City of Charlottesville, Virginia

Chesapeake Bay TMDL Phase II Action Plan

MS4 General Permit Registration Number VAR040051

November 1, 2019

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A. Introduction

The City of Charlottesville, Virginia's corporate limits and population of just under 44,000 people are located within the 750 square mile Rivanna River watershed. The Rivanna River watershed is part of the larger James River watershed, the largest watershed in Virginia; the James River is a major tributary of the Chesapeake Bay. Originating from springs in the foothills of the Blue Ridge Mountains, the Rivanna River flows along the eastern portion of Charlottesville and forms a boundary with neighboring Albemarle County. The Rivanna River and its urban tributaries provide important ecological, recreational, and cultural value to the city.

The City's 10.2 square miles contain approximately thirty-five miles of open waterways, with approximately thirteen additional miles of waterways that flow inside of the stormwater infrastructure system. Charlottesville consists of three main drainage areas. Along the eastern portions of the city, approximately 1.3 square miles of land drain through tributaries of or directly into the Rivanna River. The Meadow Creek and Moores Creek watersheds are the two largest drainage areas within the city and both drain into the Rivanna River. The Meadow Creek watershed spans the northern portion of the city and has a highly urbanized drainage area of approximately eight square miles, about 70 percent of which is located within the city limits. Moores Creek, which has its headwaters in Albemarle County, forms the southern boundary of the City; approximately 3.8 square miles of the city drain into the creek. The thirty-five square mile Moores Creek watershed encompasses diverse land uses including highly urbanized areas, suburban and rural, agricultural, as well as open space within Charlottesville and Albemarle County.

The City has a municipal separate storm sewer system (MS4), meaning there are two separate conveyance systems for stormwater and sewage, with wastewater from residents and businesses flowing to the wastewater treatment plant, and stormwater draining untreated directly into local surface waters. As a result of stormwater runoff's impacts to water quality, stormwater discharges from MS4s are regulated by the United States Environmental Protection Agency (EPA) under the Clean Water Act and by the Commonwealth of Virginia under the Virginia Stormwater Management Act. The regulations governing MS4s were developed and implemented in two phases. The first phase began in the early 1990s, requiring operators of MS4s serving populations of greater than 100,000 people to apply for and obtain a permit to discharge stormwater collected by their systems into waterways. The second phase of MS4 regulations became effective in March 2003, and requires that operators of small MS4s (less than 100,000 people) in "urbanized areas" obtain permit coverage for stormwater discharges. Small MS4s include stormwater systems operated by cities such as Charlottesville, as well as counties, towns, community colleges, and public universities.

In Virginia, discharges from small MS4s are regulated by the Department of Environmental Quality (DEQ), under the *General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems* (MS4 General Permit). Under that permit, small MS4s must develop, implement, and enforce a stormwater management program that addresses six "minimum control measures" (MCM) to control the discharge of pollutants from the MS4 to "the maximum extent practicable" (MEP) through the development and implementation of best management practices (BMP).

As required by the EPA and Commonwealth of Virginia, the City of Charlottesville operates and enforces a stormwater management program. The City was originally issued a stormwater discharge permit from DEQ on March 4, 2003 (Permit No. VAR040051). Subsequently, regulatory authority and program oversight was transferred to the Virginia Department of Conservation and Recreation (DCR) in January 2005, and the permit expired on December 9, 2007. This permit was administratively extended while new permit requirements were being finalized. The City's second MS4 General Permit was issued by DCR on July 9, 2008 and remained in effect until July 1, 2013. Regulatory authority and program oversight was transferred back to DEQ in 2013, and the City's third MS4 General Permit (2013 MS4 General Permit) was issued on July 1, 2013 and remained in effect until June 30, 2018. This permit was also administratively extended while new permit requirements were being finalized. The City's fourth and current MS4 General Permit (2018 MS4 General Permit) was issued on November 1, 2018 and will remain in effect until October 31, 2023.

In its Phase I, Phase II, and Phase III Chesapeake Bay TMDL Watershed Implementation Plans (WIP), the Commonwealth of Virginia committed to utilizing MS4 permits to ensure implementation of stormwater best management practices (BMP) on existing developed lands, taking a phased approach to reducing pollutant discharges from MS4s. As such, the City's 2018 MS4 General Permit includes a Special Condition for the Chesapeake Bay TMDL (Special Condition), which requires the City to make reductions of three pollutants of concern (POC), total nitrogen, total phosphorus, and total suspended solids, from MS4 regulated acres. Regulated acres are those lands that are owned or operated by the City, as well as lands that are served by the City's MS4. The required reductions equate to an average of 9% of nitrogen loads, 16% of phosphorus loads, and 20% of total suspended solids loads from impervious regulated acres and 6% of nitrogen loads, 7.25% of phosphorus loads, and 8.75% of total suspended solids loads from pervious regulated acres. The phased approach requires MS4 operators to achieve 5% of their total required POC reductions during the 2013-2018 MS4 General Permit cycle; 35% of the total reductions during the 2018-2023 permit cycle; and the remaining 60% of the total reductions in the 2023-2028 permit cycle.

The Special Condition required the City to develop and implement a Chesapeake Bay TMDL Action Plan that describes how the City would meet the 5% POC reductions required in the 2013 MS4 General Permit, including the means and methods that would be employed to achieve compliance. The City utilized the DEQ Guidance Memo No. 15-2005, *Chesapeake Bay TMDL Special Condition Guidance*, dated May 18, 2015 (the Guidance), as well as feedback from DEQ staff in the development of that Action Plan, which was approved by DEQ on January 29, 2016. As required by Section I.C.5 of the 2013 MS4 General Permit, a draft second phase Chesapeake Bay TMDL Action Plan was submitted by the City to DEQ with the General Permit Registration Statement for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (VAR04) on June 1, 2018. In accordance with Part II.A.11 of the 2018 MS4 General Permit, this updated Chesapeake Bay TMDL Phase II Action Plan is being submitted to DEQ no later than twelve months after the permit's effective date of November 1, 2018.

B. Chesapeake Bay TMDL Phase II Action Plan

1. Current Program and Existing Legal Authority

(*2013 MS4 General Permit I.C.2.a.(1)*)

A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition;

The City has reviewed its currently implemented MS4 Program Plan, including a review of the existing legal authorities and our ability to ensure compliance with the Special Condition. We have determined that our current MS4 Program Plan, augmented by this Action Plan, and the existing legal authorities provide the City the necessary tools to ensure compliance with the Special Condition.

Several components of the City's MS4 Program will be used to meet the Special Condition. As of July 1, 2014 the City serves as a local Virginia Stormwater Management Program (VSMP) authority; the Department of Public Works (DPW) administers the program. DPW is responsible for the implementation and enforcement of the Erosion and Sediment (E&S) Control Program. DPW staff receives DEQ E&S control training and certification at various levels, including plan review, site inspection, and program administration. The City's Water Protection Ordinance, Article II Erosion and Sediment Control, updated the original section of City Code in 2004 to incorporate requirements of the 2003 State E&S Control Law. The article, which was most recently updated in May 2014, details the standard operating procedures that are followed when reviewing and approving E&S Control Plans, inspecting and monitoring land disturbing activities, and assessing penalties and injunctions. The City requires that land disturbing activities of greater than or equal to 6,000 square feet prepare an E&S control plan. The Virginia Erosion and Sediment Control Handbook serves as the official guidance used by DPW staff for site plan review. Inspections of sites with E&S Control Plans are conducted a minimum of once every two weeks and within forty-eight hours of a runoff producing storm event. City inspectors utilize a customized/tailored site inspection form and DPW staff tracks the number of inspections conducted and any enforcement actions taken.

