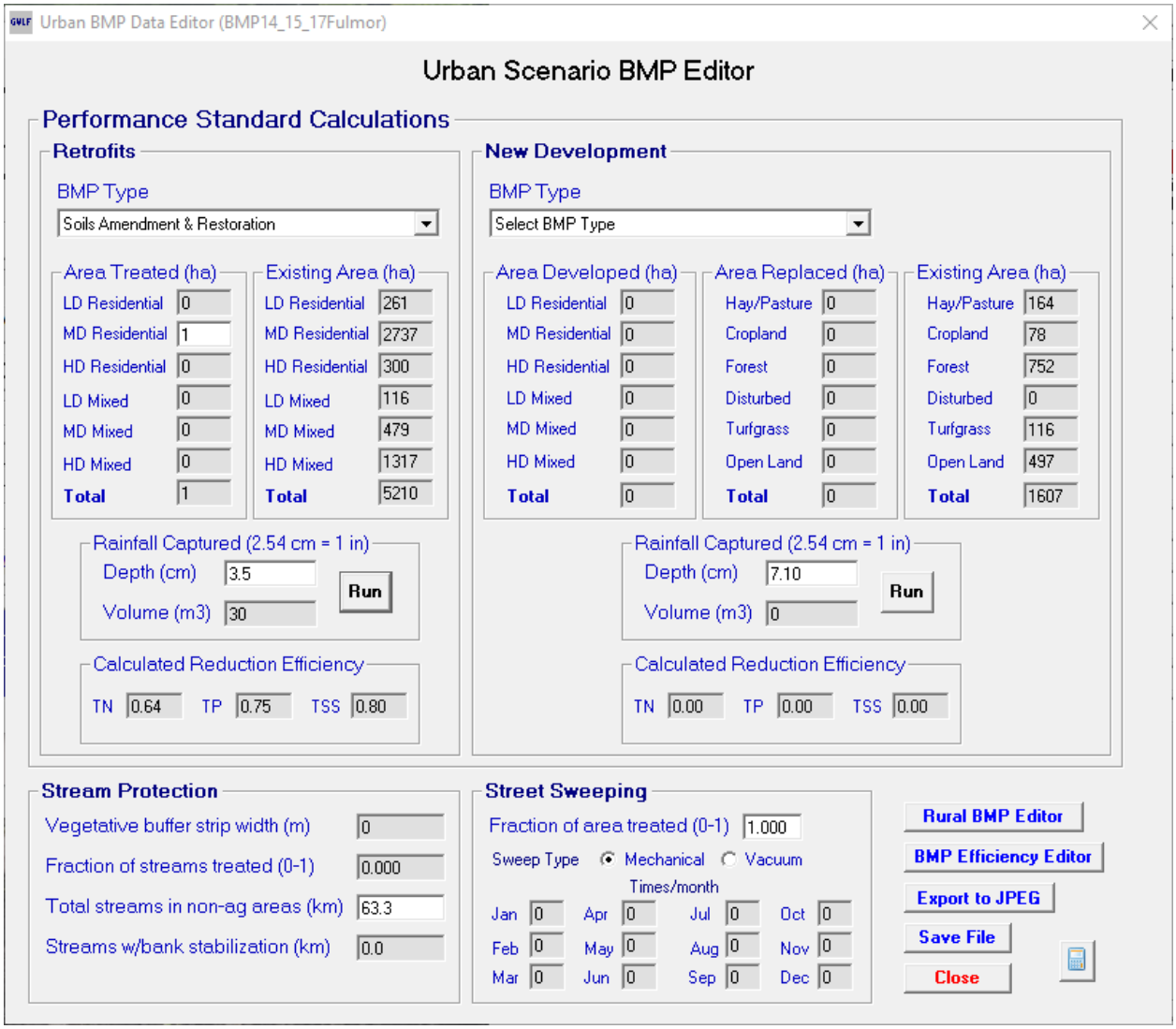
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43342.88	107.00	150.29	0.37	37.08	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14169610.0		7085.7		1816.6	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15337090		54168		4476	

Print | Export to JPEG | Exit

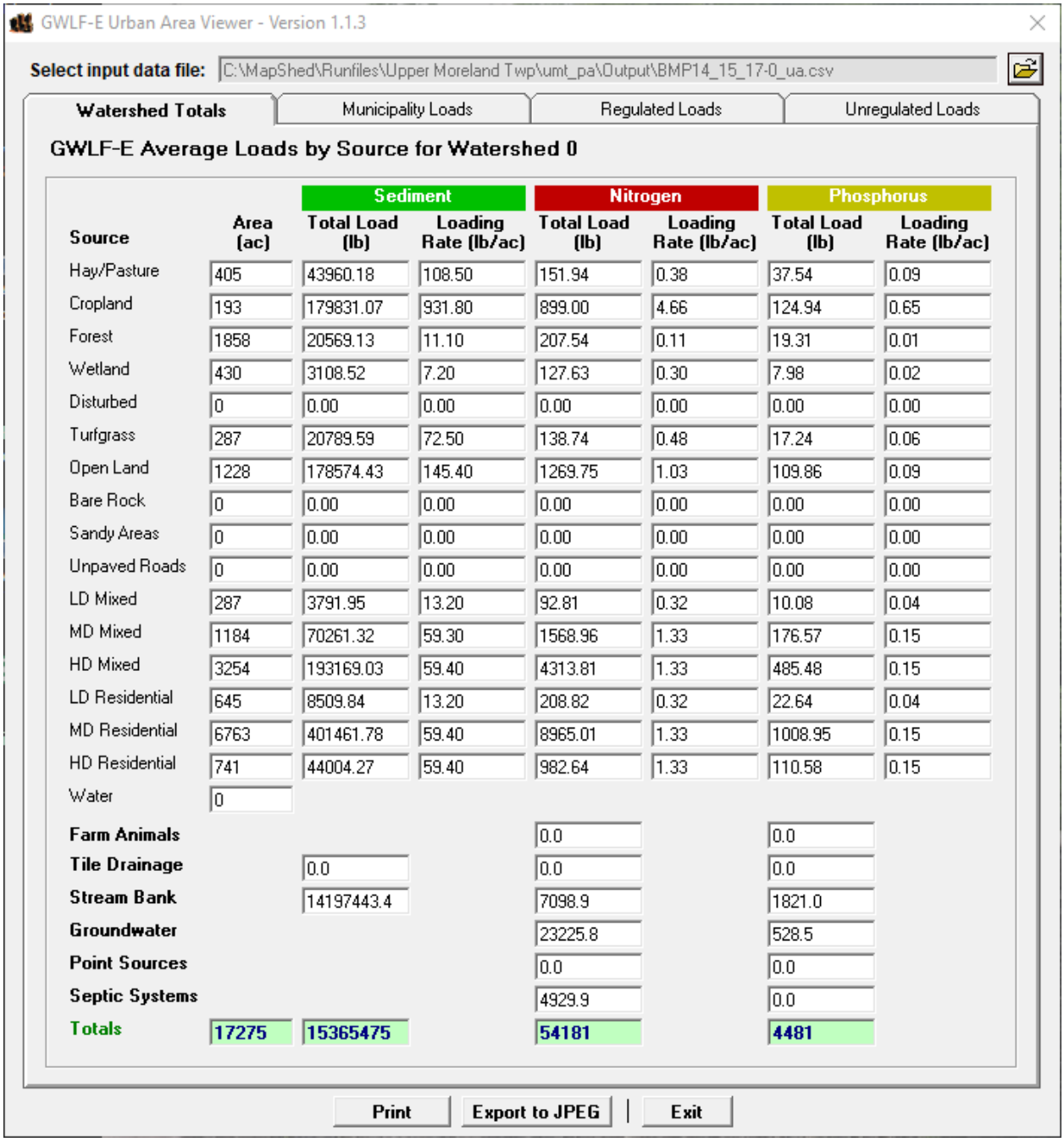
Appendix E-14.1: BMP 14, 15, 17 – Fulmor Heights, Drainage Area Parameters



