



GATEWAY

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The Township of Upper St. Clair

Total Maximum Daily Load Plan Brush Run Watershed



*Municipal Separate
Storm Sewer System*

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Manager

Latest Revision: July 31, 2017

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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, Upper St. Clair was issued a Municipal Separate Storm Sewer System (MS4) Permit through the Pennsylvania Department of Environmental Protection (PADEP) and the Environmental Protection Agency. The Township is regulated under PADEP's General NPDES Permit (PAG-136270). Implemented through the Clean Water Act, the permit's numerous requirements are through six Minimum Control Measures (MCMs). In addition, PADEP is requiring MS4s to create a plan for addressing discharges to an impaired stream that has an established Total Maximum Daily Load (TMDL) for sediment, nitrogen, and/or phosphorus. The goal of the TMDL plan is to reduce pollution by an assigned percent reduction or allocated load in order to improve water quality.

1.2 Brush Run Watershed Background

Brush Run Watershed is considered a small watershed that is part of the Middle Chartiers Creek Watershed, which is a Hydrologic Unit Code (HUC) 12 watershed. Within the Southwestern region of Pennsylvania, these HUC12 watersheds are tributaries to either the Ohio, Monongahela, Allegheny, or Youghiogheny Rivers. For Middle Chartiers Creek Watershed its tributary is the Ohio River.

The TMDL for nutrients and sediment for the Brush Run Watershed determined allocated waste load allocations (WLAs) for all point sources and load allocations (LAs) for all nonpoint sources using the ArcView Generalized Watershed Loading Functions (AVGWLF) model. Additional information on the development of the model can be found in the TMDL. For upper St. Clair, the allocated sediment load is 23,419 lbs/yr. The allocated load of phosphorus for Upper St. Clair is 47.1 lbs of sediment. The TMDL report requires a 68% reduction in sediment and 61% in phosphorus to achieve the targeted load reduction.

Chapter 2. Outfall Sewersheds & Planning Areas

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

2.1 Delineation Procedures

As part of the PRP process, outfall sewersheds were 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 (2006), aerial (2013), 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.

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 varied from using a combination of the storm sewersheds to using watershed boundaries. Upper St. Clair 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 do not drain to the MS4's system or land that 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 Township of Upper St. Clair parsed out PennDOT owned roads that are within in the Township. Appendix A illustrates the final planning area for the MS4 by displaying the HUC-12 and small watershed boundaries, as well as the parsed-out areas.

Chapter 3. Existing Loading without BMPs

A TMDL typically reports existing loads for a watershed; which is referred to as a baseline load. These loads are either specifically reported for each MS4 or are represented as a bulk/aggregate load for all MS4s in the TMDL watershed. An MS4 has the option to use the previously calculated baseline load or to recalculate the existing load through modeling software such as MapShed. For the purpose of this TMDL, the MS4 is choosing to recalculate its baseline load using MapShed. The loads generated within this report were calculated in July, 2017.

3.1 MapShed Modeling Overview

MapShed is a free and publicly available software developed by Pennsylvania State University that derives the loadings rates from mathematical simulation of pollutant generation and hydrologic processes. The software takes into account hydrology, land cover, soils, weather, topography and other environmental data to calculate sediment and nutrient loads. MapShed utilizes well known soil and hydrologic equations to model surface runoff and soil erosion.

For modeling surface runoff and streamflow, MapShed 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.

3.2 MapShed Modeling Methodology

In order for MapShed to perform these hydrologic calculations, initial data is needed beforehand. There are six required input sources and up to eleven optional sources in MapShed. The required data includes basins, weather stations, streams, soils, land use/cover, and surface elevation. The optional layers, which were included as part of this TMDL, consist of urban areas, soil-phosphorus, physiographic provinces, and counties. Each data source is described below in more detail.

3.2.1 Basin Layer

The Basins layer in MapSheds serves as the area modeled for the pollutant loads. The small watershed boundaries were used for this layer. The small watershed boundaries were obtained from Pennsylvania Spatial Data Access (PASDA) and are defined as catchment areas for named and unnamed streams. Utilizing the small watershed boundaries as the basin layer adequately accounts for downstream channel impacts.

3.2.2 Urban Area Layer

The Urban Area layer is considered optional in MapShed; however, it is required for the PRP in order to properly allocated the loads in which the MS4 is responsible for. MapShed's urban area data that is available is considered the 2010 Urbanized Areas boundaries which is based on the U.S. Census Bureau's database. The Urban Area layer simulated loads that are area weighted for each based upon their land use/cover percent distribution within the basin. The urbanized area boundary was altered slightly depending on the amount of parsing incorporated into the PRP planning area.

3.2.3 Weather Stations Layer

With MapShed, weather data for the Generalized Watershed Loading Functions-Enhanced (GWLFE) input file are automatically prepared using daily climate data contained in "csv-formatted" Excel files. These Excel files are connected to a weather station shapefile through the use of a unique station ID number. Statewide weather database contains temperature and precipitation from 78 weather stations around the state between 1975 and 1998.