DPW is also responsible for administering the post-construction stormwater management site plan review process. DPW Engineering staff is responsible for evaluating compliance of development and redevelopment projects with State and local stormwater regulations. The goal of the site plan review process is to ensure that stormwater management requirements are met for new development and redevelopment projects within the City. The City's Water Protection Ordinance, Article III Stormwater Management, addresses the control of post-construction runoff in order to protect downstream land and receiving waterways. Article III requires development sites that disturb greater than or equal to 6,000 square feet of land to prepare a Stormwater Management Plan, and sites that disturb greater than or equal to one acre to apply for coverage under DEQ's General Permit for Discharges of Stormwater from Construction Activities and develop a site-specific stormwater pollution prevention plan. The ordinance, which was most recently revised and adopted in May 2014, details the plan requirements for the control of water quality and quantity, review and approval procedures and conditions, maintenance and inspection requirements, and penalties and injunctions. Additionally, the City Standards and

Design Manual contains City-specific minimum standards and design criteria for stormwater management in development and redevelopment projects. POC reductions resulting from projects disturbing less than one acre of land, as well as those from redevelopment projects, are credited towards meeting the City's required POC reductions.

All permanent stormwater management facilities (SMF) installed in the city to satisfy local or state stormwater management requirements are tracked by DPW Engineering staff. A database has been developed that tracks MS4 General Permit required information including type of SMF, geographic location, number of acres treated by the SMF, impaired surface water the SMF discharges into, date the SMF was brought on-line, sixth order hydrologic unit code in which the SMF is located, ownership information, whether the SMF is part of this Action Plan or a Local TMDL Action Plan, existence of a maintenance agreement, and information related to inspections and enforcement actions. The City has a program to ensure regular inspection and maintenance of structural SMFs within the City. New SMFs are added to the inspection program following the construction inspection. City-owned SMFs are inspected annually and non-City owned SMFs are inspected at least once every five years.

Other components of the City's MS4 Program that contribute to meeting the Special Condition requirements include our green stormwater infrastructure retrofit efforts, street sweeping program, land use conversions, and nutrient management plans (above and beyond those required by the MS4 General Permit). The City's illicit discharge detection and elimination program may also provide POC reductions on a case-by-case basis.

The following legal authorities are utilized by the City to ensure compliance with the MS4 General Permit requirements, including the Special Condition:

- City of Charlottesville Water Protection Ordinance
- City of Charlottesville Standards and Design Manual
- City of Charlottesville Land Disturbing Permit
- City of Charlottesville-approved Erosion and Sediment Control Plan
- City of Charlottesville Agreement in Lieu of an Erosion and Sediment Control Plan
- City of Charlottesville Inspection Report
- City of Charlottesville Notice to Comply
- City of Charlottesville Stop Work Order
- City of Charlottesville-approved Final Site Plan
- City of Charlottesville-approved Stormwater Management Plan
- City of Charlottesville Stormwater Management Bond
- City of Charlottesville Stormwater Management Facility Maintenance Agreement
- Virginia Erosion and Sediment Control Law and Regulations
- Virginia Erosion and Sediment Control Handbook
- Virginia General Permit for Discharges of Stormwater from Construction Activities
- Virginia Stormwater Management Law and Regulations
- Virginia Stormwater Management Handbook
- Virginia Stormwater BMP Clearinghouse

2. New or Modified Legal Authority
(*2013 MS4 General Permit Section I.C.2.a.(2)*)
The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition;

(2018 MS4 General Permit Part II.A.11.a)
Any new or modified legal authorities, such as ordinances, permits, policy, orders, specific contract language, and interjurisdictional agreements, implemented or needing to be implemented to meet the requirements of Part II.A.3, A.4, and A.5.

No new or modified legal authorities are required for the City to comply with the requirements of the Special Condition.

3. Means and Methods to Address Discharges from New Sources
(2013 MS4 General Permit Section I.C.2.a.(3))
The means and methods that will be utilized to address discharges into the MS4 from new sources;

The City has and will continue to address discharges from new sources, defined as pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009. New sources will be addressed through the City's local VSMP, which regulates post-construction stormwater management requirements at the state and local level, as described above in *Section 1, Current Program and Existing Legal Authority*. The City's more stringent local ordinance, also described above in *Section 1, Current Program and Existing Legal Authority*, addresses discharges from sources that disturb greater than or equal to 6,000 square feet of land. Since these sources disturb less than one acre, no additional POC offsets are required under the Special Condition. As such, POC reductions resulting from the implementation of eligible BMPs may be counted towards the City's required POC reductions.

4. Estimated Existing Source Loads and Calculated Total Pollutant of Concern (POC) Required Reductions
(2013 MS4 General Permit Section I.C.2.a.(4), (2013 MS4 General Permit Section I.C.2.a.(5) and I.C.5.b.(1)-(2))
An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable [Table/Tables] in this section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate;

A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable [Table/Tables] in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4.

(2018 MS4 General Permit Part II.A.11.b)
The load and cumulative reduction calculations for each river basin calculated in accordance with Part II.A.3, A.4, and A.5.

The following sections of the Action Plan describing the methodologies used by the City to determine our pervious and impervious MS4 regulated area and corresponding required POC reductions are largely excerpted from the *Technical Memo Re: Baseline Data for the City of Charlottesville's Chesapeake Bay TMDL Action Plan* (Timmons Group, 2015), which is included as Appendix A.

Size and Extent of the MS4

The entire jurisdictional area of the City of Charlottesville lies within a 2010 U.S. Census designated urbanized area. As such, the size and extent of the City's MS4 was evaluated within the entire 10.2 square mile City jurisdictional boundary. The City's MS4 regulated land includes all lands owned and operated by the City, and all conveyances and drainage areas served by the City's MS4. The evaluation of regulated land was done using a Geographic Information System (GIS), including various GIS data layers (such as waterways and stormwater drainage infrastructure), topography, 2009 aerial photography from the Virginia Base Mapping Program (VBMP), and corresponding land cover data.

Coordination with Adjacent MS4 Permittees

The City shares jurisdictional boundaries with three other MS4 permittees; the County of Albemarle (County), the University of Virginia (UVA), and the Virginia Department of Transportation (VDOT). To address slight differences between digital maps, the County, UVA, and the City have agreed to use the City's jurisdictional boundary as a common delineation between the permittees' regulated areas. Each permittee has agreed to take responsibility for the POC loads within their regulated area boundary regardless of sheetflow draining to or from another jurisdiction. POC reduction credit for BMPs installed on any lands with inter-jurisdictional sheetflow will be received by the permittee that installs the BMP. The City agreed to include within its regulated area all lands solely owned and operated by the City (parcels and rights-of-way) that lie within the County and UVA. Correspondingly, the County and UVA agreed to include within their respective regulated areas, lands that lie within the City's jurisdictional boundary which they solely own and operate; as such, these lands were excluded from the City's regulated area. These lands are depicted in Figure 1 of Appendix A. GIS files were shared with the County and UVA to ensure all lands were accounted for.

City Owned/Operated Lands

The most recent City parcel data was used to determine parcels and rights-of-way owned/operated by the City. Areas within the City boundary that lack any parcel/right-of way information (ownership voids) were also considered City-owned. In addition, the City owns some parcels within the County's urbanized area. These areas were all considered to be regulated land under the City's MS4 permit.

MS4 Conveyances and Drainage Areas

An existing 2011 City storm sewer outfall mapping study (URS, 2011) was used as the basis in determining the size and extent of the City's MS4. Outfall drainage areas were reviewed and

modified where necessary to include all areas that drain through the City's storm sewer system. All public roadways within the City, with the exception of Interstate 64, are operated by the City. As such, the MS4 area also includes all City road rights-of-way and all lands that drain or sheet flow to those rights-of-way. Piped conveyances of stream flow under public roadways were also considered City MS4 outfalls. Consistent with the definition of "outfall" in 9 VAC 25-870-10, bridges and isolated box culverts were not considered part of the MS4.