Appendix E-14.2: BMP 14, 15, 17 – Fulmor Heights, BMP Type & Efficiency



Appendix E-14.3: BMP 14, 15, 17 – Fulmor Heights, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP14_15_17-0_ua.csv

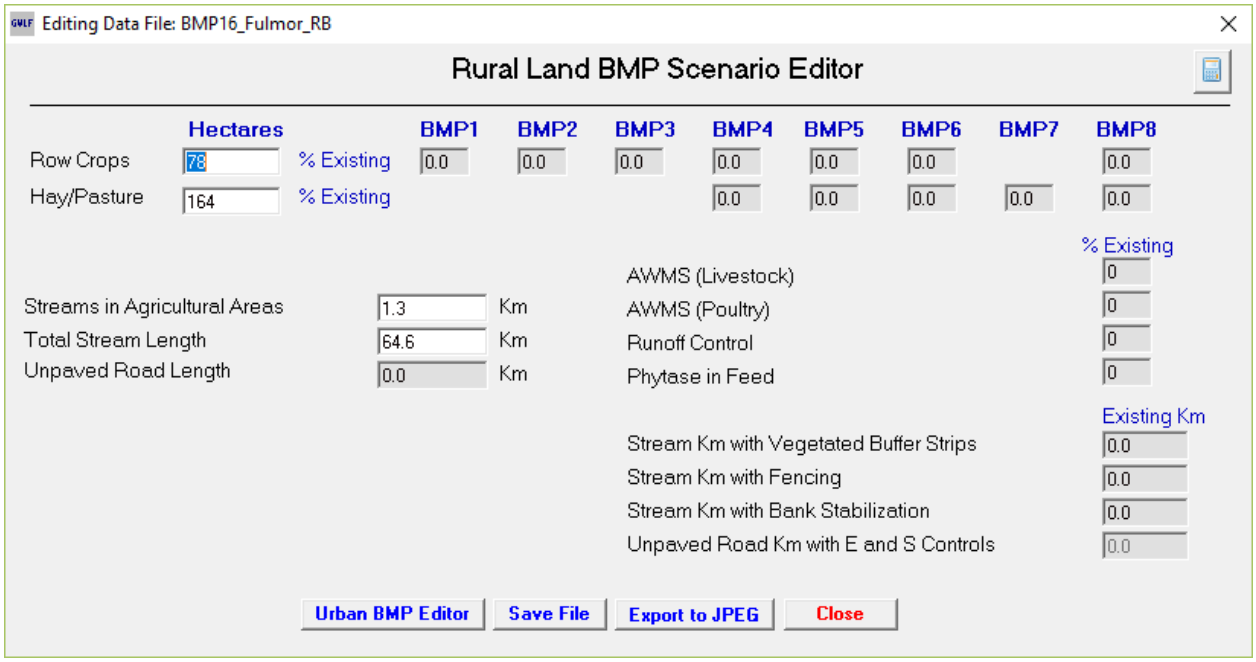
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

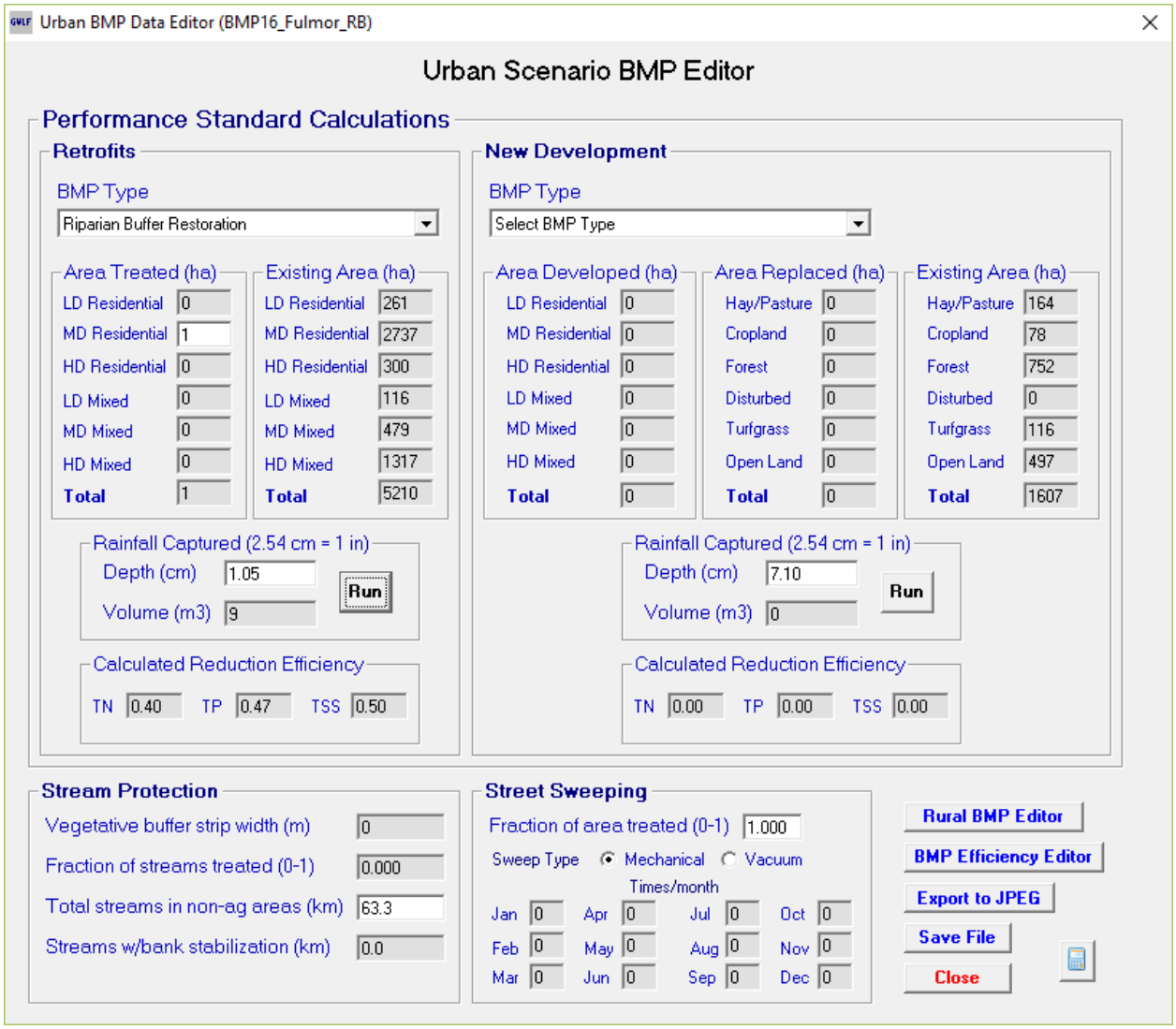
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1568.96	1.33	176.57	0.15
HD Mixed	3254	193169.03	59.40	4313.81	1.33	485.48	0.15
LD Residential	645	8509.84	13.20	208.82	0.32	22.64	0.04
MD Residential	6763	401461.78	59.40	8965.01	1.33	1008.95	0.15
HD Residential	741	44004.27	59.40	982.64	1.33	110.58	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14197443.4		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15365475		54181		4481	

