

The Town of McCandless

Pollutant Reduction Plan Girty's Run HUC-12 Watershed



Municipal Separate Storm Sewer System

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ACRONYMS

BMP	Best Management Practice
HUC	Hydraulic Unit Code
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer
NPDES	National Pollutant Discharge Elimination System
PADEP	Pennsylvania Department of Environmental Protection
PRP	Pollutant Reduction Plan
TP	Total Phosphorus

GLOSSARY OF TERMS

Impaired Waters - surface waters that fail to attain one or more of its designated uses under 25 Pa. Code Chapter 93 and as listed in Categories 4 and 5 of Pennsylvania's Integrated Water Quality Monitoring and Assessment Report.

Integrated Water Quality Monitoring and Assessment Report - the report published every other year by PADEP to report on the conditions of Pennsylvania's surface waters to satisfy sections 305(b) and 303(d) of the CWA.

Nutrients – refers to total nitrogen and total phosphorus

Outfall - a point source as defined by 40 CFR § 122.2 at the point where a municipal separate storm sewer discharges to surface waters and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other surface waters and are used to convey surface waters. (25 Pa. Code § 92a.32(a) and 40 CFR § 122.26(b)(9))

Outfall Sewershed - the land area that drains to an individual MS4 outfall, observation point, or discharge point from within the jurisdiction of the MS4 permittee.

Parsing - a process in which land area is removed from a Planning Area in order to calculate the actual or target pollutant loads that are applicable to an MS4. Land area which can be parsed includes areas that do not drain to the MS4's system or land that is already covered by an NPDES permit for control of stormwater.

Planning Area – the area used to calculate existing loads and plan load reductions for.

Sediment – refers to siltation and suspended solids; all of which are inorganic solids.

Structural Best Management Practices - means stormwater storage and management practices including, but not limited to, wet ponds and extended detention outlet structures; filtration practices such as grassed swales, sand filters and filter strips; infiltration practices such as infiltration basins and infiltration trenches; and other BMPs as referenced in Chapter 6 of the Pennsylvania Stormwater BMP Manual (363-0300-002).

Surface Waters - perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries, excluding water at facilities approved for wastewater treatment such as wastewater treatment impoundments, cooling water ponds and constructed wetlands used as part of a wastewater treatment process. (25 Pa. Code § 92a.2)

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

Chapter 1. Introduction

1.1 Purpose

Municipalities throughout the country are under a federal mandate requiring a stormwater management program for reducing pollution impacts from stormwater runoff. In 2003, the Town of McCandless was issued a Municipal Separate Storm Sewer System (MS4) Permit through the Pennsylvania Department of Environmental Protection (PADEP) and the Environmental Protection Agency. The Town is regulated under PADEP's General NPDES Permit (PAG-136140). Implemented through the Clean Water Act, the permit's numerous requirements are through six Minimum Control Measures (MCMs). In addition, PADEP is requiring MS4s that discharge to an impaired stream prepare a Pollutant Reduction Plan (PRP) for sediment, nitrogen, and/or phosphorus. The goal of the PRP is to reduce pollution caused by sediment and/or nutrients in impaired streams.

1.2 Girty's Run Watershed Background

Girty's Run Watershed is considered the Hydrologic Unit Code (HUC) 12 watershed. Within the Southwestern region of Pennsylvania, these HUC-12 watersheds are tributaries to either the Ohio, Monongahela, Allegheny, or Youghiogheny Rivers. Girty's Run is tributary to the Allegheny River.

Once every two years, PADEP publishes a report entitled "Pennsylvania Integrated Water Quality Monitoring and Assessment Report" that summarizes the various water quality management programs including water quality standards. The PRP was assigned for each MS4 based on the 2014 report. If a stream was assigned as impaired from siltation, organic enrichment, low dissolved oxygen, or nutrients then a PRP is required. Girty's Run Watershed is impacted by organic enrichment and low dissolved oxygen from urban runoff and storm sewers.

Chapter 2. Outfall Sewersheds & Planning Areas

Before beginning the calculations of the pollutant loads, the outfall sewersheds are delineated and the PRP planning area is identified.

2.1 Delineation Procedures

As part of the PRP process, outfall sewersheds are required to be delineated. An outfall sewershed is an area of land in which stormwater flows into a storm sewer system and is discharged into a stream, lake, or waterway. Accurate outfall sewersheds were drawn based on topography (2020), aerial (2021), and stream layers in ESRI ArcMap. By following these layers and the storm sewer network, all outfalls were assigned a sewershed. Aside from being a requirement of the PRP, delineation of the outfall sewersheds is useful if any parsing is implemented. Parsing is the term used by PADEP to convey detailed and analysis with the purpose of assigning responsibility.

2.2 Planning Area

The planning area is defined as the area used to calculate existing loads and plan load reductions. PADEP offered several options for how to define the planning area for each impaired water. The options vary from using a combination of the storm sewersheds to using watershed boundaries. The Town of McCandless plans to utilize the HUC-12 watershed boundary as its planning area with some additional parsing that is described in the next section.

2.3 Parsing

Once the preliminary planning area was defined; additional parsing within the area was performed to remove area that either does not drain to the MS4's system or is already covered by an NPDES permit for the control of stormwater. Parsing reduces the MS4's area of responsibility and therefore the pollutant loads. The Town of McCandless parsed out all state and county owned roads and sheet flow onto private property. Appendix A illustrates the final planning area for the MS4 by displaying the HUC-12 watershed boundaries and the planning area.

Chapter 3. Existing Loading without BMPs

The PADEP provides several suggested methods that are scientifically supported for estimating the existing loads. The approved methods for calculating the loads include PADEP Simplified Method land use loading rates, MapShed, or other watershed models that reflect both overland flow and in-stream erosion components. For the purpose of this PRP, WikiWatershed Model My Watershed (MMW) was chosen as the most appropriate method. The loads generated within this PRP were calculated in August 2022.

3.1 WikiWatershed Modeling Overview

WikiWatershed MMW is a free and publicly available software developed by the Stroud Water Research Center. Within MMW there are two options for modeling water quality and quantity; Site Storm Model and Watershed Multi-Year Model. For the purposes of the PRP, the Watershed Multi-Year Model was used. This program “simulates 30-years of daily water, nutrient, and sediment fluxes using the Generalized Watershed Loading Function Enhanced (GWLF-E) model that was developed for the MapShed desktop modeling application by Barry M. Evans, Ph.D., and his group at Penn State University.” The GWLF-E model takes into account hydrology, land cover, soils, weather, topography and other environmental data to calculate sediment and nutrient loads. The model utilizes well known soil and hydrologic equations to model surface runoff and soil erosion.