Excluded Lands

All lands owned/operated by other MS4 permittees (County, UVA, and VDOT) were excluded from the City's regulated area. Lands regulated under the General VPDES Permit for Stormwater Associated with Industrial Activity (Industrial General Permit) were also excluded. These lands are depicted in Figure 1 of Appendix A. There were no Individual VPDES Permits for stormwater discharges in the City's jurisdictional area. Forested lands were delineated, as discussed below, but not excluded from the regulated area.

2009 Land Cover

The City's land cover as of June 30, 2009 was estimated for four different categories: impervious, pervious, forest, and open water. Raster data from the Rivanna River Basin Commission's (RRBC) 2009 Land Cover Map was processed in GIS to create a polygon feature class for the four land cover types. A quality control assessment was performed for the land cover feature class, comparing it with the 2009 VBMP aerial imagery. The assessment concluded that the total area of forested lands within the City was over-estimated and the total area of impervious was under-estimated by the RRBC Land Cover Map. As such, the City's 2011 impervious cover shapefile was used as the primary data source to classify impervious cover. A second quality control assessment was performed on the 2011 impervious cover, comparing it to the 2009 VBMP aerial imagery to validate impervious cover and remove newer impervious cover associated with development or redevelopment of land between July 1, 2009 and 2011. In addition, railroad track and ballast corridors were added as assumed impervious cover. Forested areas were also reclassified using Virginia Department of Forestry standards. The resulting land cover map can be found as Figure 3 in Appendix A.

Regulated Acreage

Two variations of regulated land acreage were evaluated. The first variation includes all land within the City's jurisdictional boundary, plus all City owned/operated lands outside of the jurisdictional boundary that fall within the urbanized area, and excludes lands owned/operated by other MS4s and those regulated under an Industrial General Permit. This variation is considered conservative by assuming all lands within the City's jurisdictional boundary are regulated. A map of Variation 1 is included as Figure 4 in Appendix A. The second variation, consistent with the Guidance, includes only lands owned/operated by the City and all conveyances and drainage areas of the City's MS4. Similar to Variation 1, this variation excludes lands owned/operated by other MS4s and those regulated under an Industrial General Permit. This variation is considered more prescriptive and in line with the definition of "Regulated Land" per the Guidance. The City opted to use Variation 2 to represent their regulated land, determine their existing source loads, and calculate their required POC reductions. A map of Variation 2 is included as Figure 5 in Appendix A.

Existing Source Loads

The City's existing source loads were calculated using the 2009 land cover data and clipping it to the Regulated Area - Variation 2. Table 2a from the 2013 MS4 General Permit is provided below and as Appendix B, with the total existing acres served by the City's MS4 as of 6/30/09.

MS4 General Permit, Table 2a: Calculation Sheet for Estimating Existing Source Loads for the James River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen	2,079.59	9.39	19,527.35
Regulated Urban Pervious		2,987.34	6.99	20,881.51
Regulated Urban Impervious	Phosphorus	2,079.59	1.76	3,660.08
Regulated Urban Pervious		2,987.34	0.50	1,493.67
Regulated Urban Impervious	Total Suspended Solids	2,079.59	676.94	1,407,757.65
Regulated Urban Pervious		2,987.34	101.08	301,960.33

First Permit Cycle Required POC Reductions

The City's 2013 MS4 General Permit required POC reductions (5% of L2 Scoping Run) were calculated using the 2009 land cover data and clipping it to the Regulated Area - Variation 2. Table 3a from the 2013 MS4 General Permit is provided below and as Appendix C, with the total existing acres served by the City's MS4 as of 6/30/09 and total first permit cycle required POC reductions. Note: the City used the more accurate loading rates included in DEQ's May 18, 2015 Guidance for calculation of our 5% of L2 POC reduction requirements.

MS4 General Permit, Table 3a: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the James River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)
Regulated Urban Impervious	Nitrogen	2,079.59	0.042255	87.87
Regulated Urban Pervious		2,987.34	0.02097	62.64
Regulated Urban Impervious	Phosphorus	2,079.59	0.01408	29.28
Regulated Urban Pervious		2,987.34	0.0018125	5.41

Regulated Urban Impervious	Total Suspended Solids	2,079.59	6.7694	14,077.58
Regulated Urban Pervious		2,987.34	0.442225	1,321.08

The City has achieved the first cycle required POC reductions described above, as documented in Appendix D.

Second Permit Cycle Required POC Reductions

Table 3a from the 2018 MS4 General Permit, Calculation Sheet for Estimating Source Loads and Reduction Requirements for the James River, Lynnhaven, and Little Creek Basins, below calculates the required 40% of L2 cumulative reductions. As the 2010 U.S. Census did not include any expanded urbanized areas for the City, the acres of existing developed lands as of 6/30/2009 remained the same.

Table 3a
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the James River, Lynnhaven, and Little Creek Basins

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	Load(lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading	Percentage of L2 required reduction by 6/30/2023	40% cumulative reduction Required by 6/30/2023 (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	9.39	2,079.59	19,527.35	9%	40%	702.98	1,204
	Regulated urban pervious	6.99	2,987.34	20,881.51	6%	40%	501.15	
Phosphorus	Regulated urban impervious	1.76	2,079.59	3,660.08	16%	40%	234.25	278
	Regulated urban pervious	0.5	2,987.34	1,493.67	7.25%	40%	43.32	
Total suspended solids	Regulated urban impervious	676.94	2,079.59	1,407,757.6	20%	40%	112,620.61	123,189
	Regulated urban pervious	101.08	2,987.34	301,960.33	8.75%	40%	10,568.61	

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.
[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census urbanized area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009.
[3]Column C = Column A x Column B.
[4]Column F = Column C x Column D x Column E.
[5]Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

5. Means and Methods to Meet the Required Reductions and Schedule

(2013 MS4 General Permit Section I.C.2.a.(6))

The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection, and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions;

(2018 MS4 General Permit Part II.A.11.c)

The total reductions achieved as of July 1, 2018 for each pollutant of concern in each river basin.

Appendix D contains a spreadsheet that lists the means and methods that were implemented between July 1, 2009 and the end of the first permit cycle to achieve the required POC reductions for existing development. The spreadsheet demonstrates that the City has exceeded the 5% and 35% (cumulative 40%) of L2 POC reduction requirements with practices that have already been implemented. Specifically, the means and methods included in the Action Plan result in the following percent reductions of the City's total (100%) L2 POC reduction requirements: 64.1% of nitrogen, 100.8% of phosphorus, and 186.8% of total suspended solids as of July 1, 2018. As a result, no additional projects are proposed at this time. In accordance with the Guidance, the City expects that the POC reductions in excess of the 5% and 35% of L2 requirements will be guaranteed at the efficiencies available at the time the Action Plan was submitted to DEQ, and that the excess POC reductions will be applied to L2 POC reduction requirements in subsequent MS4 Permit cycles.

The spreadsheet includes a Summary Ledger that provides the following information:

- Total 5% and 35% of L2 POC reduction requirements for nitrogen, phosphorus, and total suspended solids
- Practices that were implemented by the end of the first permit cycle
- Date of implementation
- Approximate latitude and longitude location for each practice
- Nitrogen, phosphorus, and total suspended solids loads reduced by each practice

All practices included were installed after July 1, 2009. POC reductions were calculated based on the methodologies described and efficiencies provided in the Guidance. In accordance with the Guidance, the City understands that the POC reduction efficiencies available at the time of Action Plan submittal to DEQ will be guaranteed, regardless of downward efficiency adjustments that may occur after the Action Plan is submitted. Consistent with the Guidance, the BMPs that the City is including in the Action Plan have been placed in the following categories, which are further described below:

1. Redevelopment
2. Stricter Development Requirements
3. Oversized BMPs
4. Voluntary Projects (BMPs Applied to Existing Development)
5. Stream Restoration
6. Urban Nutrient Management
7. Street Sweeping

Projects with land disturbance areas equal to or greater than one acre were subject to VSMP requirements for stormwater management. The City reviewed all relevant site plan documentation and utilized the included calculations (file calculations) to determine POC reductions. The calculations on file only provide phosphorus reductions. Eligible phosphorus,

nitrogen, and total suspended solids reductions were determined using the methodology described in Appendix V.E. of the Guidance in combination with best professional judgment.