Print | Export to JPEG | Exit

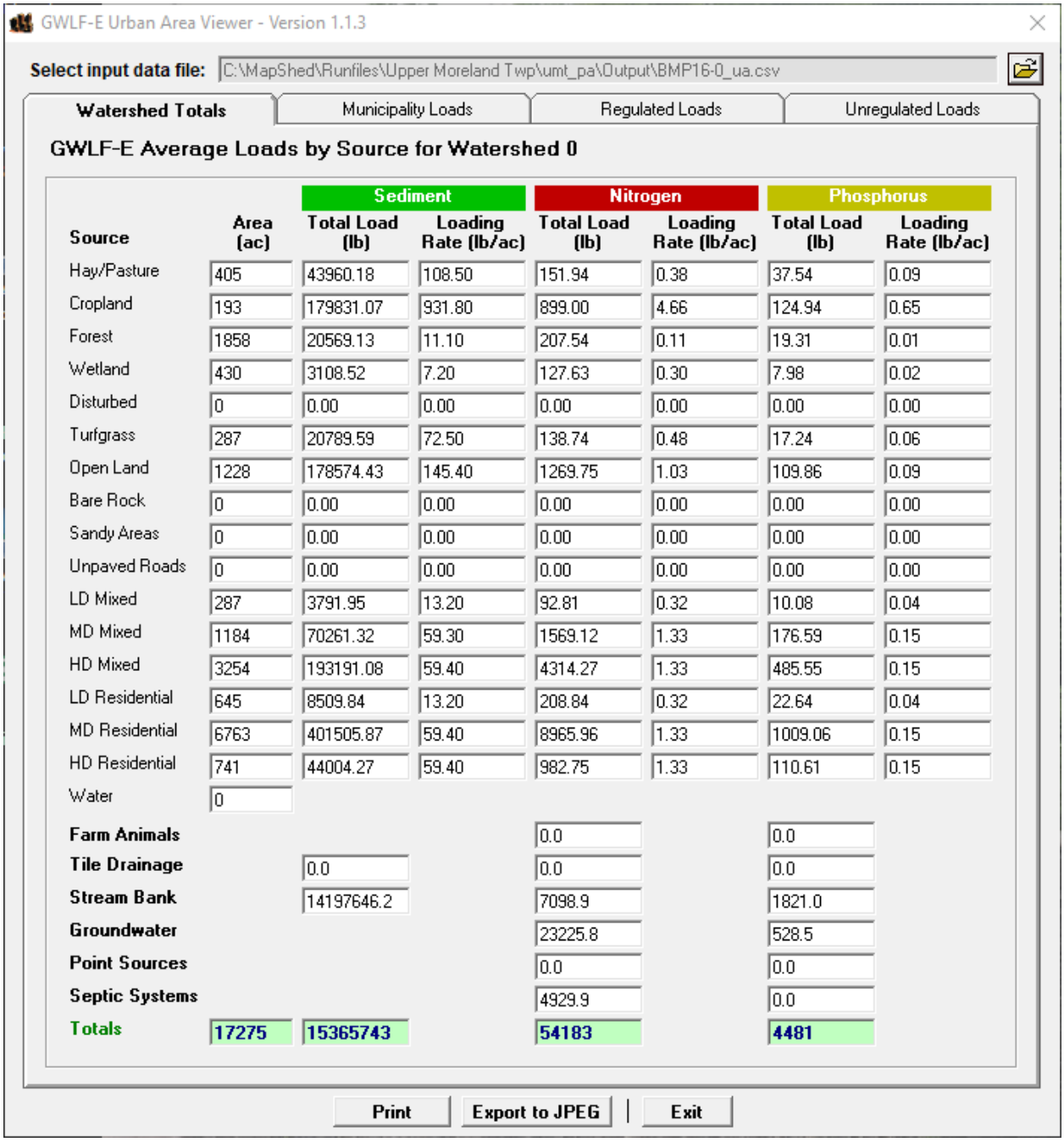
Appendix E-16.1: BMP 16 – Riparian Buffer, Drainage Area Parameters