For modeling surface runoff and streamflow, the GWLF-E model uses the National Resources Conservation Service Curve Number (NRCS-CN) combined with daily precipitation and temperature data. Evapotranspiration is calculated using the daily weather data and a land cover dependent factor. To model monthly erosion and sediment loss, the Universal Soil Loss Equation is applied. Nitrogen, phosphorus, and total suspended solids are modeled for each type of land cover using export coefficients for both the dissolved and solid phases. Overall, the software uses geographic data, land use runoff coefficients, daily weather, and the universal soil loss equations to calculate pollutant loads in terms of mass and concentration. Additional information on the layers and methods used in WikiWatershed MMW can be found at <https://wikiwatershed.org/documentation/mmw-tech/>.

3.2 WikiWatershed Modeling Methodology

In order for WikiWatershed MMW to perform these hydrologic calculations, an area of interest is needed. The area of interest for this PRP includes the boundaries of the HUC-12 watersheds. Once the sediment and phosphorus loads are calculated in the Multi-Year Model, the MMW Spreadsheet Tool developed by Barry Evans, Anthony Aufdenkampe, and Mike Hickman is utilized for estimating the pollutant loads in the planning areas. The land cover and sediment and phosphorus loads previously obtained from WikiWatershed MMW are entered into the spreadsheet in order to generate loading rates as pounds per year per acre. The planning area is imported into WikiWatershed MMW as the area of interest to obtain the land cover distribution data. This data is entered into the spreadsheet where it calculates the sediment and phosphorus loads from each type of land cover within the planning area.

3.3 WikiWatershed Modeling Results

The results from WikiWatershed MMW and the MMW Spreadsheet Tool can be found in Appendix B.

3.3.1 Girty's Run HUC-12 Watershed Results

The PRP comprised in this report is focused on load reductions on a HUC-12 watershed basis. Girty's Run watershed is about 8,533 acres in size, with only 314 of those total acres located within the Town of McCandless. However, after parsing, the total planning area within the MS4 boundary is 200 acres. Table 3-1 shows the amount of phosphorus pollution from developed land cover and undeveloped land cover.

Table 3-1: HUC-12 Existing Pollutant Load Results without BMPs

SOURCE	PHOSPHORUS (lbs/yr)
Developed Land Cover	24.20
Undeveloped Land Cover	2.68
Total	26.88

3.4 Final Existing Loading and Required Reductions

The final existing loading and required reduction is illustrated in Table 3-2. Since Girty's Run is only impaired for nutrients, the required reduction is 5% of the existing phosphorus load. The MS4 is not required to target a specified sediment reduction within this watershed.

Table 3-2 Final Existing Loads and Required Reductions

POLLUTANT	FINAL EXISTING LOAD (lbs/yr)	REQUIRED REDUCTION (lbs/yr)
Phosphorus	26.88	1.34

Chapter 4. Achieving Load Reductions

Based on the PRP requirements, the final existing load calculated in Chapter 3 needs to be reduced by implementing proposed structural and non-structural BMPs. Appendix C entails maps of the proposed BMP locations and associated drainage areas. There are various methods used to determine the removal rates of each type of BMP. These approved methods are discussed in further detail below.

McCandless' stormwater ordinance goes above and beyond the Chapter 102 NPDES permit requirements for stormwater associated with construction activities, such as requiring stormwater management on projects disturbing less than 1 acre. As a result, the MS4 can take credit for those pollution reductions that will occur from exceeding PADEP regulatory requirements.

In addition to taking credit for new stormwater BMPs from development and redevelopment projects that do not require an NPDES permit, the Town is also planning to propose load reductions through new retrofit BMPs. These types of BMPs are still considered retrofits because the drainage area in which the new BMP will be installed is not being developed or changed. PADEP provides several methods that are scientifically-supported for estimating the pollution reduction potential of new retrofit BMPs. These approved methods for calculating the reductions are the PADEP BMP Effectiveness Values Table and the Expert Panel Removal Rates for Urban Stormwater Retrofit Projects. McCandless plans to calculate the efficiency of the new retrofit BMPs through the PADEP BMP Effectiveness Values Table.

The Town of McCandless also has a tree planting program. The tree planting initiative encourages residential and commercial property owners to report the planting of trees on their property. This will serve as an outreach and educational mechanism as well. The program would expand the tree canopy throughout the Town and therefore reduce stormwater runoff. Trees are beneficial for reducing stormwater pollution by taking up nutrients and various pollutants through their root systems. Though tree planting is not a requirement to residents and businesses, the Town will tabulate the number of trees planted within this 5-year cycle and add the result to the amount of phosphorus removed, which will be determined based on guidance from PADEP. The Town also intends to ask the Environmental Advisory Committee to incorporate a tree canopy investigation as part of its green space inventory.

Though stream restoration projects are classified as structural BMPs, the method used to calculate their reduction efficiency is slightly different than the previously discussed methods. For simplicity purposes, a default effectiveness rate of 115 lb/ft/yr for sediment load will be used for each proposed stream restoration project. To obtain the phosphorus loading rate, a default value of 1.05 pounds of phosphorus per ton of sediment is used.

PADEP provides several suggested methods that are scientifically supported for estimating the pollution reduction potential of structural stormwater BMPs. These methods include the Expert

Panel New Development Performance Standards Report and DEP's BMP Effectiveness Values Table. McCandless plans to calculate the efficiency of the structural stormwater BMPs through the PADEP BMP Effectiveness Values Table.

For calculating the pollutant loads generated within the BMP's drainage area, the MMW Spreadsheet Tool was used. The MMW Spreadsheet Tool developed by Barry Evans, Anthony Aufdenkampe, and Mike Hickman is utilized for estimating the pollutant loads in the planning areas. The land cover and sediment and phosphorus loads previously obtained from WikiWatershed are entered into the spreadsheet in order to generate loading rates as pounds per year per acre. These loading rates for the HUC-12 watershed were already calculated and depicted in Appendix B. The drainage area to each BMP is then imported into WikiWatershed as the area of interest to obtain the land cover distribution data. This data is entered into the spreadsheet where it calculates the sediment and phosphorus loads from each type of land cover within the drainage area. The spreadsheet for each analyzed BMP drainage area is located in Appendix D. Appendix E is an overall table detailing the existing loads, the percent removals, and the load reductions of each existing BMP.