The City has stricter development requirements that require projects that disturb equal to or greater than 6,000 square feet to implement stormwater management practices. The City has also voluntarily implemented practices that were not required to meet local or state stormwater management requirements. In these instances, the City compared the pollutant reductions from the file calculations with the Virginia Stormwater BMP Clearinghouse (Clearinghouse), Chesapeake Bay Program Retrofit Curves/Equations (Retrofit Curves) and the Chesapeake Bay Program Established Efficiencies (CBP Efficiencies). The Retrofit Curves were utilized to determine total suspended solids reductions when the Clearinghouse efficiencies for phosphorus and nitrogen were used. Upon determination that the practice met all applicable standards and requirements for use of more than one specific methodology, the methodology that produced the most advantageous POC reductions was used.

Redevelopment

The City considers eligible redevelopment projects to be sites that were previously utilized and had impervious areas altered in a manner that resulted in a reduction in post development pollutant loading (L_{post}) when compared to pre development pollutant loading (L_{pre}). This was accomplished through a net reduction in impervious surface and/or implementation of BMPs. The POC reductions considered eligible are the sum of L_{post}-L_{pre} plus additional POC reductions from BMPs. The calculations on file only provide phosphorus reductions. Nitrogen and total suspended solids reductions were determined using the methodology described in Appendix V.E. of the Guidance in combination with best professional judgment. Some of the redevelopment practices included are associated with projects that were required to meet the City's stricter local requirement. In these instances the methodology described above for stricter development requirements and voluntary practices was applied.

Stricter Development Requirements

These projects had land disturbance areas greater than 6,000 square feet but less than an acre and therefore were subject to stricter development controls. The City included the entire reductions associated with the practices given that the practices were not required to comply with VSMP stormwater management requirements.

Oversized BMPs

These projects are associated with land disturbance areas greater than one acre subject to VSMP requirements for stormwater management and that implemented oversized BMPs. The file calculations were used to determine the eligible pollutant reductions for these practices. The difference between the required reductions and the provided reductions was considered eligible.

Voluntary Projects

These practices implemented after July 1, 2009 were not required by state or local stormwater management regulations. The entire POC reductions associated with these practices were considered eligible.

Stream Restoration
Implemented stream restoration projects that are eligible pollutant reduction practices are included. The City used the interim rates developed by the Chesapeake Bay Program to calculate reductions associated with stream restoration projects as described in Appendix V.J of the Guidance. Appendix E provides documentation of the degraded nature of the stream prior to restoration for all included stream restoration projects.

Urban Nutrient Management
Implemented urban nutrient management plans that were developed for public lands one contiguous acre or less are included. POC reductions were calculated using the methodology described in Appendix V.K of the Guidance.

Street Sweeping
POC reductions from the City's street sweeping program were calculated using the qualifying street lanes method described in Appendix V.G, combined with best professional judgment.

The City recognizes that additional practices will be implemented on an ongoing basis as sites are developed and redeveloped, or as retrofit opportunities arise, and will submit an updated Summary Ledger to DEQ with our MS4 Annual Reports. This will provide a mechanism to report implementation of additional projects and update planned POC reductions with calculations based on actual constructed conditions. This reflects an adaptive management approach that the City will employ, and as such the City reserves the right to add, remove, and/or substitute means and methods in this Action Plan as long as the 5% and 35% of L2 POC reduction requirements are achieved.

Additionally, the City submitted to DEQ a complete list, to the maximum extent practicable, of historical water quality BMPs installed prior to June 30, 2013. As a result, and in accordance with the Guidance, the City understands that we received full credit for BMPs that were:

1. Initially installed on or after January 1, 2006 and prior to July 1, 2009, and;
2. Constructed to address water quality within the City's regulated service area.

In accordance with email correspondence from DEQ, the City provided the POC reduction credit achieved by these historical BMPs as part of an Action Plan revision submitted with the MS4 Annual Report on October 1, 2016. The list of historical BMPs for which the City may claim full POC reduction credit has been provided as Appendix F.

6. Means and methods to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014
(2013 MS4 General Permit Section I.C.2.a.(7))

The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall utilize the [applicable table] in this section to develop the equivalent pollutant load for nitrogen and total suspended solids. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.

(2018 MS4 General Permit Part II.A.4)
No later than the expiration date of this permit, the permittee shall offset 40% of the increased loads from new sources initiating construction between July 1, 2009 and June 30, 2019, and designed in accordance with 9VAC25-870 Part II C (9VAC25-870-93 et seq.) if the following conditions apply:
a. The activity disturbs one acre or greater; and
b. the resulting total phosphorus load was greater than 0.45 lb/acre/year, which is equivalent to an average land cover condition of 16% impervious cover.

The City has utilized an average land cover condition of 16% for the design of post-development stormwater management facilities, and as a result there is no requirement under the Special Condition to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2019.

7. Means and methods to offset increased loads from grandfathered projects that begin construction after July 1, 2014
(*2013 MS4 General Permit Section I.C.2.a.(8)*)

The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids.

(2018 MS4 General Permit Part II.A.5)

No later than the expiration date of this permit, the permittee shall offset the increased loads from projects grandfathered in accordance with 9VAC25-870-48 that begin construction after July 1, 2014, if the following conditions apply:
a. The activity disturbs one acre or greater; and
b. the resulting total phosphorus load was greater than 0.45 lb/acre/year, which is equivalent to an average land cover condition of 16% impervious cover.

The City has and will continue to utilize an average land cover condition of 16% for the design of post-development stormwater management facilities for grandfathered projects, and as a result there is no requirement to offset increased loads from grandfathered projects initiating construction after July 1, 2014.

8. A list of future projects, and associated acreage that qualify as grandfathered
(2013 MS4 General Permit Section I.C.2.a.(10))

A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48

The following projects have been approved or had an obligation of locality, state, or federal funding prior to July 1, 2012, but did not receive coverage under the General Permit for Discharges of Stormwater from Construction Activities prior to July 1, 2014:

Route 20 Bridge Replacement – estimated 3.5 disturbed acres

9. An estimate of the expected cost to implement the necessary reductions
(2013 MS4 General Permit Section I.C.2.a.(11))

An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle;

The City has been able to meet and exceed the required 5% and 35% POC reductions with projects that have been brought on-line after July 1, 2009 and prior to the submittal of the Phase II Action Plan. Many of these projects were related to private development and redevelopment activities. As a result, there are no additional expected costs to the City associated with those projects.

10.a Public Comments on Draft Action Plan (GENERAL PERMIT REQUIREMENTS)
(2013 MS4 General Permit Section I.C.2.a.(12))

An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.

The City's Draft Action Plan was posted to the City's official website on June 30, 2015 for solicitation of public comment. A press release, as well as a post on the City's "Green City" Facebook page, regarding the draft Action Plan and the opportunity for public comment was also distributed on June 30, 2015. The Draft Action Plan was also included as a Report on the July 6, 2015 Charlottesville City Council meeting agenda, at which time additional public comment was welcomed. The public comment period continued through July 2015. Two public comments were received and considered by the City.

(2018 MS4 General Permit Part II.A.12)

Prior to submittal of the action plan required in Part II.A.11, the permittee shall provide an opportunity for public comment on the additional BMPs proposed to meet the reductions not previously approved by the department in the first phase Chesapeake Bay TMDL action plan for no less than 15 days.

The opportunity for public comment was not required for the City's Phase II Action Plan, as no additional projects are proposed in the plan.