Appendix E-16.2: BMP 16 - Riparian Buffer, BMP Type & Efficiency

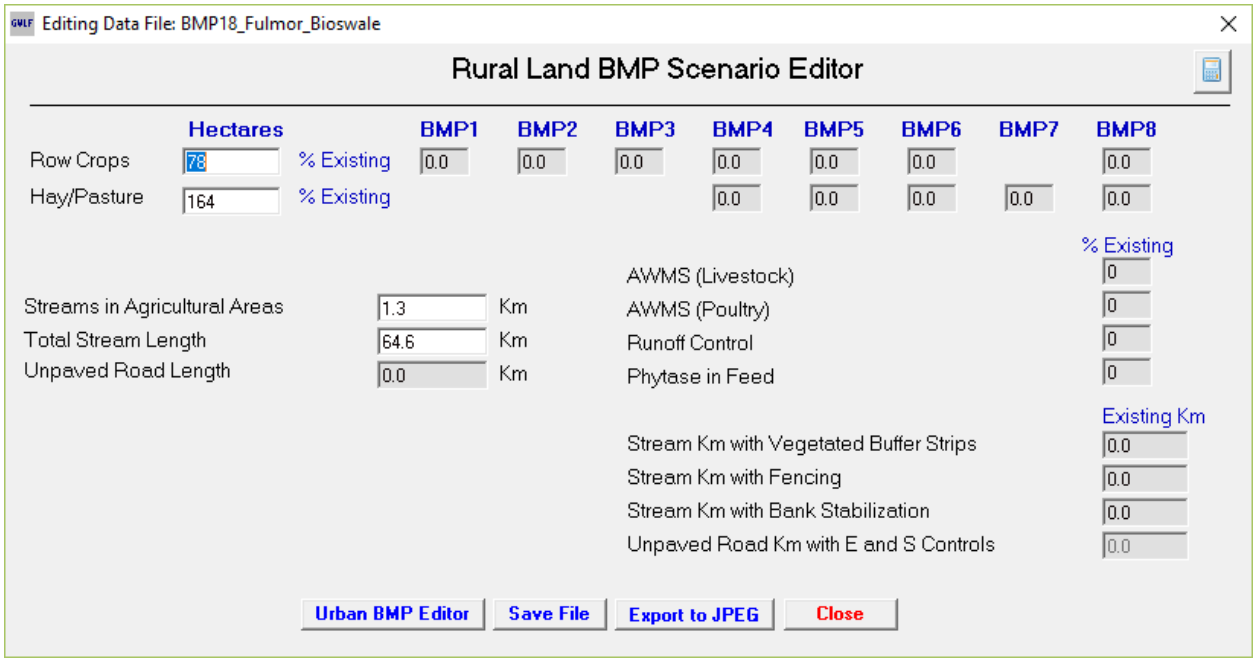


Appendix E-16.3: BMP 16 - Riparian Buffer, Watershed Loading w/ BMP

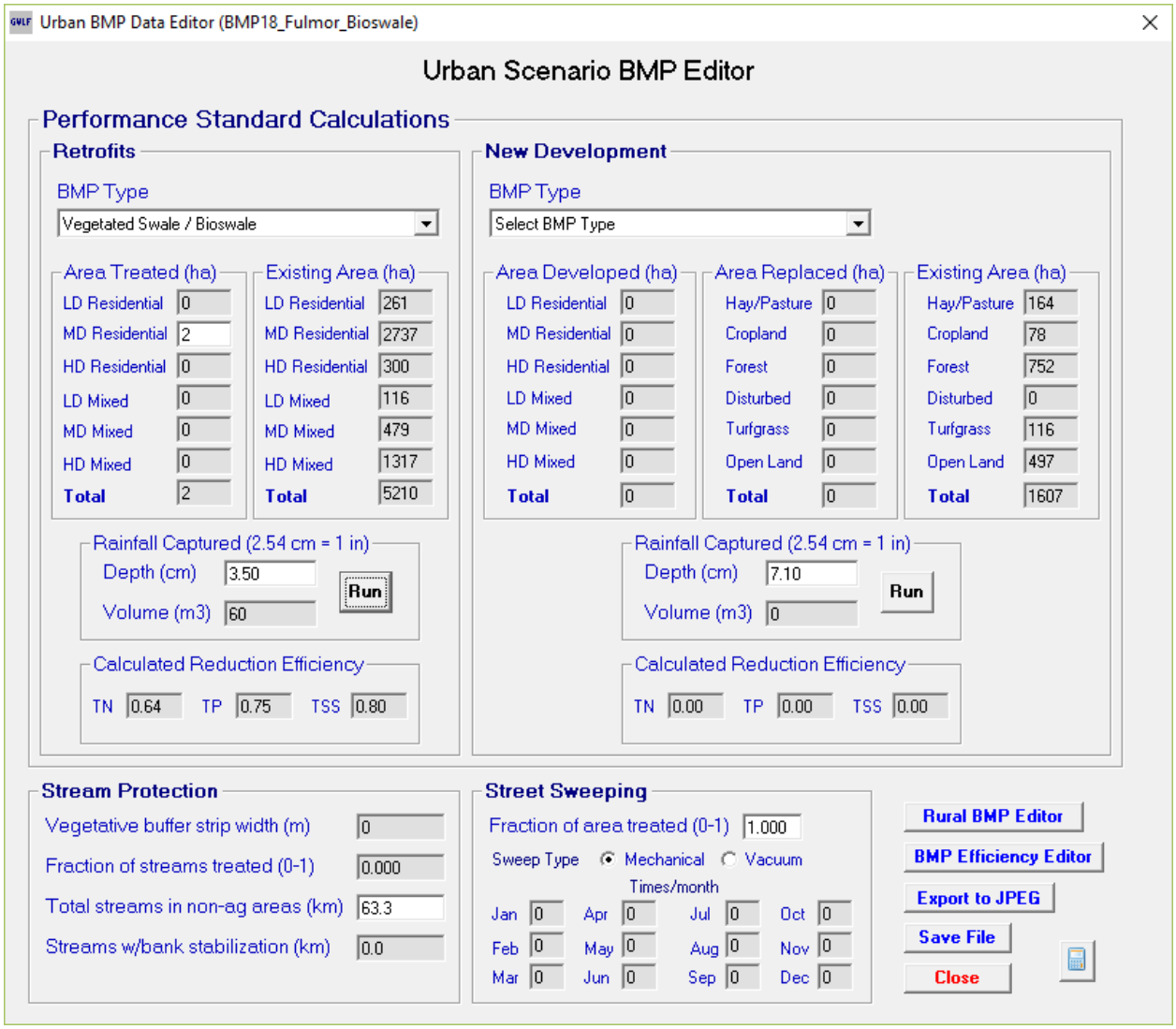


		Sediment		Nitrogen		Phosphorus	
Source	**Area (ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**	**Total Load (lb)**	**Loading Rate (lb/ac)**
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14197646.2		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	**17275**	**15365743**		**54183**		**4481**	