OPERATION AND MAINTENANCE OF POTENTIAL BMPS

Each situation for which a potential BMP is considered will be evaluated based on merits (listed in no particular order) such as documented areas of historical flooding, portions of watersheds in floodplains, estimated degradation of a stream greater than or equal to 10% of sediment in the stream where the BMP is proposed, areas of general streambank erosion, the type of BMP/retrofit proposed, and portions of watersheds without stormwater management BMPs. The Town may assume maintenance responsibility for BMPs that detain or retain stormwater with the approval of Town Council. All other situations will remain the responsibility of the private property owner. Operation and maintenance for all BMPs on Town property are the responsibility of the Town.

FUNDING OF POTENTIAL BMPS

Potential BMPs have been identified for permitting purposes in Section 4.1 Potential Structural BMPs. The approval of and funding for each BMP is subject to the Town's budgeting process. Grant opportunities (public and private) will be researched and pursued to buttress local funding.

4.1 Structural BMPs

Slovak Savings Bank Infiltration Facility (P01)

- *Location:* N40° 33' 46.83417235", W80° 02' 17.83980821"
- *Description:* An infiltration bed was constructed as part of a small development project within the Town at Prescott Drive and Perry Highway (US Route 19). The treated drainage area is 0.9 acre and includes primarily medium density residential.
- *Estimated Reductions:* The potential project can reduce 0.23 lbs/year of phosphorus from the Girty's Run Watershed.
- *Operation & Maintenance:* Operation and maintenance of the stormwater facility will be performed by the owner in accordance with the PA Stormwater BMP Manual for the applicable type of BMP.
- *Funding:* Privately funded.
- *Project Requirements:* Inspection of stormwater facility by Town.

Vision Holdings Water Quality Filter Inserts (P02)

- *Location:* 8301 Perry Highway, McCandless PA 15237
- *Description:* 2 water quality filter inserts will be installed as part of a small redevelopment project within the Town. The treated drainage area for the two inlet filters is approximately 0.25 acres.
- *Estimated Reductions:* The potential project can reduce 0.07 lbs/year of phosphorus from the Girty's Run Watershed.
- *Operation & Maintenance:* Operation and maintenance of the water quality filter inserts be performed by the owner in accordance with the manufacturer.
- *Funding:* The owner will be responsible for the costs associated with the project.
- *Project Requirements:* Inspection of inlet filters by Town

Sheetz Stream Restoration (P03)

- *Location:* Start: N40° 33' 41.90", W80° 02' 21.03"
End: N40° 33' 42.53", W80° 02' 20.49"
- *Description:* Approximately 100 LF of Unnamed tributary to Girty's Run was rehabilitated near Perry Highway.
- *Estimated Reductions:* The project reduced 6.04 lbs/year of phosphorus from Girty's Run.
- *Operation & Maintenance:* Operation and maintenance of the restored stream will be performed by the Sheetz.
- *Funding:* Privately funded.

Perrymont Road Stream Restoration (P04)

- *Location:* Start: N40° 33' 33.68", W80° 02' 04.12"
End: N40° 33' 29.76", W80° 02' 03.83"
- *Description:* A maximum of 400 LF of Girty's Run may be rehabilitated, however in order to meet the PRP reduction requirement only 100 LF of stream restoration is needed. The actual start and end of the stream segment may adjust depending on the condition of the stream banks during field analysis. Streams that have highly eroded banks will be given priority for streambank restoration.
- *Estimated Reductions:* The potential project can reduce at least 6.04 lbs/year of phosphorus from Girty's Run.
- *Operation & Maintenance:* Operation and maintenance of the restored stream will be performed by the Town of McCandless.
- *Funding:* Town's Capital Budget, grant opportunities, and other watershed-based funding opportunities.