3.2.4 Streams Layer

In order to better estimate erosion, a streams layer is required within the model. The stream segments are derived from the National Hydrography Datasets at a 1:24,000 scale or better. The length of a stream within a basin affects many things such as streambank erosion.

3.2.5 Soils Layer

The soils layer holds information pertaining to various soil properties such as the available water-holding capacity, soil erodibility factor and the dominant hydrologic soil group. These properties are crucial when calculating the loads generated within a basin. Within Brush Run Watershed, Upper St. Clair has soils mostly comprised of Group D.

3.2.6 Land Use Layer

The Land Use layer is one of the most critical layers used by MapShed since pollutant loads generated within a watershed are largely influenced by land surface conditions. These surface conditions are correlated to runoff, surface erosion and infiltration, which are directly associated with vegetative cover. For the purpose of the TMDL plan, the land use data is close to or the same as the one modeled in the TMDL; which is the 1992 National Land Cover Database.

3.2.7 Surface Elevation Layer

This particular grid layer is used to calculate land slope-related data for use within the model. The 30-meter digital elevation model used is considered a higher resolution grid cell data.

3.2.8 County Boundaries Layer

Having the boundary for each Pennsylvania county loaded into Mapshed will represent geographically estimates of the cropping management and erosion control practice factors for hay/pasture, row crops and wooded land covers.

3.2.9 Physiographic Province Layer

The physiographic province layer covers geographically and seasonally based estimates for the groundwater recession rate and erosivity coefficient values. Upper St. Clair is located within the Appalachian Plateaus Province, which has a groundwater recession rate of 0.1, a cool rain factor of 0.08 and a warm rain factor of 0.26.

3.2.10 Soil Phosphorus Layer

The soil phosphorus layer is used to estimate the phosphorus concentrations in sediment transported to nearby streams. For the purpose of the TMDL, the layer is depicted as Soil Test P. The soil Test P is an estimate of available soil phosphorus that was measured by standard lab tests.

3.3 MapShed Modeling Results

Each small watershed was analyzed separately in MapShed and the results can be found in Appendix B. The results from MapShed for the existing loads without BMPs are captured as screenshots of the Urban Area Viewer.

3.3.1 Brush Run Watershed Results

Brush Run Watershed is about 3,922 acres in size, with only 1,280 of those total acres being located within Upper St. Clair Township. However, after parsing the total watershed area within the MS4 boundary is 1,278 acres. Table 3-1 shows the amount of sediment and phosphorus pollution from land cover and stream bank erosion.

Table 3-1: Brush Run Watershed Existing Pollutant Load Results without BMPs

Pollutant	Existing Load (lbs/yr)	PRP Required Reduction (lbs/yr)	TMDL Required Reduction (lbs/yr)
Sediment	551,650.2	55,165.02	375,122.14
Phosphorus	93.7	4.69	57.16

The TMDL plan consists of two objectives; long term reduction and short term reduction. The long term reduction is the plan for the reduction of pollutant loads to achieve the waste load allocation in the TMDL. The short term reduction is for achieving either the WLA goal or similar to the PRP requirements of 10% for sediment and 5% for phosphorus and will be achieved within the NPDES permit term; i.e. 5 years. Upper St. Clair plans to achieve the 10%

sediment and 5% phosphorus for its short term reduction. For the long term reduction, Upper St. Clair plans to achieve its WLA for both sediment and phosphorus within 11 to 30 years.

Chapter 4. Achieving Load Reductions

Based on the TMDL requirements, the final existing load calculated in Chapter 3 needs to be reduced by implementing proposed structural and non-structural BMPs. PADEP is leaving it up to the MS4 on how they will plan to reduce the required pollution reduction. However, their proposed structural BMPs must be developed to the point that they can be located on a map and estimate their specific load reductions. The MS4 may briefly describe other BMPs that cannot yet be located as a possibility, but may not count them as planned load reductions. As a result, these BMPs are only proposed at a planning level; once additional analysis based on engineering design and cost feasibility is performed; the BMPs may be altered or eliminated. PADEP is allowing MS4's to update their PRPs between March 2018 and March 2023 to account for these changes in proposed BMPs.

One such opportunity that the Township of Upper St. Clair cannot account for in this September 2017 submission is taking credit for its stricter stormwater management ordinance. Upper St. Clair's stormwater ordinance goes above and beyond the Chapter 102 NPDES permit requirements for stormwater associated with construction activities. As a result, the MS4 can take credit for those pollution reductions that will occur from exceeding PADEP regulatory requirements.

Upper St. Clair may also update this plan in the future based on opportunities with various conservation and environmental groups. These types of organizations are dedicated to reducing pollution through outreach and small BMP installation to accomplish their goals. The Township recognizes these opportunities and will continue to promote outreach to such organizations.