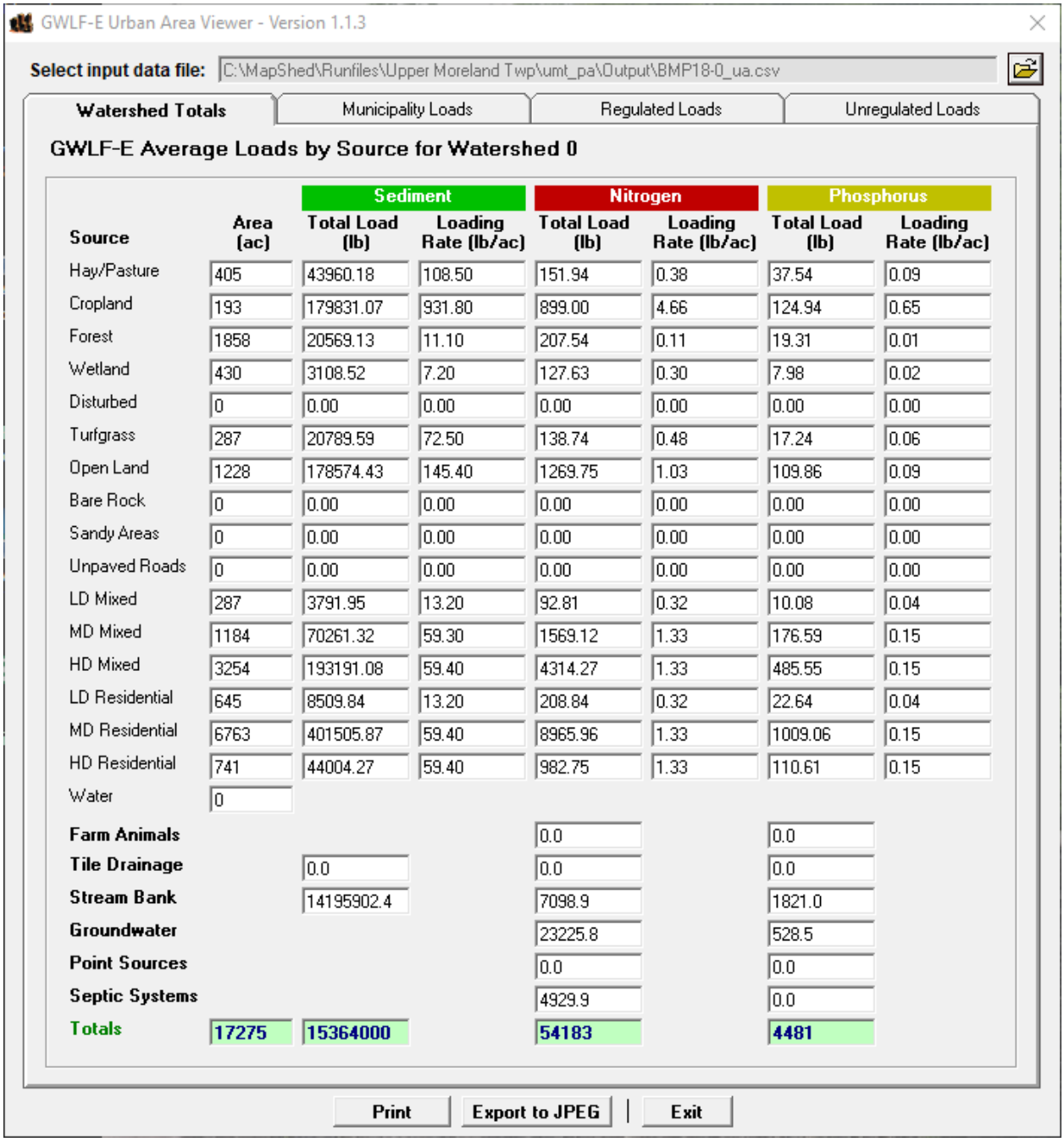
Appendix E-18.1: BMP 18 – Bioswale, Drainage Area Parameters



Appendix E-18.2: BMP 18 - Bioswale, BMP Type & Efficiency



Appendix E-18.3: BMP 18 - Bioswale, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP18-0_ua.csv

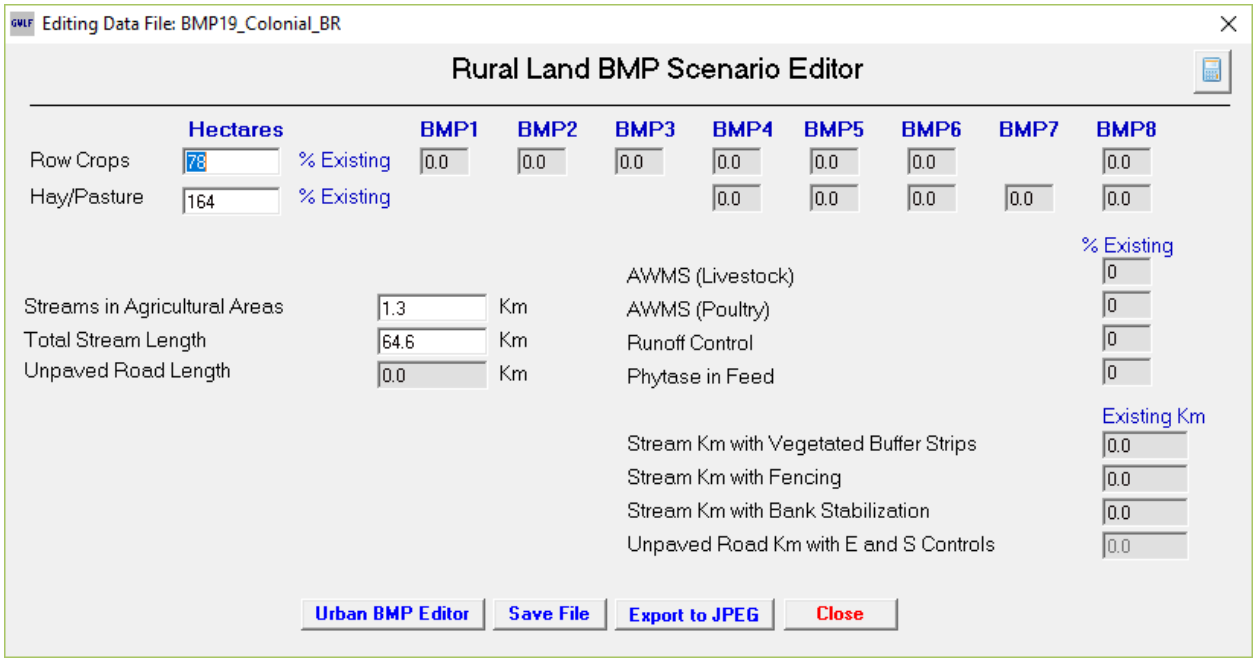
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