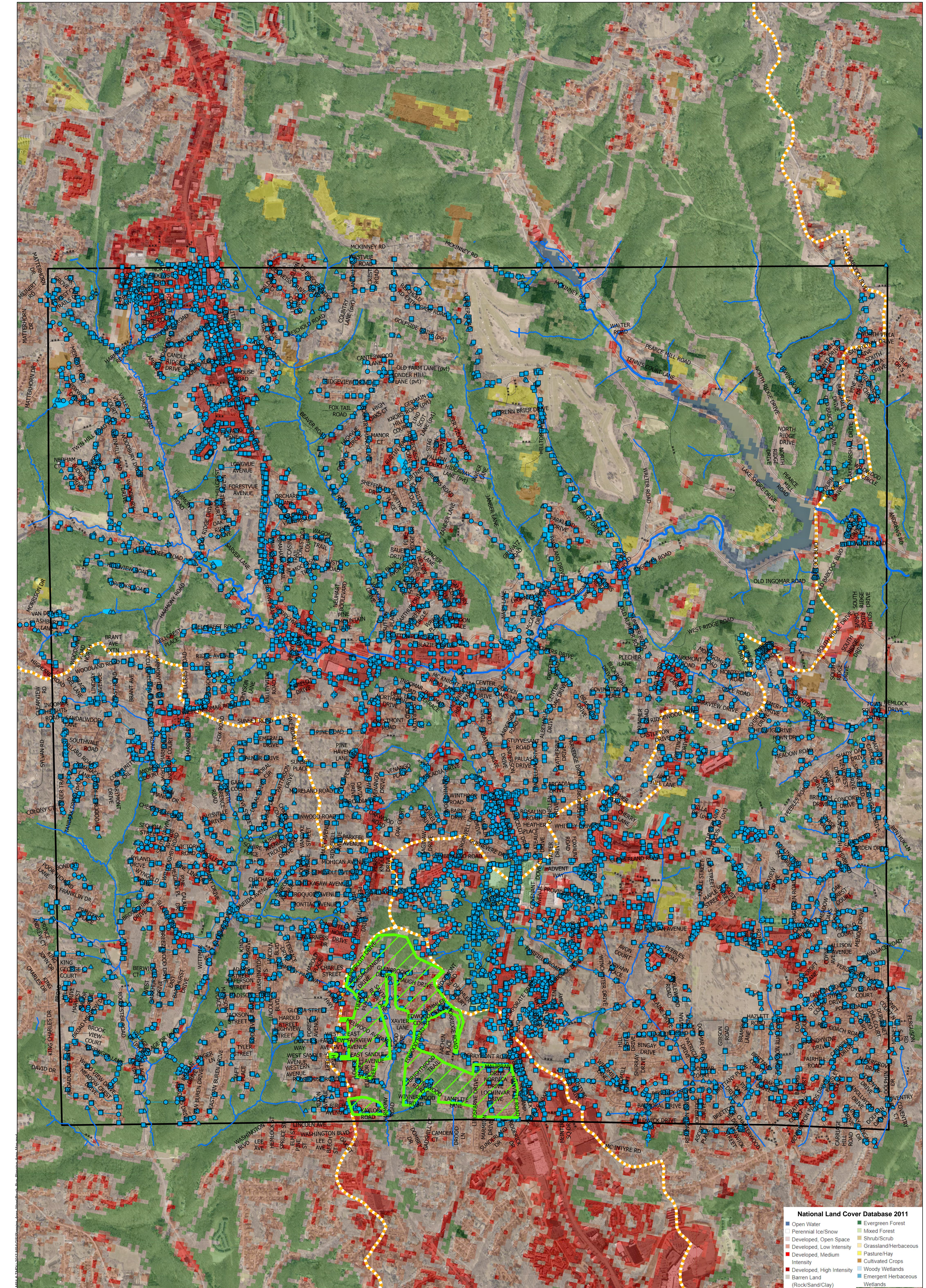
4.2 Summary of Proposed BMPs

Table 4-1 illustrates the existing load, required reduction, and anticipated reduction. The MS4 will achieve its load reduction requirement for the HUC-12 watershed through the implementation of the proposed BMPs.

Table 4-1: Expected Load Reductions from Proposed BMPs

POLLUTANT	FINAL EXISTING LOAD (lbs/yr)	REQUIRED REDUCTION (lbs/yr)	MINIMUM ACHIEVED REDUCTION (lbs/yr)
Phosphorus	26.88	1.34	6.04

Appendix A – Planning Area Map



Township of McCandless Girty's Run Planning Area Map

Appendix B – Existing Loads without BMPs

Look-Up Table for MMW Land Use Loading Rates

Watershed: Girty Run

Year: 2022

Section 3: MMW Model Output

This page is where the output data from a multi-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By: AAN
Data Entered: 2022-05-25
Source File Name: User Specified
Watershed: Girty Run
Year: 2022

Model My Watershed OUTPUT DATA

Source Units	Area acres	Sediment tons/year	Tot N lbs/year	Tot P lbs/year
Hay/Past	12.35	1.03	8.16	4.85
Cropland	-	-	-	-
Forest	1,837.04	4.60	111.79	18.74
Wetland	-	-	-	-
Distrubed	-	-	-	-
Turfgrass	-	-	-	-
Open Land	56.79	3.09	42.12	9.92
Bare Rock	-	-	-	-
Sandy Areas	-	-	-	-
Unpaved_Road	-	-	-	-
Ld_Mixed	4,972.84	14.75	832.83	87.32
Md_Mixed	1,175.31	40.65	1,741.73	178.16
Hd_Mixed	479.01	16.58	710.23	72.77
Ld_Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd_Residential	-	-	-	-
Farm Animals	-	236.38	63.06	-
Tile Drainage	-	-	-	-
Stream Bank	1,353.69	1,488.38	1,018.71	-
Groundwater	-	6,128.80	272.10	-
Pont Source	-	-	-	-
Septic Systems	-	3,730.64	-	-
Totals	8,533.33	1,434.38	15,031.04	1,725.63

STREAM LENGTH*	KM*	FEET	Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	32.61	106988.2	25.3	0.01	0.01
Ag Streams	0	0.0	0	0	0
Non-Ag Streams	32.61	106988.2	0	0	0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	6	0.9	5.4	0.0054	1.07	0.3	0.005778	0.00162
Chickens, Layers	75	1.8	135	0.135	0.85	0.29	0.11475	0.03915
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	25	500	12500	12.5	0.28	0.06	3.5	0.75
Pigs/Hogs/Swine	3	61	183	0.183	0.48	0.15	0.08784	0.02745
Sheep	24	50	1200	1.2	0.37	0.1	0.444	0.12
Turkeys	0	6.8	0	0	0.59	0.2	0	0

Daily Totals 4.15 0.94
Poultry Totals 0.12 0.04
Livestock Totals 4.03 0.90
Poultry Fraction 0.02989 0.04543
Livestock Fraction 0.97097 0.95655

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km ²)	AREA (acres)
Open Water	0.01	2.47
Perennial Ice/Snow	0	-
Developed, Open Space	9.79	2,417.28
Developed, Low Intensity	10.35	2,555.56
Developed, Medium Intensity	4.76	1,175.31
Developed, High Intensity	1.94	479.01
Barren Land (Rock/Sand/Clay)	0	-
Deciduous Forest	7.39	1,824.69
Evergreen Forest	0.02	4.94
Mixed Forest	0.03	7.41
Shrub/Scrub	0	-
Grassland/Herbaceous	0.23	56.79
Pasture/Hay	0.05	12.35
Cultivated Crops	0	-
Woody Wetlands	0	-
Emergent Herbaceous Wetlands	0	-
Totals	34.56	8,533.33

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	939.20	3.70	2.20	1,025.5455	8,1585	4,851
Cropland	0.00	0.00	0.00	0	0	0
Wooded Areas	4,175.70	50.70	8.50	4,603.7092	111,7935	18,7425
Wetlands	0.00	0.00	0.00	0	0	0
Open Land	2,800.30	19.10	4.50	3,087.3075	42,1155	9,9225
Barren Areas	0.00	0.00	0.00	0	0	0
Low-Density Mixed	13,378.00	377.00	98.50	14,748.00225	832,8285	87,318
Medium-Density Mixed	36,869.70	768.00	88.80	40,648.94425	174,7295	178,164
High-Density Mixed	15,035.30	322.10	33.00	16,576.41825	710,2305	72,765
Other Upland Areas	12,655.50	357.40	37.50	13,952.68875	788,067	82,6875
Farm Animals	0.00	107.20	28.60	0	236,376	63,063
Stream Bank Erosion	1,227,835.00	675.00	462.00	1353,688.088	1488,375	1018,71
Subsurface Flow	0.00	2,779.50	123.40	0	6128,7975	272,097
Point Sources	0.00	0.00	0.00	0	0	0
Septic Systems	0.00	1,691.90	0.00	0	3730,6395	0