Upper St. Clair Township encompasses two HUC-12 watershed boundaries; Lower Chartiers Creek and Middle Chartiers Creek that share the same impairments. The Township intends to coordinate with PADEP on combining the two watersheds into one PRP planning area. Combining the two separate PRPs will allow for flexibility in choosing the best project locations to reduce the amount of sediment and phosphorus pollution in Chartiers Creek.

At the time of this submission, the Township of Upper St. Clair is proposing structural BMPs that include new retrofit BMPs and stream restoration projects throughout the PRP planning area. 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.

Upper St. Clair is planning to propose load reductions through existing BMP retrofits. There are three types of retrofits that can be performed; enhancement, restoration or conversion. The type

of retrofit being done to the BMP determines if a full or an incremental percent removal is utilized. BMP enhancement utilizes the original stormwater treatment mechanism but improves removal by increasing storage volume or hydraulic residence time. Enhanced BMPs will utilize an incremental removal rate. BMP conversions involve retrofit of older existing stormwater ponds, such as converting a dry pond into a constructed wetland or a wet pond. Restoration of a BMP applies to major maintenance upgrades to BMPs which have either failed or lost their original stormwater treatment capacity. Typical major maintenance items include dredging ponds, replanting all vegetation, replacing contaminated soil, or complete rehabilitation. For restoration of existing BMPs, the full percent removal can be credited for the PRP. 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. Upper St. Clair plans to calculate the efficiency of the existing BMP retrofits through the PA DEP'S BMP Effectiveness Values Table.

Upper St. Clair is 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. Upper St. Clair plans to calculate the efficiency of the new retrofit BMPs through the PA DEP'S BMP Effectiveness Values Table.

For calculating the pollutant loads generated within the BMP's drainage area, the more detailed approach of analyzing the proposed BMPs individually in MapShed was used. The approach is taken by using MapShed to analyze the land cover within a BMP's drainage area using its Land Cover Distribution Tool. If the BMP's drainage area overlaps with a parsed area, then before the land cover is analyzed in MapShed, these parsed areas within each drainage area are clipped out in order to prevent load analysis on the parsed areas. Once the amount of land cover in the drainage area is computed, the values will be entered into the applicable spreadsheet depending on which small watershed the BMP is located in. Each small watershed produces its own specific loading rate (lbs/acre) for each land cover for sediment and phosphorus. These loading rates are applied to the BMP's drainage area land cover and the existing load for each is calculated. The streambank component of MapShed does not produce a loading rate as it is generated primarily based on the amount of developed land in the watershed. Since this is the case, a simplified approach of calculating the amount of streambank erosion in a BMP's drainage area is taken. This simplified approach involves determining the fraction of the drainage area's developed land (i.e. residential and mixed) within the watershed. This percentage is then applied to the watershed's total streambank erosion load for sediment and phosphorus through multiplication.. The spreadsheet that determines the amount of existing load for each proposed BMP's 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 proposed BMP.

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.

4.1 Structural BMPs

Heartwood Wet Pond (BR7466-01)

- *Location:* N40° 19' 26.6062", W80° 05' 02.3449"
- *Description:* The Township's existing detention pond will be converted to a wet pond retrofit. The treated drainage area is 27.2 acres and includes low density mixed.
- *Estimated Reductions:* The potential project can reduce 9,489.75 lbs/year of sediment and 0.85 lbs/year of phosphorus from Brush Run.
- *Operation & Maintenance:* Operation and maintenance of the stormwater facility will be performed by the Township of Upper Saint Clair in accordance with the PA Stormwater BMP Manual for the applicable type of BMP.
- *Funding:* Township's Capital Budget, grant opportunities, and other watershed based funding opportunities.

Corteland and Oaklawn Wet Pond (BR7466-02)

- *Location:* N40° 18' 34.1334", W80° 04' 31.9577"
- *Description:* The property, with the permission of the Home Owner's Association, would be a construction location for a new wet pond. The treated drainage area is 37.8 acres and includes primarily low density mixed.
- *Estimated Reductions:* The potential project can reduce 12,141.11 lbs/year of sediment and 1.23 lbs/year of phosphorus from Brush Run
- *Operation & Maintenance:* Operation and maintenance of the stormwater facility will be performed by the Township of Upper Saint Clair in accordance with the PA Stormwater BMP Manual for the applicable type of BMP.
- *Funding:* Township's Capital Budget, grant opportunities, and other watershed based funding opportunities.