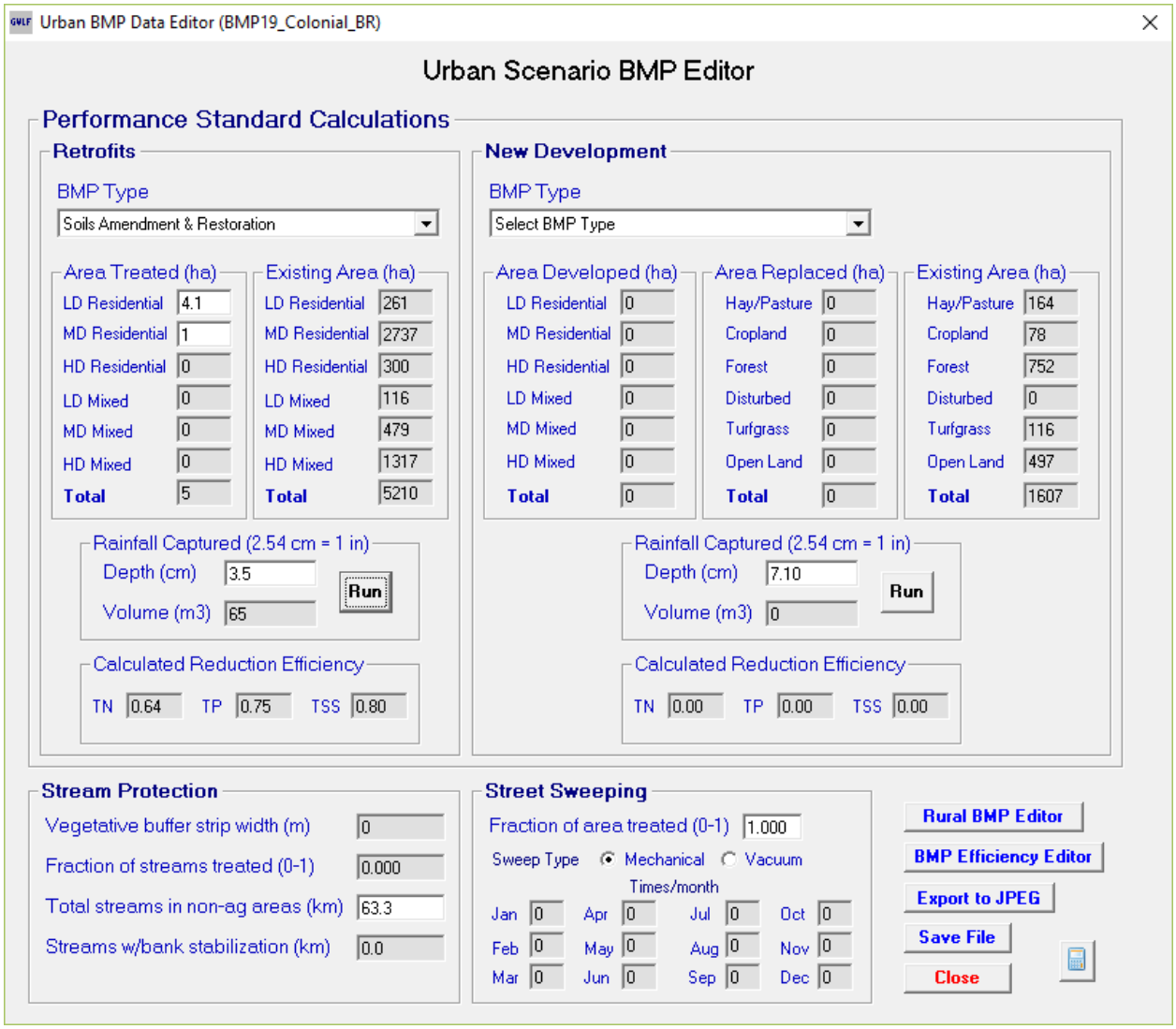
Source	Area (ac)	Sediment Total Load (lb)	Sediment Loading Rate (lb/ac)	Nitrogen Total Load (lb)	Nitrogen Loading Rate (lb/ac)	Phosphorus Total Load (lb)	Phosphorus Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14195902.4		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15364000		54183		4481	

Print | Export to JPEG | Exit

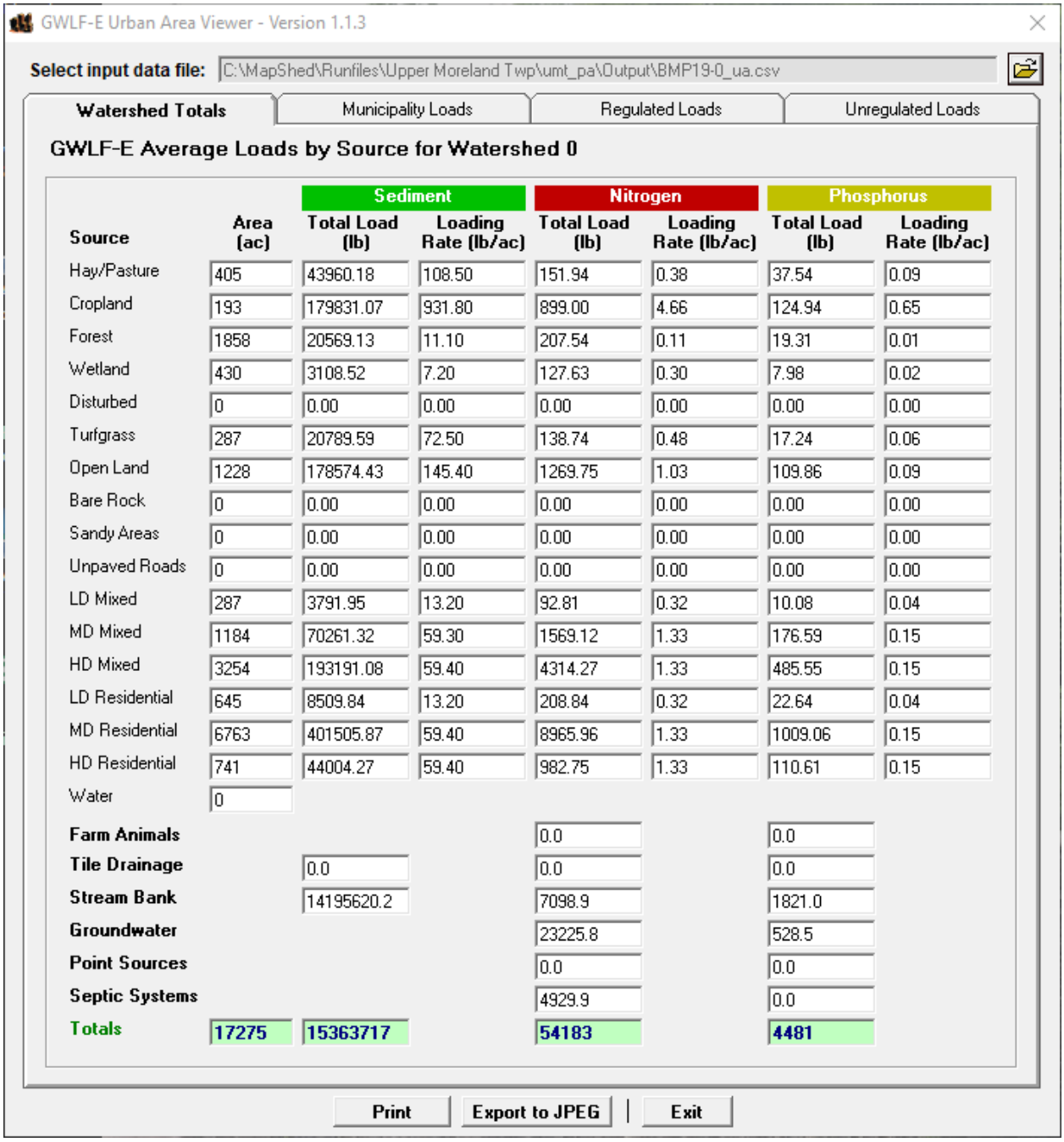
Appendix E-19.1: BMP 19 – Basin Retrofit, Drainage Area Parameters