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH	KM*	FEET
Total Length	0	0.0
Ag Streams	0	0.0
Non-Ag Streams	0	0.0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km ²)	AREA (acres)
Open Water	0	-
Perennial Ice/Snow	0	-
Developed, Open Space	0	-
Developed, Medium Intensity	0	-
Developed, High Intensity	0	-
Barren Land (Rock/Sand/Clay)	0	-
Deciduous Forest	0	-
Evergreen Forest	0	-
Mixed Forest	0	-
Shrub/Scrub	0	-
Grassland/Herbaceous	0	-
Resture/Hay	0	-
Cultivated Crops	0	-
Woody Wetlands	0	-
Emergent Herbaceous Wetlands	0	-
Totals	-	-

TYPE	AREA (m ²)	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water	0	0.00	0.00	0.00	0.00
Perennial Ice/Snow	0	0.00	0.00	0.00	0.00
Developed, Open Space	256,659.18	63.36	19.01	8.24	19,077.76
Developed, Low Intensity	40,821.32	100.79	30.24	13.10	30,350.98
Developed, Medium Intensity	31,915.36	8.00	14.67	2.54	4,143.62
Developed, High Intensity	358,689.69	0.89	1.74	0.32	563.33
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	108,657.81	26.80	5.09	2.68	6,512.54
Evergreen Forest	0	0.00	0.00	0.00	0.00
Mixed Forest	0	0.00	0.00	0.00	0.00
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Resture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	810,146.28	200.04	70.75	26.88	60,651.24

*Only use this input block if land cover distribution is given in square meters (m²).
This occurs when AOI is less than about 2 square kilometer².

Look-Up Table for MMW Loading Rates
 Watershed: Girty Run
 Year: 2022
 Source File: User Specified

Section 2: Landcover Loading Rates Look-Up Table

TOTAL WATERSHED ANNUAL LOADS

Source	Area	Sediment	Total Nitrogen	Total Phosphorus	SEDIMENT					NITROGEN					PHOSPHORUS				
					From Land Use		TOTAL SEDIMENT LOADING RATE			From Land Use		TOTAL NITROGEN LOADING RATE			From Land Use		TOTAL PHOSPHORUS LOADING RATE		
					From Stream Banks (1)	lbs/acre	lbs/acre	lbs/acre	lbs/acre	From Stream Banks (1)	lbs/acre	From Farm Animals (2)	lbs/acre	From Stream Banks (1)	lbs/acre	From Farm Animals (2)	lbs/acre	From Stream Banks (1)	lbs/acre
Hay/Past	area_ac	sediment_tons	TN_lbs	TP_lbs	Column1	TSS_LoadRateLd	TSS_LoadRateBu	TSS_LoadRateA	TSS_LoadRateP	Column2	TN_LoadRateLd	TN_LoadRateBu	TN_LoadRateA	TN_LoadRateP	Column3	TP_LoadRateLd	TP_LoadRateBu	TP_LoadRateA	TP_LoadRateP
Hay/Past	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cropland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Forest	1,837.04	4.60	111.79	18.74	5.01	237.95	24.07	0.06	0.06	n/a	0.19	0.01	0.00	n/a	0.10	0.00	0.00	0.00	
Wetland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Disturbed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Turfgrass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Open_Land	56.79	3.09	42.12	9.92	108.73	237.95	346.68	0.74	0.74	n/a	0.87	0.17	0.09	n/a	0.26	0.00	0.00	0.00	
Bare_Rock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Sandy_Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Unpaved_Road	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ld_Mixed	4,934.34	14.79	830.42	59.00	250.19	307.2	0.17	0.17	0.17	n/a	0.50	0.02	0.11	n/a	0.10	0.00	0.00	0.00	
Md_Mixed	1,175.31	40.65	1,741.75	178.16	69.17	436.37	595.54	1.48	1.48	n/a	1.79	0.15	0.16	n/a	0.31	0.00	0.00	0.00	
Hd_Mixed	479.01	16.58	710.23	72.77	69.21	569.92	639.13	1.48	1.48	n/a	1.96	0.15	0.21	n/a	0.36	0.00	0.00	0.00	
Ld_Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Md_Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Hd_Residential	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n/a	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Source	Total		
	Sediment	Total Nitrogen	Phosphorus
Units	Tons	Pounds	Pounds
Farm Animals	0.00	236.38	63.06
Tile Drainage	0.00	0.00	0.00
Stream Bank (1)	1,353.69	1,488.38	1,018.71
Groundwater	0.00	6,128.80	272.10
Point Source	0.00	0.00	0.00
Septic Systems	0.00	3,730.64	0.00

Notes:

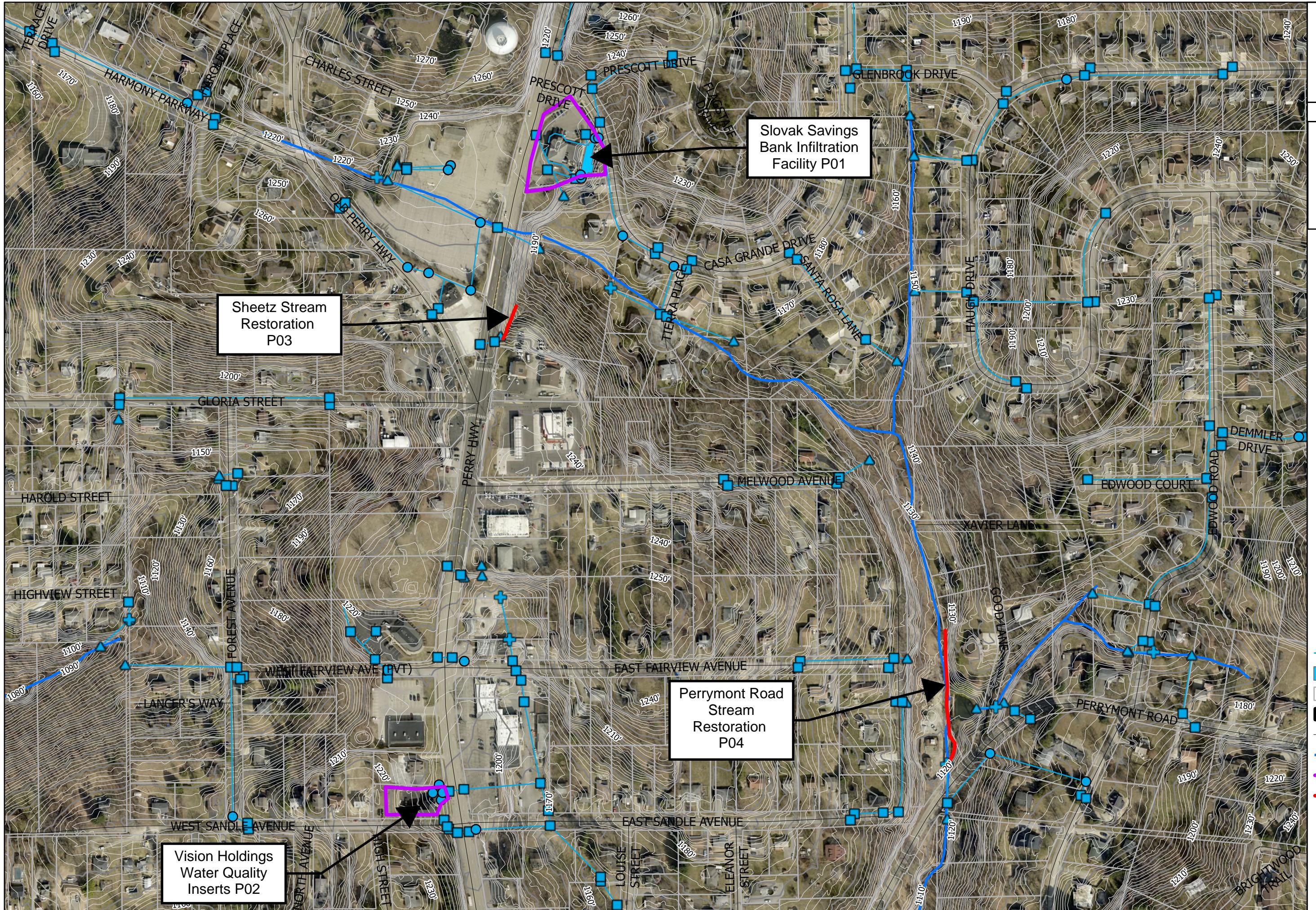
(1) - Separate worksheets are used to calculate and apportion the loading rates from the Stream Bank source loads (for sediment, total nitrogen, and total phosphorus) from the MMW Output file into each land use category, using methodology provided by Dr. Barry Evans (Pennsylvania State University), the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

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

Groundwater	0.0	6,128.8	272.1
Point Source	0.0	0.0	0.0

Septic Systems	0.0	3,730.6	0.0
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Appendix C – Proposed Structural BMPs Maps



Date: 12/14/2022
Scale: 1" = 300'

Path: G:\Projects\859000_Upper St Clair\85374 MSA & TMDL\2017 MSA\PR\GIS\Potential BMP Mapbook\Bust_1_Run_BMP_Mapbook_1x17.mxd

Appendix D – Proposed BMPs Load Calculations

Look-Up Table for MMW Land Use Loading Rates

Watershed: Girty Run

Year: 2022

Section 3: MMW Model Output

This page is where the output data from a multi-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By: **User Specified**
 Date Data Entered: **2022-05-25**
 Source File Name: **Slovak Savings Bank**
 Watershed: **Girty Run**
 Year: **2022**

Model My Watershed OUTPUT DATA

Source Units	Area acres	Sediment tons/year	Tot N lbs/year	Tot P lbs/year
Hay/Past	12.35	1.03	8.16	4.85
Cropland	-	-	-	-
Forest	1,837.04	4.60	111.79	18.74
Wetland	-	-	-	-
Disturbed	-	-	-	-
Turfgrass	-	-	-	-
Open Land	56.79	3.09	42.12	9.92
Bare Rock	-	-	-	-
Sandy Areas	-	-	-	-
Unpaved_Road	-	-	-	-
Ld_Mixed	4,972.84	14.75	832.83	87.32
Md_Mixed	1,175.31	40.65	1,741.73	178.16
Hd_Mixed	479.01	16.58	710.23	72.77
Ld_Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd_Residential	-	-	-	-
Farm Animals	-	236.38	63.06	-
Tile Drainage	-	-	-	-
Stream Bank	1,353.69	1,488.38	1,018.71	-
Groundwater	-	6,128.80	272.10	-
Pont Source	-	-	-	-
Septic Systems	-	3,730.64	-	-
Totals	8,533.33	1,434.38	15,031.04	1,725.63

STREAM LENGTH*	KM*	FEET	Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	32.61	106988.2	25.3	0.01	0.01
Ag Streams	0	0.0	0	0	0
Non-Ag Streams	32.61	106988.2	0	0	0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	6	0.9	5.4	0.0054	1.07	0.3	0.005778	0.00162
Chickens, Layers	75	1.8	135	0.135	0.85	0.29	0.11475	0.03915
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	25	500	12500	12.5	0.28	0.06	3.5	0.75
Pigs/Hogs/Swine	3	61	183	0.183	0.48	0.15	0.08784	0.02745
Sheep	24	50	1200	1.2	0.37	0.1	0.444	0.12
Turkeys	0	6.8	0	0	0.59	0.2	0	0

Daily Totals 4.15 0.94
 Poultry Totals 0.12 0.04
 Livestock Totals 4.03 0.90
 Poultry Fraction 0.02989 0.04543
 Livestock Fraction 0.97097 0.95655