Stream Restoration (BR7466-03)

- Location:** Start: N40° 18' 25.5233", W80° 05' 32.7702”
 End: N40° 18' 25.2887", W80° 05' 30.4761”
 Start: N40° 18' 22.9990", W80° 05' 07.6351”
 End: N40° 18' 24.2954", W80° 05' 05.6864”
- Description:** Approximately two segments, each 200 LF, make for a combined total of 400 LF of Tributary 36874 to Brush Run may be rehabilitated. The actual start and end of the stream segment may be changed 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 46,000 lbs/year of sediment and 24.15 lbs/year of phosphorus.
- Operation & Maintenance:** Operation and maintenance of the restored stream may be performed by the Township of Upper Saint Clair in accordance with the approved permit.
- Funding:** Township’s Capital Budget, grant opportunities, and other watershed based funding opportunities.

4.2 Summary of Proposed BMPs

After incorporating all the proposed BMPs, the existing and final pollutant loads for sediment and phosphorus within the TMDL planning area were determined and are illustrated in Table 4-1. The MS4 has achieved its load reduction requirement for the Brush Run watershed through the implementation of proposed BMPs.

Table 4-1: Expected Load Reductions from Proposed BMPs

POLLUTANT	EXISTING LOAD (lbs/yr)	REQUIRED REDUCTION (lbs/yr)	TMDL REQUIRED REDUCTION (lbs/yr)	PROPOSED REDUCTION (lbs/yr)	FINAL LOAD w/ BMPS (lbs/yr)
Sediment	551,650.2	55,165.02	375,122.14	67,630.86	484,019.34
Phosphorus	93.7	4.69	57.16	26.23	67.47

Chapter 5. TMDL 5 Year Plan

The Township of Upper St. Clair proposes the following plan to comply with the proposed NPDES permit to be issued by the DEP for the MS4 program.

5.1 Year 1 Plan Overview

- Continue to evaluate existing BMP's to further analyze load ratings and reductions.
- Develop specific BMP technology concepts for each delineated Proposed BMP drainage area.
- Determine segments of stream restoration based on property ownership, ease of access, damage mitigation, exposed pipeline locations, stream banks conditions, etc.

5.2 Year 2 Plan Overview

- Feasibility study for each of the proposed BMPs based on property ownership, ease of access, slope, soils, utilities, permitting, cost, etc.
- Engineering analysis and preliminary design development for stream restoration projects.
- Engineering analysis and preliminary design for retrofit of existing ponds.

5.3 Year 3 Plan Overview

- Where feasible, begin engineering analysis and preliminary design development of the proposed BMP concepts.
- Begin permitting and design of stream restoration projects

5.4 Year 4 Plan Overview

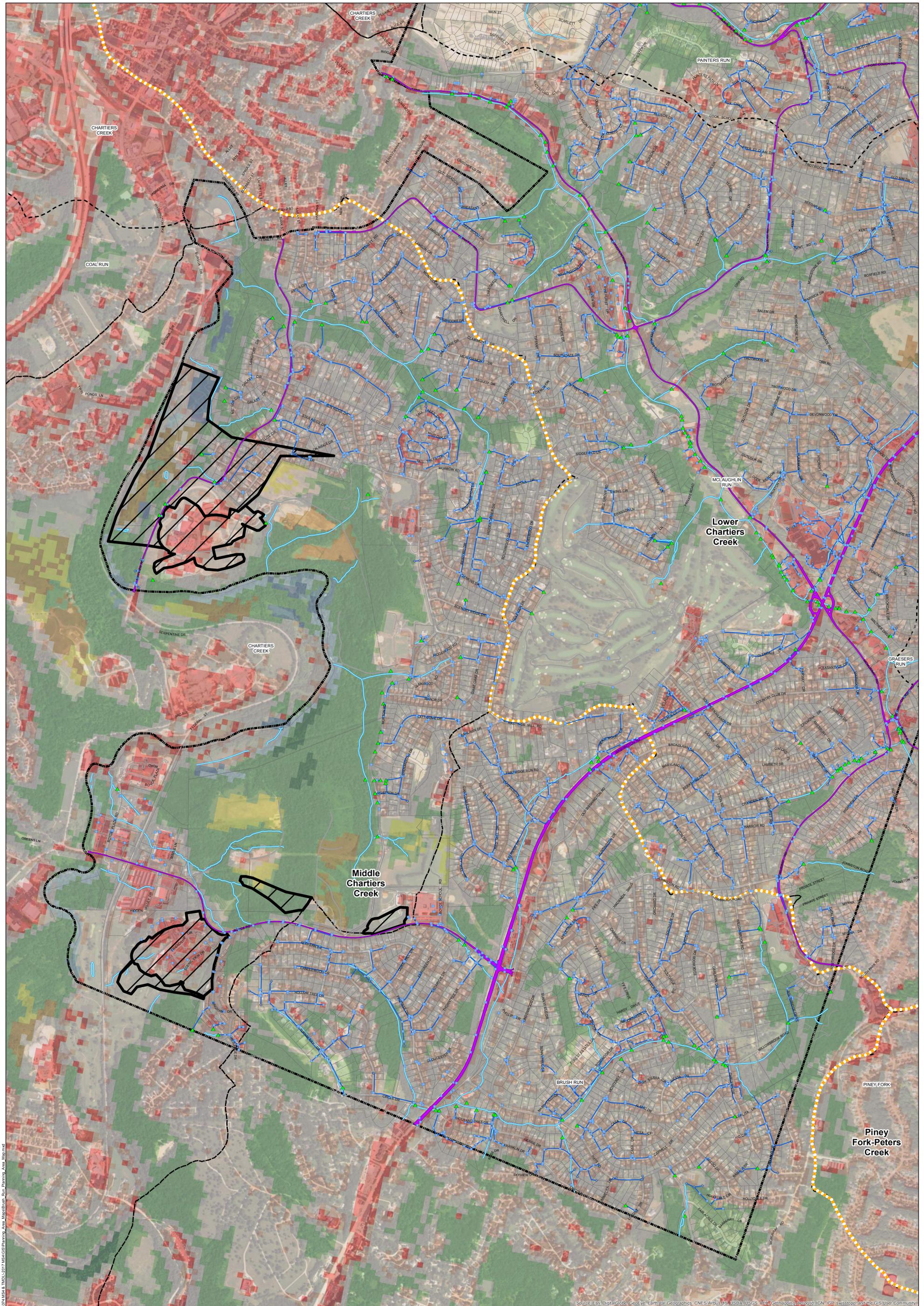
- Develop final design and bid documents for implementation of design BMP projects.
- Complete permitting and design and bid stream restoration projects.