March 2, 2015

TECHNICAL MEMO

Re: Baseline Data for the City of Charlottesville's Chesapeake Bay TMDL Action Plan

ESTIMATED EXISTING SOURCE LOADS AND CALCULATED TOTAL POC REQUIRED REDUCTIONS

The City of Charlottesville (City) hired Timmons Group to assist with the estimation of the City's existing nitrogen, phosphorus, and total suspended solids source loads and calculation of required pollutants of concern (POC) reductions, in accordance with the Special Condition for the Chesapeake Bay TMDL of the City's MS4 General Permit. The following technical memorandum summarizes the methodology employed to achieve these estimates and calculations. Timmons Group collaborated closely with City staff and utilized the Department of Environmental Quality's Chesapeake Bay TMDL Special Condition Guidance (Guidance) dated August 18, 2014 throughout this project.

SIZE AND EXTENT OF THE MS4

The entire jurisdictional area of the City of Charlottesville lies within a 2010 U.S. Census designated urbanized area. As such, the size and extent of the City's MS4 was evaluated within the entire 10.2 square mile City jurisdictional boundary. The City's MS4 regulated land includes all lands owned and operated by the City, and all conveyances and drainage areas served by the City's MS4. The evaluation of regulated land was done using a Geographic Information System (GIS), including various GIS data layers (such as waterways and stormwater drainage infrastructure), topography, 2009 aerial photography from the Virginia Base Mapping Program (VBMP), and corresponding land cover data.

COORDINATION WITH ADJACENT MS4 PERMITTEES (MOU)

The City shares jurisdictional boundaries with the three other MS4 permittees; the County of Albemarle (County), the University of Virginia (UVA), and the Virginia Department of Transportation (VDOT). The County, UVA, and the City have agreed to use the City's jurisdictional boundary as a common delineation between the permittees' regulated areas. The City agreed to include within its regulated area, all lands solely owned and operated by the City (parcels and rights-of-way) that lie within the County and UVA. Correspondingly, the County and UVA agreed to include within their respective regulated areas, lands

which they solely own and operate; as such, these lands were excluded from the City's regulated area. GIS files were shared with the County and UVA to ensure all lands were accounted for. At the time of issuance of this document, GIS files have not been shared with VDOT. Figure 1 shows the ownership of solely owned and/or operated parcels and ROW for the corresponding MS4 permittees.

CITY OWNED/OPERATED LANDS

The most recent City parcel data (provided by the City) was used to determine parcels and rights-of-way owned/operated by the City (see Figure 1). Areas within the City boundary that lack any parcel/right-of-way information (ownership voids) were also considered City-owned. In addition, the City owns some parcels within the County's urbanized area. These areas were all considered to be regulated land under the City's MS4 permit.

MS4 CONVEYANCES AND DRAINAGE AREAS

An existing 2011 City storm sewer outfall mapping study (URS 2011) was used as the basis in determining the size and extent of the City's MS4. Outfall drainage areas were reviewed and modified where necessary to include all areas that drain through the City's storm sewer system. All public roadways within the City, with the exception of Interstate 64, are operated by the City. As such, the MS4 area also includes all City road rights-of-way and all lands that drain or sheet flow to those rights-of-way. Piped conveyances of stream flow under public roadways were also considered City MS4 outfalls. Consistent with the definition of "outfall" in 9 VAC 25-870-10, bridges and isolated box culverts were not considered part of the MS4. Figure 2 shows the total area served by the City's MS4 conveyances and drainage areas.

EXCLUDED LANDS

All lands owned/operated by other MS4 permittees (County, UVA, and VDOT) were excluded from the City's regulated area. Lands regulated under the General VPDES for Stormwater Associated with Industrial Activity (Industrial General Permit) were also excluded (see Figure 1). There were no Individual VPDES Permits for stormwater discharges. Forested lands were delineated, as discussed below, but not excluded from the regulated area.

2009 LAND COVER

The City's land cover as of June 30, 2009 was estimated for four different categories: impervious, pervious, forest, and open water. Raster data from the Rivanna River Basin Commission's (RRBC) 2009 Land Cover Map was processed in GIS to create a polygon feature class for the four land cover types. A quality control assessment was performed for the land cover feature class, comparing it with the 2009 VBMP aerial imagery. The assessment concluded that the total area of forested lands within the City was over-estimated and the total area of impervious was under-estimated by the RRBC Land Cover Map. As such, the City's 2011 impervious cover shapefile was used as the primary data source to classify impervious cover. A second quality control assessment was performed on the 2011 impervious cover, comparing it to the 2009 VBMP aerial imagery to validate impervious cover and remove newer impervious cover associated with development or redevelopment of land between 2009 and 2011. In addition,