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km ²)	AREA (acres)
Open Water	0.01	2.47
Perennial Ice/Snow	0	-
Developed, Open Space	9.79	2,417.28
Developed, Low Intensity	10.35	2,555.56
Developed, Medium Intensity	4.76	1,175.31
Developed, High Intensity	1.94	479.01
Barren Land (Rock/Sand/Clay)	0	-
Deciduous Forest	7.39	1,824.69
Evergreen Forest	0.02	4.94
Mixed Forest	0.03	7.41
Shrub/Scrub	0	-
Grassland/Herbaceous	0.23	56.79
Pasture/Hay	0.05	12.35
Cultivated Crops	0	-
Woody Wetlands	0	-
Emergent Herbaceous Wetlands	0	-
Totals	34.56	8,533.33

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	939.20	3.70	0.20	1,025.5455	8,1585	4,851
Cropland	0.00	0.00	0.00	0	0	0
Wooded Areas	4,175.70	50.70	8.50	4,603.7092	111,7935	18,7425
Wetlands	0.00	0.00	0.00	0	0	0
Open Land	2,800.30	19.10	4.50	3,087.3075	42,1155	9,9225
Barren Areas	0.00	0.00	0.00	0	0	0
Low-Density Mixed	13,378.00	377.00	39.50	14,748.00225	832,8285	87,318
Medium-Density Mixed	36,869.70	768.00	89.80	40,648.94455	1741,7295	178,164
High-Density Mixed	15,035.30	322.10	33.00	16,576.41825	710,2305	72,765
Other Upland Areas	12,655.50	357.40	37.50	13,952.68875	788,067	82,6875
Farm Animals	0.00	107.20	28.60	0	236,376	63,063
Stream Bank Erosion	1,227,835.00	675.00	462.00	1353,688088	1488,375	1018,71
Subsurface Flow	0.00	2,779.50	123.40	0	6128,7975	272,097
Point Sources	0.00	0.00	0.00	0	0	0
Septic Systems	0.00	1,691.90	0.00	0	3730,6395	0

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH	KM*	FEET
Total Length	0	0.0
Ag Streams	0	0.0
Non-Ag Streams	0	0.0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km ²)	AREA (acres)
Open Water	0	-
Perennial Ice/Snow	0	-
Developed, Open Space	0	-
Developed, Medium Intensity	0	-
Developed, High Intensity	0	-
Barren Land (Rock/Sand/Clay)	0	-
Deciduous Forest	0	-
Evergreen Forest	0	-
Mixed Forest	0	-
Shrub/Scrub	0	-
Grassland/Herbaceous	0	-
Resture/Hay	0	-
Cultivated Crops	0	-
Woody Wetlands	0	-
Emergent Herbaceous Wetlands	0	-
Totals	-	-

TYPE	AREA (m ²)*	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water	0	0.00	0.00	0.00	0.00
Perennial Ice/Snow	0	0.00	0.00	0.00	0.00
Developed, Open Space	0	0.00	0.00	0.00	0.00
Developed, Low Intensity	0	0.00	0.00	0.00	0.00
Developed, Medium Intensity	3588.68	0.89	1.59	0.27	447.96
Developed, High Intensity	0	0.00	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	0	0.00	0.00	0.00	0.00
Evergreen Forest	0	0.00	0.00	0.00	0.00
Mixed Forest	0	0.00	0.00	0.00	0.00
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Resture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	3588.68	0.89	1.59	0.27	447.96
TOTAL LOADS			0.23	425.56	

*Only use this input block if land cover distribution is given in square meters (m²).

This occurs when AOI is less than about 2 square kilometer².

Look-Up Table for MMW Land Use Loading Rates

Watershed: Girty Run

Year: 2022

Section 3: MMW Model Output

This page is where the output data from a multi-year MMW model run is to be copied and pasted into this workbook and is the source data for calculations throughout the workbook.

1. Source File Name - User-specified filename for the output file from MMW (optional).
2. Watershed Name - User-specified name of a watershed for which land use loading rates are being calculated (optional).
3. Source file - The annual pollutant data, in English Units, is copied directly from the MMW output file to the table below.
4. Year - the year modeled (optional).

Data Entered By: User Specified
Data Entered: 2022-05-25
Source File Name: Vision Holdings
Watershed: Girty Run
Year: 2022

Model My Watershed OUTPUT DATA

Source Units	Area acres	Sediment tons/year	Tot N lbs/year	Tot P lbs/year
Hay/Past	12.35	1.03	8.16	4.85
Cropland	-	-	-	-
Forest	1,837.04	4.60	111.79	18.74
Wetland	-	-	-	-
Disturbed	-	-	-	-
Turfgrass	-	-	-	-
Open Land	56.79	3.09	42.12	9.92
Bare Rock	-	-	-	-
Sandy Areas	-	-	-	-
Unpaved_Road	-	-	-	-
Ld_Mixed	4,972.84	14.75	832.83	87.32
Md_Mixed	1,175.31	40.65	1,741.73	178.16
Hd_Mixed	479.01	16.58	710.23	72.77
Ld_Residential	-	-	-	-
Md_Residential	-	-	-	-
Hd_Residential	-	-	-	-
Farm Animals	-	236.38	63.06	-
Tile Drainage	-	-	-	-
Stream Bank	1,353.69	1,488.38	1,018.71	-
Groundwater	-	6,128.80	272.10	-
Pont Source	-	-	-	-
Septic Systems	-	3,730.64	-	-
Totals	8,533.33	1,434.38	15,031.04	1,725.63

STREAM LENGTH*	KM*	FEET	Sed lb/ft	TN lb/ft	TP lb/ft
Total Length	32.61	106988.2	25.3	0.01	0.01
Ag Streams	0	0.0	0	0	0
Non-Ag Streams	32.61	106988.2	0	0	0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

FARM ANIMAL DATA

TYPE*	NUMBER*	AVG WT KG	TOTAL KG	TOTAL AEU	KG N/AEU/DAY	KG P/AEU/DAY	TOTAL N/DAY	TOTAL P/DAY
Chickens, Broilers	6	0.9	5.4	0.0054	1.07	0.3	0.005778	0.00162
Chickens, Layers	75	1.8	135	0.135	0.85	0.29	0.11475	0.03915
Cows, Beef	0	360	0	0	0.31	0.09	0	0
Cows, Dairy	0	640	0	0	0.44	0.07	0	0
Horses	25	500	12500	12.5	0.28	0.06	3.5	0.75
Pigs/Hogs/Swine	3	61	183	0.183	0.48	0.15	0.08784	0.02745
Sheep	24	50	1200	1.2	0.37	0.1	0.444	0.12
Turkeys	0	6.8	0	0	0.59	0.2	0	0