Appendix E-19.2: BMP 19 - Basin Retrofit, BMP Type & Efficiency



Appendix E-19.3: BMP 19 - Basin Retrofit, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP19-0_ua.csv

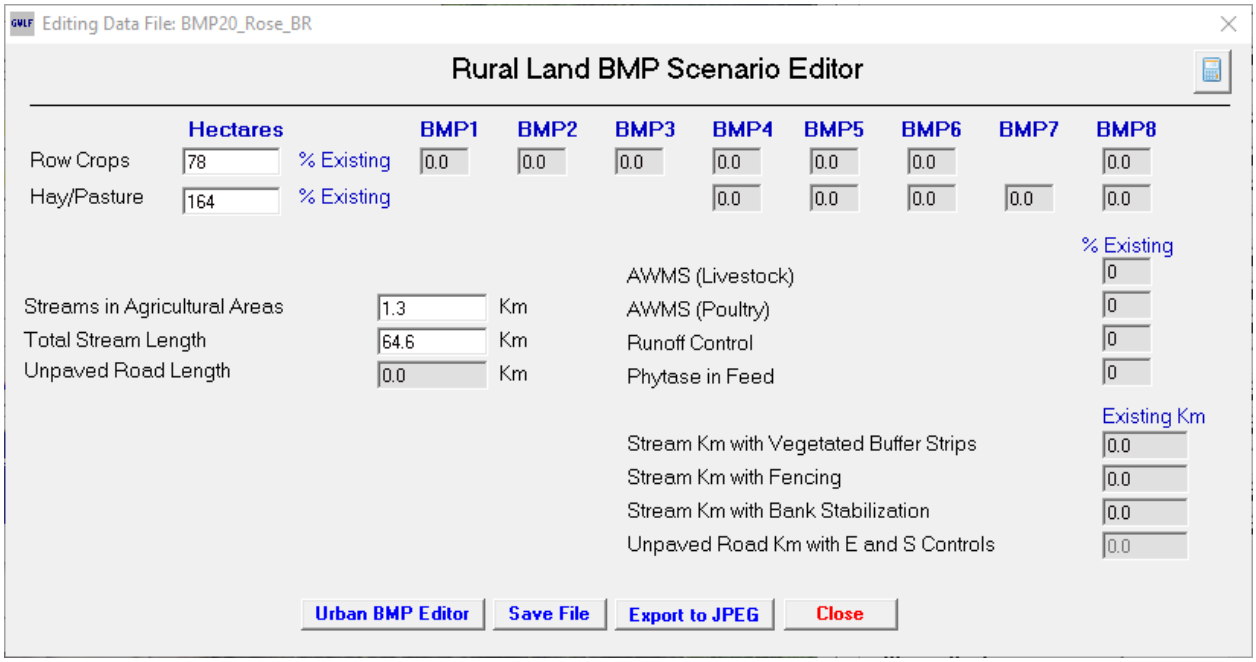
Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

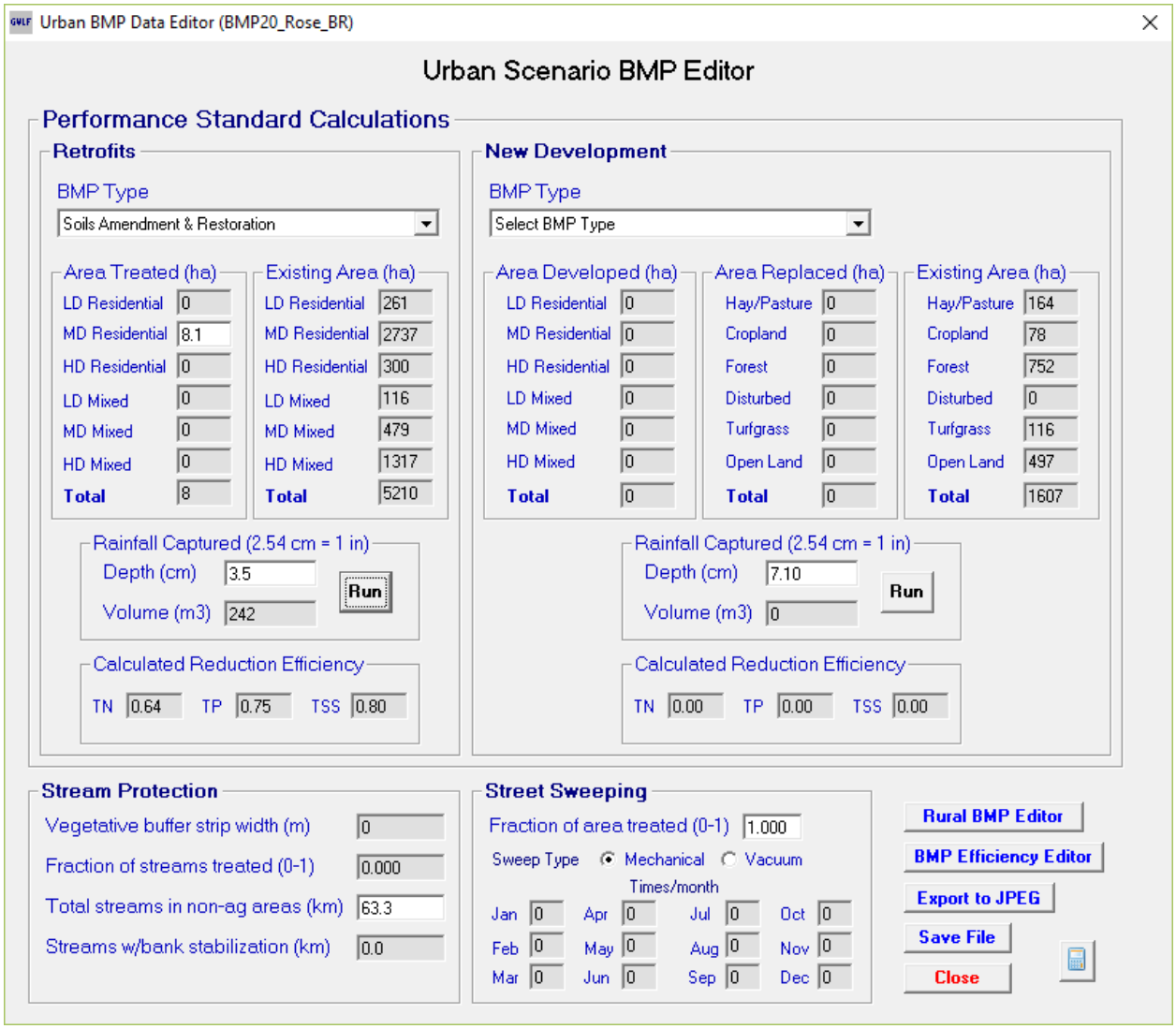
		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14195620.2		7098.9		1821.0	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15363717		54183		4481	