Figure 1: MS4 Ownership

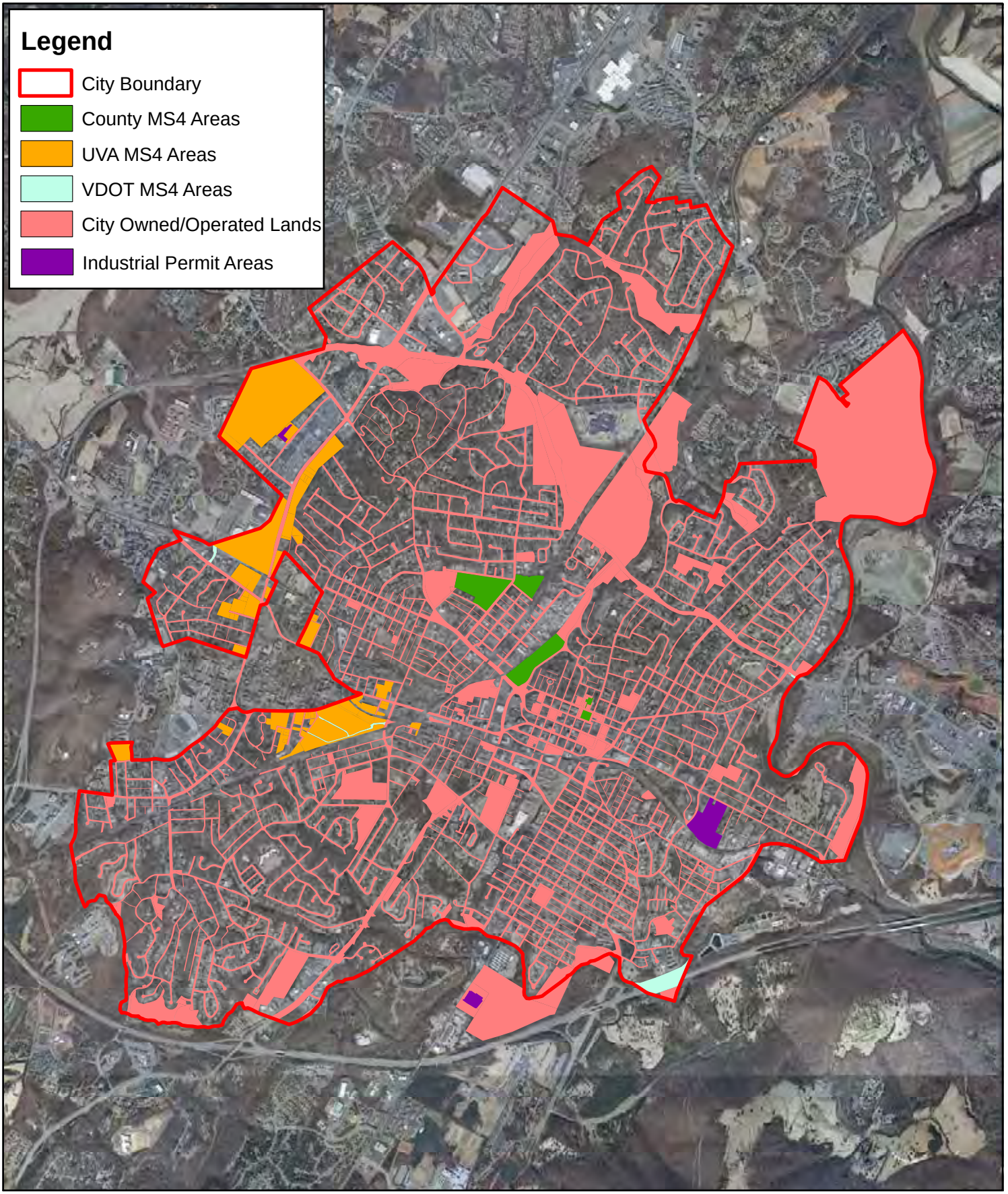
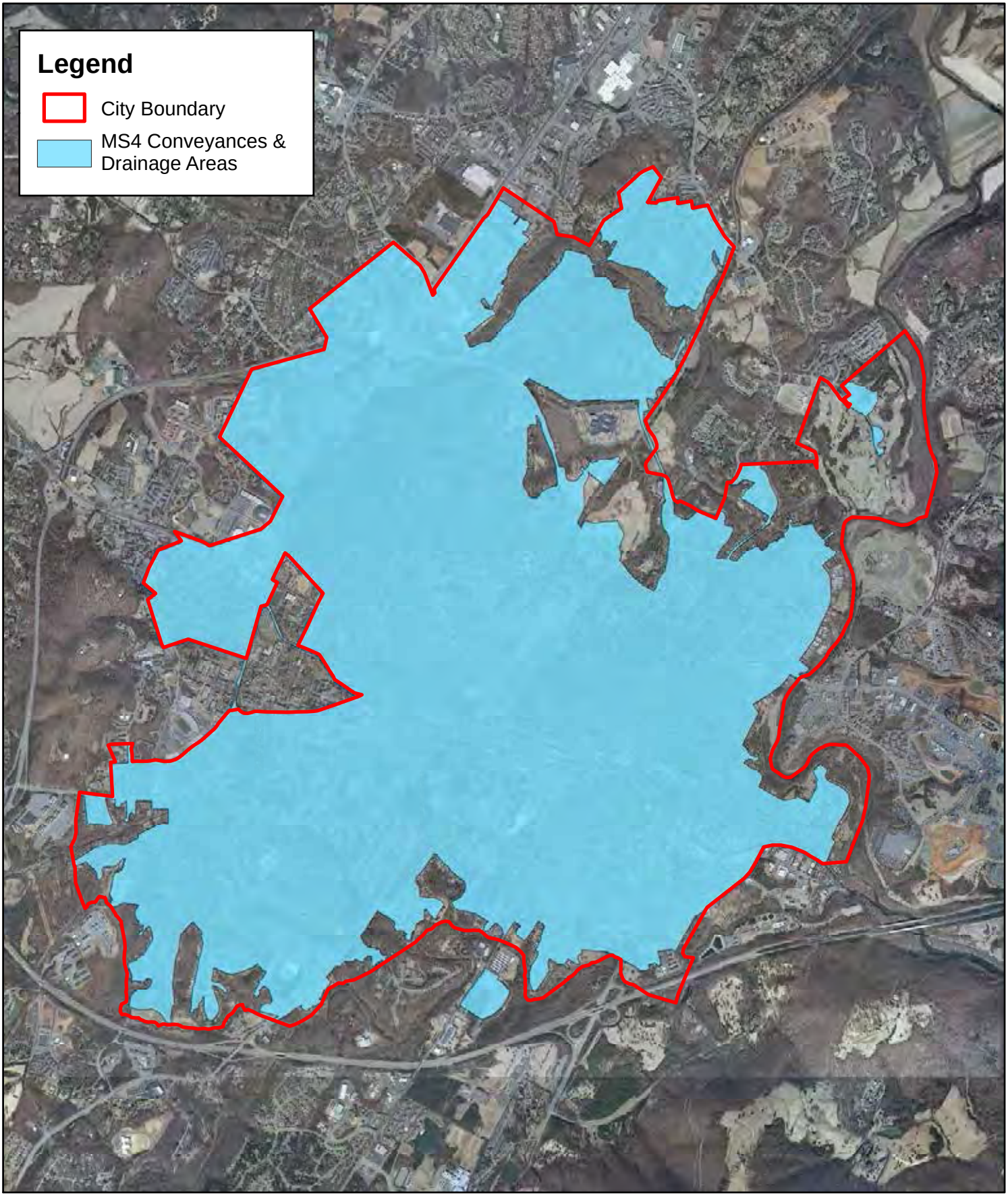


Figure 2: MS4 Conveyances and Drainage Areas



railroad track and ballast corridors were added as assumed impervious cover. Forested areas were also reclassified using the Virginia Department of Forestry standards:

> *The minimum area for classification as forest is 1 acre with a minimum width of 120 feet stem-to-stem. Forested strips must be at least 120 feet wide for a continuous length of at least 363 feet in order to meet the 1 acre minimum. Unimproved roads, trails, and other clearings in forest areas are classified as forest if less than 120 feet wide or smaller than 1 acre.*

Figure 3 shows the resultant land cover conditions and total acreages.

REGULATED ACREAGE

Two variations of regulated land acreage were evaluated for the City. The first variation includes all land within the City's jurisdictional boundary, plus all City owned/operated lands outside of the jurisdictional boundary that fall within the urbanized area, and excludes lands owned/operated by other MS4s and those regulated under an Industrial General Permit. This variation is considered conservative by assuming all lands within the City's jurisdictional boundary are regulated. Figure 4 shows the extents of Regulated Area – Variation 1.

The second variation, consistent with the Guidance, includes only lands owned/operated by the City and all conveyances and drainage areas of the City's MS4. Similar to Variation 1, this variation excludes lands owned/operated by other MS4s and those regulated under an Industrial General Permit. This variation is considered more prescriptive and in line with the definition of "Regulated Land" per the Guidance.

Figure 5 shows the extents of Regulated Area – Variation 2.

The resultant regulated areas and land cover conditions for these two variations are provided in Table 1.

Table 1: Comparison of Regulated Area Variations

Land Cover	Variation 1 (Acres)	Variation 2 (Acres)
Impervious	2,188.65	2,079.59
Pervious	3,263.93	2,987.34
Forest	899.43	634.49
Open Water	39.69	31.02
Total Acreage	**6,391.7**	**5,732.44**

Variation 2 represents a 10% reduction in total regulated area. The City opted to use Variation 2 to represent their regulated land, determine their existing source loads, and calculate their required POC reductions.

Figure 3: 2009 Land Cover

Land Cover	Acreage	%
Impervious	2299.88	34%
Pervious	3395.77	51%
Forest	951.73	14%
Open Water	43.06	1%
Total Acreage*	**6690.44**	