5.5 Year 5 Plan Overview

- Construction oversight and completion of proposed BMPs.
- Continue inspection and maintenance activities of existing BMP's.
- Construction, oversight and completion of stream restoration projects.

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Appendix A – Planning Area Map



Township of Upper St. Clair

Brush Run Planning Area Map

The Path: G:\Projects\8500_Upper St. Clair\85374_MSA & TIGL\2017_MSA\GIS\Planning_Area_Map.mxd
 Run Planning Area Map.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, IGH, Swisstopo, and the GIS User Community

Appendix B – Existing Loads without BMPs

BRUSH RUN 7466 SMALL WATERSHED

GWLF-E Urban Area Viewer - Version 1.1.3

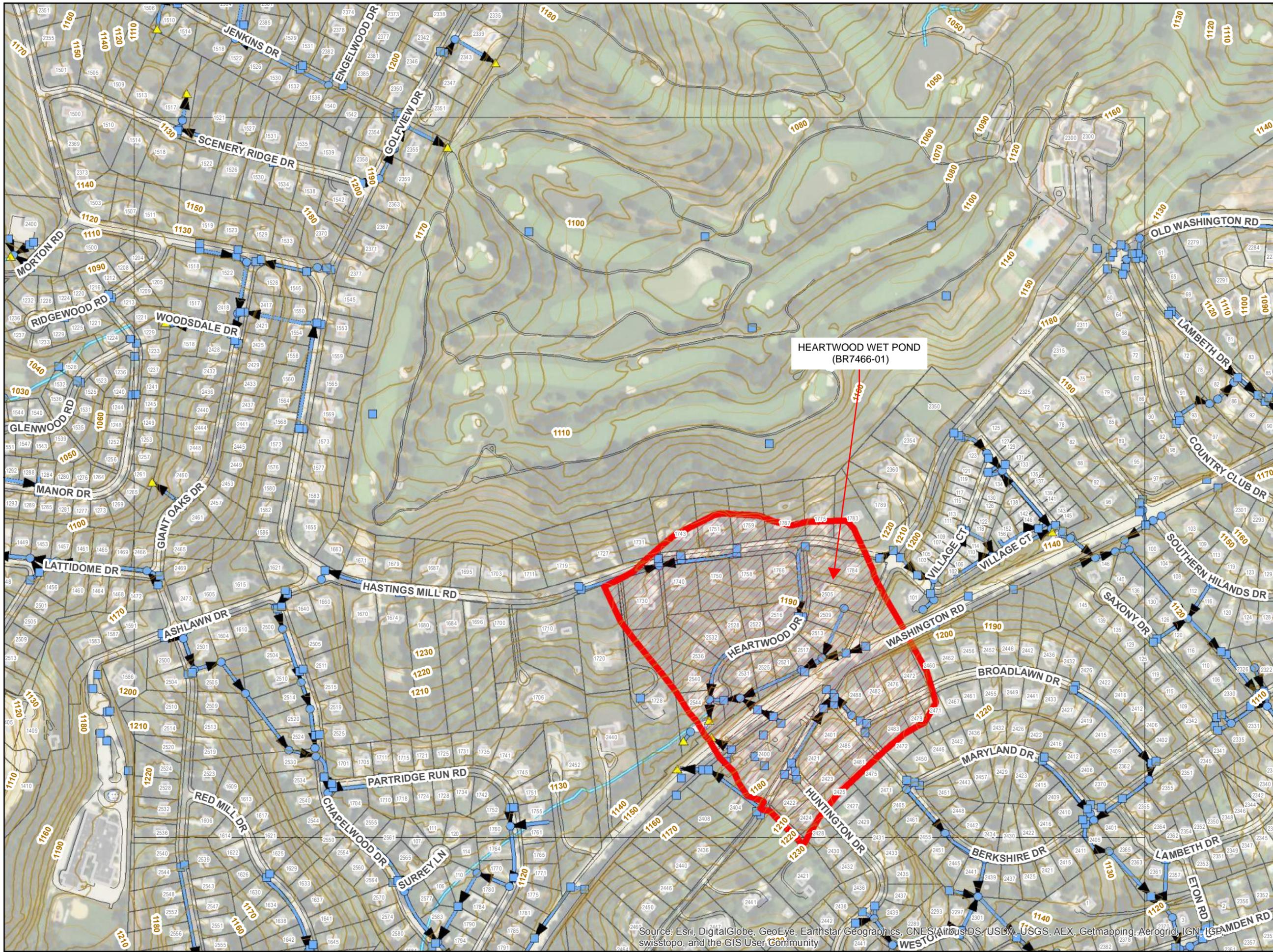
Select input data file: C:\MapShed\Runfiles\BrushRun_USC\Output\Parsedwatershed-26907897.8477_ua.csv