Daily Totals 4.15 0.94
Poultry Totals 0.12 0.04
Livestock Totals 4.03 0.90
Poultry Fraction 0.02989 0.04543
Livestock Fraction 0.97097 0.95655

* These values can be obtained from the "Animal" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Watershed (from "Analyze" csv file)

TYPE	AREA (km ²)	AREA (acres)
Open Water	0.01	2.47
Perennial Ice/Snow	0	-
Developed, Open Space	9.79	2,417.28
Developed, Low Intensity	10.35	2,555.56
Developed, Medium Intensity	4.76	1,175.31
Developed, High Intensity	1.94	479.01
Barren Land (Rock/Sand/Clay)	0	-
Deciduous Forest	7.39	1,824.69
Evergreen Forest	0.02	4.94
Mixed Forest	0.03	7.41
Shrub/Scrub	0	-
Grassland/Herbaceous	0.23	56.79
Pasture/Hay	0.05	12.35
Cultivated Crops	0	-
Woody Wetlands	0	-
Emergent Herbaceous Wetlands	0	-
Totals	34.56	8,533.33

Pollutant Load Conversion from Metric to Standard Units (from "Model" csv file)

SOURCE	SEDIMENT (kg)	TOTAL N (kg)	TOTAL P (kg)	SEDIMENT (tons)	TOTAL N (lbs)	TOTAL P (lbs)
Hay/Pasture	939.20	3.70	0.20	1,025.5455	8,1585	4,851
Cropland	0.00	0.00	0.00	0	0	0
Wooded Areas	4,175.70	50.70	8.50	4,603.7092	111,7935	18,7425
Wetlands	0.00	0.00	0.00	0	0	0
Open Land	2,800.30	19.10	4.50	3,087.3075	42,1155	9,9225
Barren Areas	0.00	0.00	0.00	0	0	0
Low-Density Mixed	13,378.00	377.00	39.50	14,748.00225	832,8285	87,318
Medium-Density Mixed	36,869.70	768.00	89.80	40,648.94455	1741,7295	178,164
High-Density Mixed	15,035.30	322.10	33.00	16,576.41825	710,2305	72,765
Other Upland Areas	12,655.50	357.40	37.50	13,952.68875	788,067	82,6875
Farm Animals	0.00	107.20	28.60	0	236,376	63,063
Stream Bank Erosion	1,227,835.00	675.00	462.00	1353,688088	1488,375	1018,71
Subsurface Flow	0.00	2,779.50	123.40	0	6128,7975	272,097
Point Sources	0.00	0.00	0.00	0	0	0
Septic Systems	0.00	1,691.90	0.00	0	3730,6395	0

(Note: The values below only pertain to the smaller target area)

STREAM LENGTH	KM*	FEET
Total Length	0	0.0
Ag Streams	0	0.0
Non-Ag Streams	0	0.0

* These values can be obtained from the "Stream" tab in the "Analyze" section of a Model My Watershed run

MMW NLCD Land Cover Categories for Urban Area (from second, smaller "Analyze" csv file)

TYPE	AREA (km ²)	AREA (acres)
Open Water	0	-
Perennial Ice/Snow	0	-
Developed, Open Space	0	-
Developed, Medium Intensity	0	-
Developed, High Intensity	0	-
Barren Land (Rock/Sand/Clay)	0	-
Deciduous Forest	0	-
Evergreen Forest	0	-
Mixed Forest	0	-
Shrub/Scrub	0	-
Grassland/Herbaceous	0	-
Resture/Hay	0	-
Cultivated Crops	0	-
Woody Wetlands	0	-
Emergent Herbaceous Wetlands	0	-
Totals	-	-

TYPE	AREA (m ²)*	AREA (acres)	TN (lb/yr)	TP (lb/yr)	Sediment (lb/yr)
Open Water	0	0.00	0.00	0.00	0.00
Perennial Ice/Snow	0	0.00	0.00	0.00	0.00
Developed, Open Space	0	0.00	0.00	0.00	0.00
Developed, Low Intensity	0	0.00	0.00	0.00	0.00
Developed, Medium Intensity	1000	0.25	0.44	0.08	124.83
Developed, High Intensity	0	0.00	0.00	0.00	0.00
Barren Land (Rock/Sand/Clay)	0	0.00	0.00	0.00	0.00
Deciduous Forest	0	0.00	0.00	0.00	0.00
Evergreen Forest	0	0.00	0.00	0.00	0.00
Mixed Forest	0	0.00	0.00	0.00	0.00
Shrub/Scrub	0	0.00	0.00	0.00	0.00
Grassland/Herbaceous	0	0.00	0.00	0.00	0.00
Resture/Hay	0	0.00	0.00	0.00	0.00
Cultivated Crops	0	0.00	0.00	0.00	0.00
Woody Wetlands	0	0.00	0.00	0.00	0.00
Emergent Herbaceous Wetlands	0	0.00	0.00	0.00	0.00
Totals	1000	0.25	0.44	0.08	124.83
TOTAL LOADS			0.44	0.08	124.83
			0.07	0.00	123.58

*Only use this input block if land cover distribution is given in square meters (m²).

This occurs when AOI is less than about 2 square kilometer².

Appendix E – Proposed BMPs Load Reduction Table

Girty's Run Proposed BMPs Load Reduction Table

BMP ID	BMP Type	Removal Efficiency Determination Method	Existing Sediment Load (lb/yr)	Existing TP Load (lb/yr)	Sediment Removal Efficiency	TP Removal Efficiency	Sediment Load Reduction (lb/yr)	TP Load Reduction (lb/yr)
P01	Slovak Savings Bank Infiltration Facility	BMP Effectiveness Values	447.96	0.27	95%	85%	425.56	0.23
P02	Vision Holdings Water Quality Filter Inserts	Manufacturer Specifications	-	0.08	0%	60%	-	0.05
P03	Sheetz Stream Restoration	BMP Effectiveness Values	11,500.00	6.04	100%	100%	11,500.00	6.04
P04	Perrymont Road Stream Restoration	BMP Effectiveness Values	11,500.00	6.04	100%	100%	11,500.00	6.04
Total							23,425.56	12.35