Print | Export to JPEG | Exit

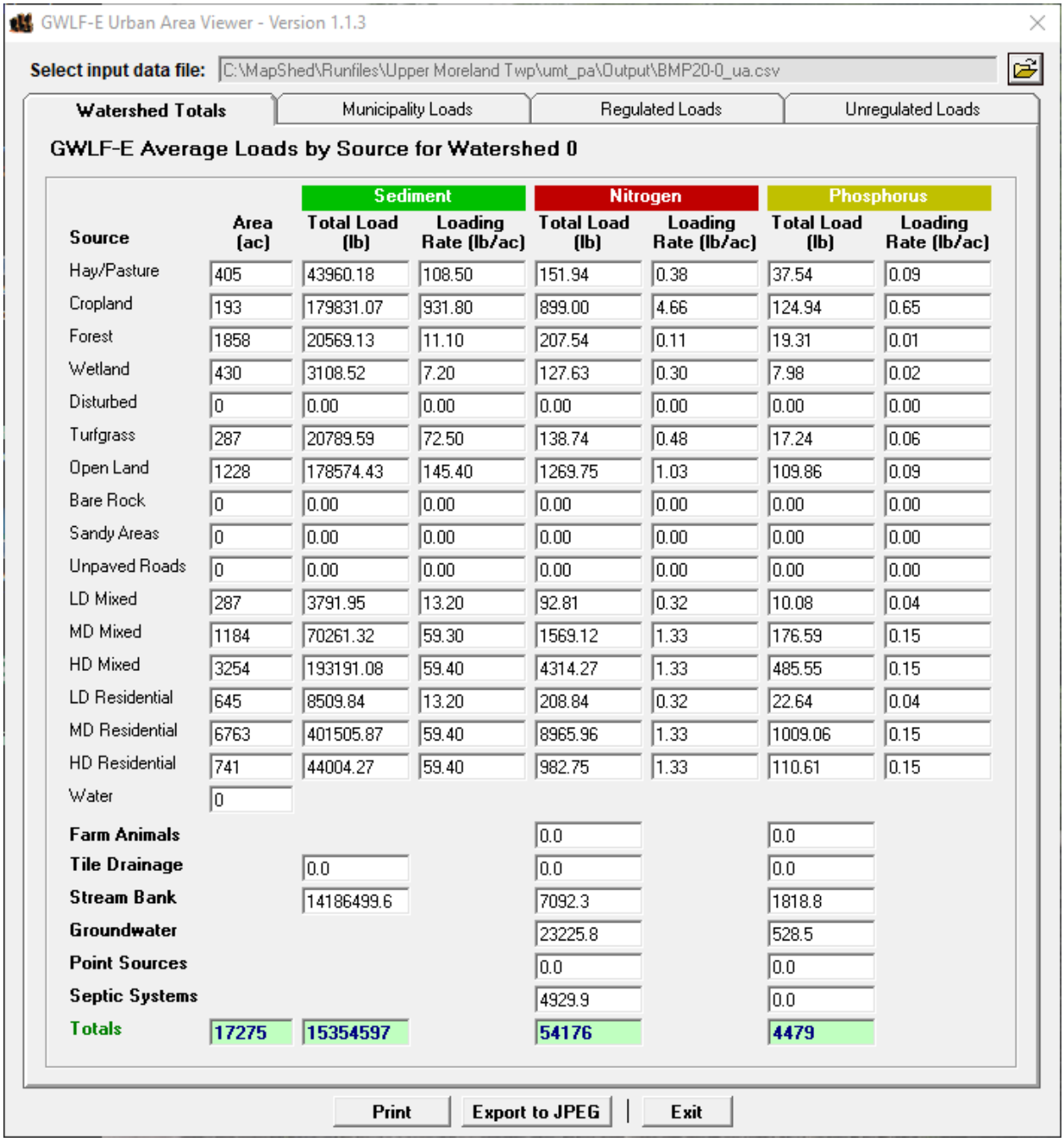
Appendix E-20.1: BMP 20 – Basin Retrofit, Drainage Area Parameters



Appendix E-20.2: BMP 20 - Basin Retrofit, BMP Type & Efficiency



Appendix E-20.3: BMP 20 - Basin Retrofit, Watershed Loading w/ BMP



GWLF-E Urban Area Viewer - Version 1.1.3

Select input data file: C:\MapShed\Runfiles\Upper Moreland Twp\umt_pa\Output\BMP20-0_ua.csv

Watershed Totals | Municipality Loads | Regulated Loads | Unregulated Loads

GWLF-E Average Loads by Source for Watershed 0

		Sediment		Nitrogen		Phosphorus	
Source	Area (ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)
Hay/Pasture	405	43960.18	108.50	151.94	0.38	37.54	0.09
Cropland	193	179831.07	931.80	899.00	4.66	124.94	0.65
Forest	1858	20569.13	11.10	207.54	0.11	19.31	0.01
Wetland	430	3108.52	7.20	127.63	0.30	7.98	0.02
Disturbed	0	0.00	0.00	0.00	0.00	0.00	0.00
Turfgrass	287	20789.59	72.50	138.74	0.48	17.24	0.06
Open Land	1228	178574.43	145.40	1269.75	1.03	109.86	0.09
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	287	3791.95	13.20	92.81	0.32	10.08	0.04
MD Mixed	1184	70261.32	59.30	1569.12	1.33	176.59	0.15
HD Mixed	3254	193191.08	59.40	4314.27	1.33	485.55	0.15
LD Residential	645	8509.84	13.20	208.84	0.32	22.64	0.04
MD Residential	6763	401505.87	59.40	8965.96	1.33	1009.06	0.15
HD Residential	741	44004.27	59.40	982.75	1.33	110.61	0.15
Water	0						
Farm Animals				0.0		0.0	
Tile Drainage		0.0		0.0		0.0	
Stream Bank		14186499.6		7092.3		1818.8	
Groundwater				23225.8		528.5	
Point Sources				0.0		0.0	
Septic Systems				4929.9		0.0	
Totals	17275	15354597		54176		4479	

Print | Export to JPEG | Exit

Appendix E-21.1: BMP 21 – Streambank Stabilization

Streambank Restoration	
Streambank Length (ft)	350
TSS Removal Rate (lbs/ft/yr)	115
Potential Reduction (lbs)	40,250

Appendix E-22.1: BMP 22 – Streambank Stabilization

Streambank Restoration	
Streambank Length (ft)	500
TSS Removal Rate (lbs/ft/yr)	115
Potential Reduction (lbs)	57,500

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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.

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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
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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.

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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.

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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%.