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

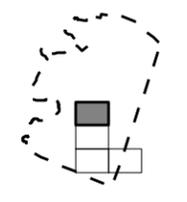
View loads for municipality: Upperstclair (00001)

Source	Source Area (ac)	Sediment		Nitrogen		Phosphorus		Source Weighting
		Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	Total Load (lb)	Loading Rate (lb/ac)	
Hay/Pasture	77	15292.20	198.60	46.20	0.60	6.90	0.09	
Cropland	30	80421.00	2680.70	207.00	6.90	24.00	0.80	
Forest	178	2687.80	15.10	12.50	0.07	1.80	0.01	
Wetland	0	0.00	0.00	0.00	0.00	0.00	0.00	
Disturbed	69	6962.10	100.90	15.20	0.22	2.80	0.04	
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	919	7995.30	8.70	229.80	0.25	27.60	0.03	
MD Mixed	0	0.00	0.00	0.00	0.00	0.00	0.00	
HD Mixed	5	247.00	49.40	9.70	1.93	1.00	0.20	
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							
Farm Animals				0.0		0.0	0.000	
Tile Drainage		0.00		0.0		0.0	0.000	
Stream Bank		438044.81		219.2		29.6	0.221	
Groundwater				2245.1		31.8	0.202	
Point Sources				0.0		0.0	0.000	
Septic Systems				0.0		0.0	0.000	
Totals	1278	551650.2		2984.7		125.5		

Appendix C– Proposed Structural BMPs Maps



Date: 7/24/2017
Scale: 1" = 400'



Township of Upper St. Clair
Brush Run Watershed
Potential Structural BMP
Drainage Area Locations

Project Number: C-85374-2017

- Proposed BMP Drainage Area
- Brush Run Stream Restoration
- Storm Discharge Point
- Storm Sewer Inlet
- Storm Sewer Manhole
- Storm Sewer Structure
- Storm Sewer Clean Out
- Storm Sewer Pipes
- Existing BMPs
- Streams
- Parcels
- Building Footprints
- Boundary