*includes lands owned/operated by City outside of jurisdictional boundary

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS

0 0.25 0.5 1 1.5 2 Miles

N

Figure 4: Regulated Area - Variation 1

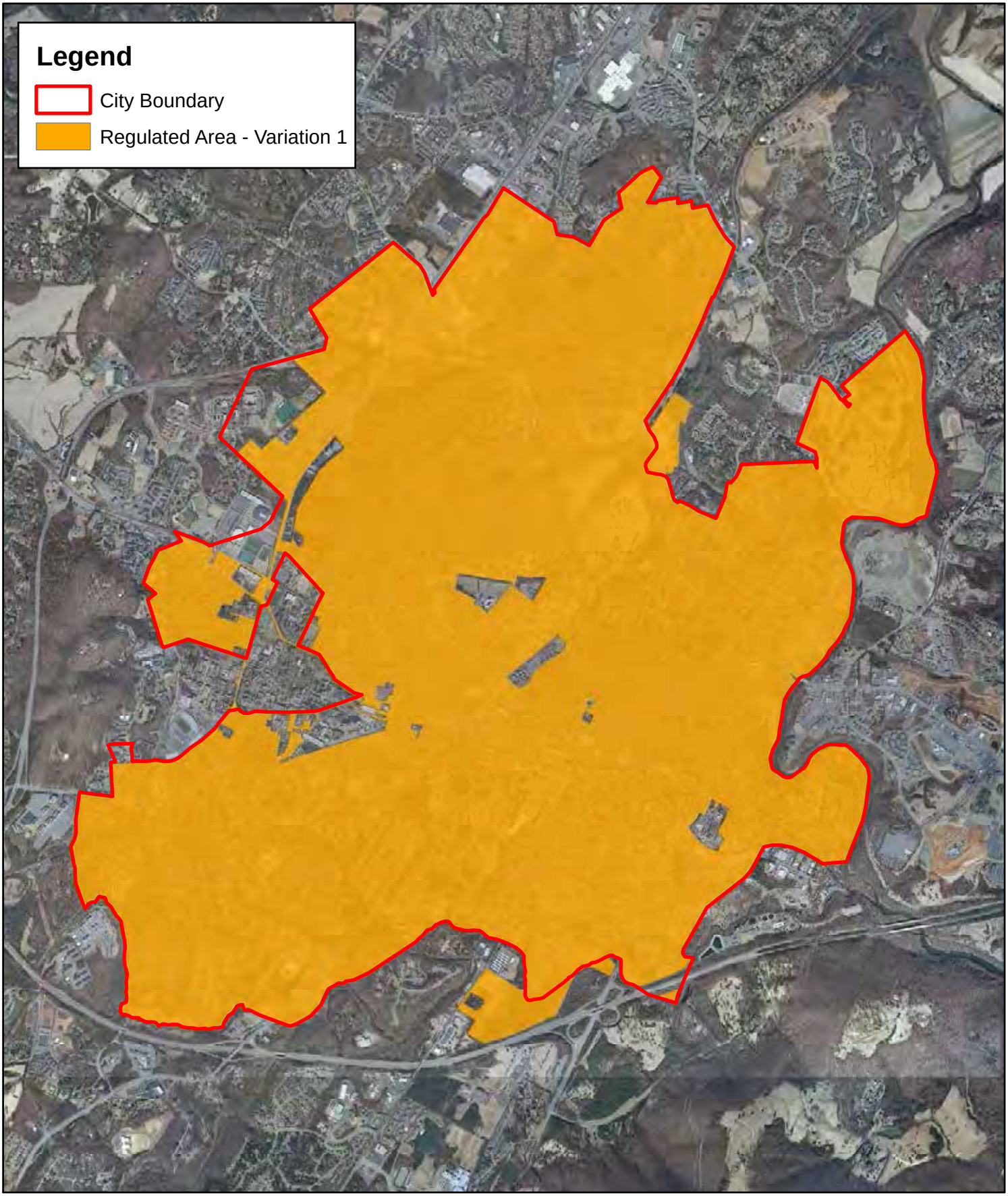
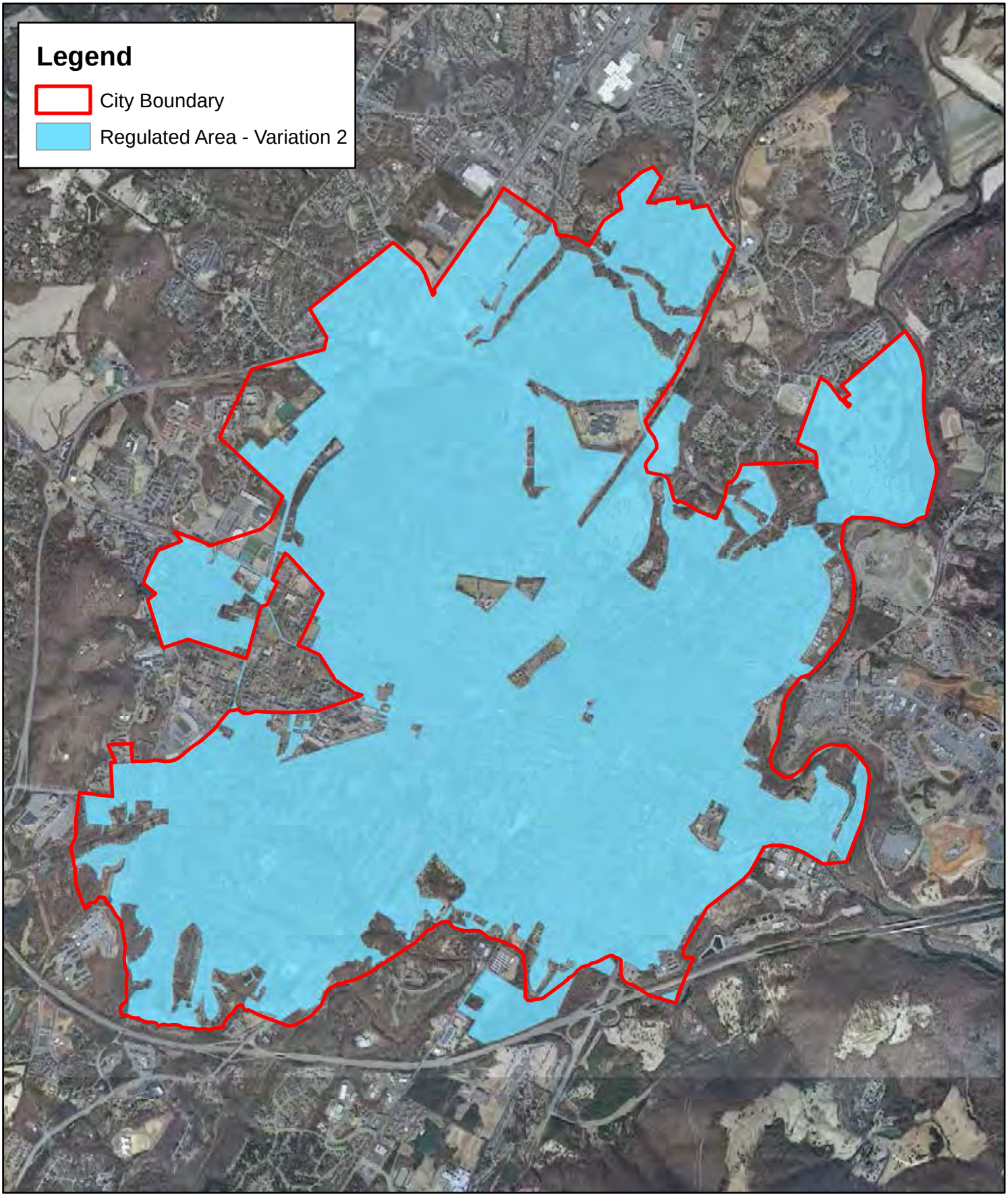


Figure 5: Regulated Area - Variation 2



Appendix B

MS4 General Permit, Table 2a: Calculation Sheet for Estimating Existing Source Loads for the James River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen	2,079.59	9.39	19,527.35
Regulated Urban Pervious		2,987.34	6.99	20,881.51
Regulated Urban Impervious	Phosphorus	2,079.59	1.76	3,660.08
Regulated Urban Pervious		2,987.34	0.50	1,493.67
Regulated Urban Impervious	Total Suspended Solids	2,079.59	676.94	1,407,757.65
Regulated Urban Pervious		2,987.34	101.08	301,960.33

Appendix C

MS4 General Permit, Table 3a: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the James River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)
Regulated Urban Impervious	Nitrogen	2,079.59	0.042255	87.87
Regulated Urban Pervious		2,987.34	0.02097	62.64
Regulated Urban Impervious	Phosphorus	2,079.59	0.01408	29.28
Regulated Urban Pervious		2,987.34	0.0018125	5.41
Regulated Urban Impervious	Total Suspended Solids	2,079.59	6.7694	14,077.58
Regulated Urban Pervious		2,987.34	0.442225	1,321.08

Table 3a
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the James River, Lynnhaven, and Little Creek Basins

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	Load(lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading	Percentage of L2 required reduction by 6/30/2023	40% cumulative reduction Required by 6/30/2023 (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	9.39	2,079.59	19,527.35	9%	40%	702.98	1,204
	Regulated urban pervious	6.99	2,987.34	20,881.51	6%	40%	501.15	
Phosphorus	Regulated urban impervious	1.76	2,079.59	3,660.08	16%	40%	234.25	278
	Regulated urban pervious	0.5	2,987.34	1,493.67	7.25%	40%	43.32	
Total suspended solids	Regulated urban impervious	676.94	2,079.59	1,407,757.6	20%	40%	112,620.61	123,189
	Regulated urban pervious	101.08	2,987.34	301,960.33	8.75%	40%	10,568.61	

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.