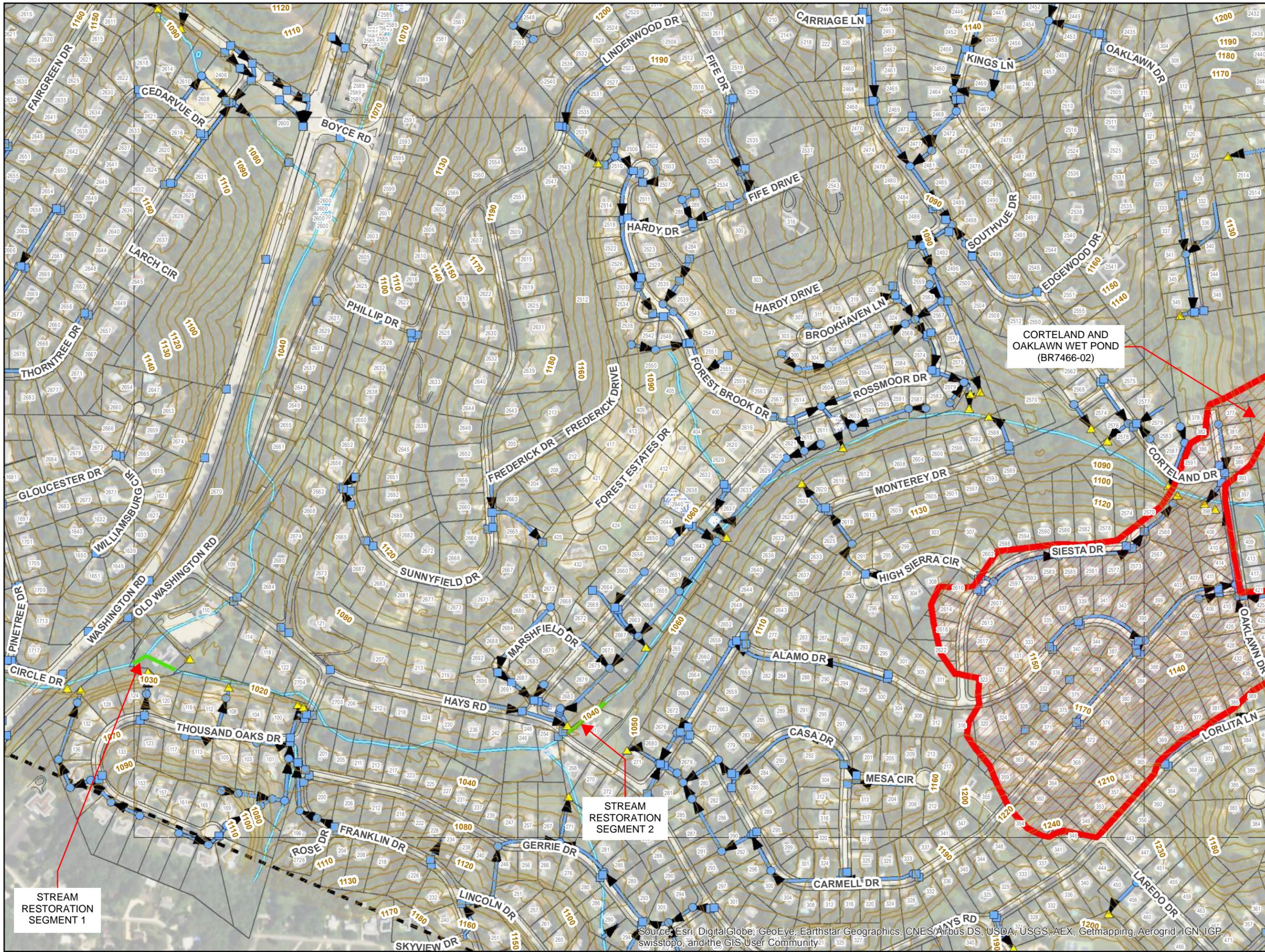
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100 McMorris Road
Pittsburgh, PA 15205
Phone: 412-921-4030
Fax 412-921-9960

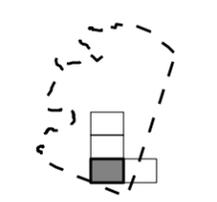


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Path: G:\Projects\85000 Upper St. Clair\85374 MS4 & TMDL\2017 MS4\PRPGIS\Potential BMP Map\BrushRun_BMP_Mapbook_1x17.mxd



Date: 7/24/2017
Scale: 1" = 400'



Township of Upper St. Clair
Brush Run Watershed
 Potential Structural BMP
 Drainage Area Locations
 Project Number: C-85374-2017

- ▬ Proposed BMP Drainage Area
- ▬ Brush Run Stream Restoration
- ▲ Storm Discharge Point
- Storm Sewer Inlet
- Storm Sewer Manhole
- ⊕ Storm Sewer Structure
- + Storm Sewer Clean Out
- ▬ Storm Sewer Pipes
- ▬ Existing BMPs
- ▬ Streams
- ▭ Parcels
- ▭ Building Footprints
- ▬ Boundary

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100 McMorris Road
 Pittsburgh, PA 15205
 Phone: 412-921-4030
 Fax 412-921-9960



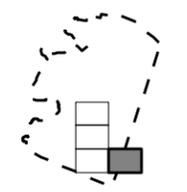
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



CORTELAND AND
OAKLAWN WET POND
(BR7466-02)



Date: 7/24/2017
Scale: 1" = 400'



Township of Upper St. Clair
Brush Run Watershed
Potential Structural BMP
Drainage Area Locations
Project Number: C-85374-2017

- Proposed BMP Drainage Area
- Brush Run Stream Restoration
- Storm Discharge Point
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- Boundary

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100 McMorris Road
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Path: G:\Projects\85000 Upper St. Clair\85374 MS4 & TMDL\2017 MS4\PRPGIS\Potential BMP Map\BrushRun_BMP_Mapbook_1x17.mxd

Appendix D – Proposed BMPs Load Calculations

Heartwood Estates

Land Cover	BMP Drainage Area (Hectares)	Watershed Area (acres)	BMP Drainage Area (acres)	
Hay/Pasture	0.1	731	0.25	
Cropland	0	660	0.00	
Forest	0	1166	0.00	
Wetland	0	12	0.00	
Disturbed	0.1	230	0.25	
Turfgrass	0	141	0.00	
Open Land	0	0	0.00	
Bare Rock	0	0	0.00	
Sandy Areas	0	0	0.00	
Unpaved Roads	0	0	0.00	
LD Residential	0	0	0.00	
MD Residential	0	0	0.00	
HD Residential	0	0	0.00	
LD Mixed	10.8	3576	26.69	
MD Mixed	0	0	0.00	
HD Mixed	0	124	0.00	
Total	11.00	6640.00	27.18	
				Percent Difference
Stream Bank	10.8	3700	26.69	0.72%

MapShed Modeling

Land Cover	Watershed Sediment Loading Rate (lbs/acre)	Watershed TP Loading Rate (lbs/acre)	BMP DA Sediment (lbs)	BMP DA TP (lbs)
Hay/Pasture	198.6	0.09	49.075053	0.02223945
Cropland	2680.7	0.8	0	0
Forest	15.1	0.01	0	0
Wetland	5.5	0.01	0	0
Disturbed	100.9	0.04	24.9328945	0.0098842
Turfgrass	64.5	0.03	0	0
Open Land	0	0	0	0
Bare Rock	0	0	0	0
Sandy Areas	0	0	0	0
Unpaved Roads	0	0	0	0
LD Mixed	8.7	0.03	232.179858	0.8006202
MD Mixed	0	0	0	0
HD Mixed	49.4	0.2	0	0
LD Residential	0	0	0	0
MD Residential	0	0	0	0
HD Residential	0	0	0	0
Total	3,123.40	1.21	306.19	0.83

Source	Watershed Sediment (lbs)	Watershed TP (lbs)	BMP DA Percent	BMP DA Sediment (lbs)	BMP DA TP (lbs)
Stream Bank	2,150,353.60	145.5	0.72%	15,510.06	1.05

Total Existing Loads

Sediment	15,816.25 lbs/yr
Phosphorus	1.88 lbs/yr

Corteland and Oaklawn

Land Cover	BMP Drainage Area (Hectares)	Watershed Area (acres)	BMP Drainage Area (acres)	
Hay/Pasture	0.9	731	2.22	
Cropland	0.1	660	0.25	
Forest	0.1	1166	0.25	
Wetland	0	12	0.00	
Disturbed	1.3	230	3.21	
Turfgrass	0	141	0.00	
Open Land	0	0	0.00	
Bare Rock	0	0	0.00	
Sandy Areas	0	0	0.00	
Unpaved Roads	0	0	0.00	
LD Residential	0	0	0.00	
MD Residential	0	0	0.00	
HD Residential	0	0	0.00	
LD Mixed	12.9	3576	31.88	
MD Mixed	0	0	0.00	
HD Mixed	0	124	0.00	
Total	15.30	6640.00	37.81	
				Percent Difference
Stream Bank	12.9	3700	31.88	0.86%

MapShed Modeling

Land Cover	Watershed Sediment Loading Rate (lbs/acre)	Watershed TP Loading Rate (lbs/acre)	BMP DA Sediment (lbs)	BMP DA TP (lbs)
Hay/Pasture	198.6	0.09	441.675477	0.20015505
Cropland	2680.7	0.8	662.4143735	0.197684
Forest	15.1	0.01	3.7312855	0.00247105
Wetland	5.5	0.01	0	0
Disturbed	100.9	0.04	324.1276285	0.1284946
Turfgrass	64.5	0.03	0	0
Open Land	0	0	0	0
Bare Rock	0	0	0	0
Sandy Areas	0	0	0	0
Unpaved Roads	0	0	0	0
LD Mixed	8.7	0.03	277.3259415	0.95629635
MD Mixed	0	0	0	0
HD Mixed	49.4	0.2	0	0
LD Residential	0	0	0	0
MD Residential	0	0	0	0
HD Residential	0	0	0	0
Total	3,123.40	1.21	1,709.27	1.49

Source	Watershed Sediment (lbs)	Watershed TP (lbs)	BMP DA Percent	BMP DA Sediment (lbs)	BMP DA TP (lbs)
Stream Bank	2,150,353.60	145.5	0.86%	18,525.90	1.25

Total Existing Loads

Sediment	20,235.18 lbs/yr
Phosphorus	2.74 lbs/yr

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Appendix E – Proposed BMPs Load Reduction Table

Brush 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)
BR7466-01	Heartwood - Wet Pond	BMP Effectiveness Table	15,816.25	1.88	60%	45%	9,489.75	0.85
BR7466-02	Corteland and Oaklawn - Wet Pond	BMP Effectiveness Table	20,235.18	2.74	60%	45%	12,141.11	1.23
BR7466-03	Stream Restoration	BMP Effectiveness Table	46,000.00	24.15	100%	100%	46,000.00	24.15
Total							67,630.86	26.23