[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census urbanized area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009.

[3]Column C = Column A x Column B.

[4]Column F = Column C x Column D x Column E.

[5]Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

City Of Charlottesville Chesapeake Bay TMDL Action Plan
Appendix D

Summary Page Ledger:

Management Practices and Retrofit Programs to Achieve 5% and 35% Reductions Required For Existing Development

		Location (Lat/Long)	Date of Implementation	Nitrogen	Phosphorus	Total Suspended Solids
1. Total 5% Reductions Required				150.52	34.70	15,398.65
2. Total 35% Reductions Required				1,053.57	242.83	107,790.62
3. Total Cumulative (40%) Reductions Required				1,204.09	277.53	123,189.27
4. Reduction Practices Implemented / To be Implemented						
Site Name	BMP Type					
ABC Preschool	Bioretention	38.0286/-78.4726	FY13	-1.75	-0.25	-89.56
Saint Thomas Aquinas Priory	8'x4' Filterra	38.0386/-78.5163	FY13	-0.04	-0.01	-5.38
Saint Thomas Aquinas Priory	Bioretention	38.0388/-78.5157	FY13	-2.03	-0.31	-110.92
Cabell Ave Apartments	4'x6' Filterra	38.0419/-78.4966	FY13	-0.03	-0.01	-4.03
Brody Jewish Student Center	Bioretention	38.0426/-78.5021	FY11	-1.34	-0.24	-92.51
Brody Jewish Student Center	Bioretention	38.0428/-78.5019	FY11	-0.72	-0.12	-45.38
Kroger Fueling Center	4'x6' Filterra	38.0599/-78.4928	FY12	-0.03	-0.01	-4.12
Jaunt Parking Lot	Permeable Pavers	38.0151/-78.4705	FY13	-2.61	-0.51	-205.46
1600 Monticello Ave.	Raintank Infiltration	38.0164/-78.4756	After 7/1/09	-1.20	-0.24	-102.89
601 Park Street	Bioretention	38.0348/-78.4762	FY13	-3.55	-0.50	-174.10
1327 Carlton Ave	Bioretention	38.0214/-78.4666	FY12	-0.74	-0.22	-100.86
Brookwood	Bioretention	38.0168/-78.4941	After 7/1/09	-2.36	-0.40	-149.72
Rives Park	Bioretention	38.0173/-78.4707	After 7/1/09	-1.12	-0.07	-103.50
Meade Park Aquatic Center	2 Bioretention Areas	38.0279/-78.4654	FY11	-4.28	-0.30	-395.98
Whole Foods	Sand Filter	38.06/-78.4884	FY11	-0.10	-0.04	-16.98
CHS Stadium Improvements	Bioretention	38.052/-78.4712	After 7/1/09	-4.44	-0.44	-451.03
Hydraulic Road Substation	Filterra & Biopave	38.058/-78.4904	After 7/1/09	0.00	-1.54	0.00
Sunrise Park	Permeable Pavement	38.0208/-78.467	After 7/1/09	-11.25	-0.52	-1,141.25
Fontaine Fire Station	2 Bioretention Areas	38.0259/-78.5198	After 7/1/09	0.00	-0.16	0.00
Arlington & Millmont Apartments	Dry Swale	38.0496/-78.5058	FY14	0.00	-0.65	0.00
	4'x6' Roof Drain Filterra	38.04978/-78.50564	FY14			
	4'x6' Roof Drain Filterra	38.0504/-78.50507	FY16			
Wertland Street	2 BaySavers	38.0354/-78.4959 38.0352/-78.495	FY14	0.00	-0.56	0.00
Smith Aquatic Center	Biofilter-1	38.0276/-78.4975	FY11	-3.21	-0.45	-571.56
	Biofilter-2 + Rain Garden	38.0271/-78.4972	FY11			
Boys & Girls Club	Biofilter	38.0273/-78.4983	FY11	-2.17	-0.37	-220.06
250 Bypass@McIntire Rd.	Enhanced Ext. Detention	38.04505/-78.47251	FY16	0.00	-1.77	0.00
	Bioretention #1	38.04328/-7847466	FY16			
	Bioretention #2	38.04119/-78.47637	FY16			
	11 - Filterras	38.04254/-78.4746	FY16			
CTS OPERATIONS CENTER	SWM#1 Bioretention	38.0126/-78.4878	FY10	0.00	-0.39	0.00
	SWM#2 Bioretention	38.0122/-78.488	FY10			
	SWM#3 Bioretention	38.0119/-78.4875	FY10			
	SWM#4 Underground Storage	38.0114/-78.4872	FY10			
	SWM#5 Extended Detention	38.0118/-78.4861	FY10			
	SWM#6 Bioretention	38.0123/-78.4875	FY10			
	SWM#7 Bioretention	38.0129/-78.4873	FY10			
	SWM#8 Bioretention	38.0132/-78.4873	FY10			
	SWM#9 Rainwater Harvesting	38.0122/-78.4876	FY10			
Jefferson School	Enhanced Ext. Detention	38.0322/-78.4864	FY13	-6.77	-2.04	-1,559.86
Martha Jefferson	Bioswale	38.0322/-78.4718	FY17	-37.19	-2.18	-3,387.40
Pace Center	Water Quality Swale	38.0214/-78.4652	FY14	-6.66	-1.28	-538.75
	Bioretention	38.0213/-78.4649	FY14			
Retail at Barracks Road	4'x6' Filterra	38.0497/-78.5026	FY14	-0.14	-0.03	-12.51
600 Preston Place	Permeable Pavers	38.0411/-78.4982	FY13	-1.23	-0.21	-80.62
	Raintank Drywell	38.041/-78.4983	FY13			
Blue Moon Fund	Bioretention	38.0296/-78.484	FY11	-1.57	-0.28	-105.86
	Cistern to Vegetated Swale	38.0295/-78.4841	FY11			
	Infiltration	38.0296/-78.484	FY11			
CHS MLK	Bioretention	38.053/-78.4772	FY10	-23.31	-0.74	-1,364.53
Rugby Road	Permeable Pavers	38.05472/-78.49006	FY10	-1.60	-0.22	-76.02
Azalea Park	Constructed Wetland	38.0105/-78.5132	FY13	-93.78	-12.01	-6,719.67
CHS Parking Lot	Permeable Pavement + Vegetated Filter Strip	38.0512/-78.4751	FY17	-13.28	-0.39	-952.01
909 E. Market	Permeable Asphalt	38.0298/-78.4746	FY16	-0.34	-0.08	-31.61
Old Lynchburg Road	Bioretention	38.0171/-78.5147	FY14	-5.89	-0.96	-371.83
Forest Hills Park	Bioretention	38.0231/-78.4975	FY17	-52.31	-6.41	-2,040.34
Venable Bioretention	Bioretention	38.0381/-78.4959	FY16	-2.59	-0.53	-214.86
Plaza on West Main	MTD Vortex	38.0319/-78.4934	FY16	-1.14	-0.47	-92.60
Residence Inn	Sand Filter	38.0310/-78.4855	FY16	-5.01	-0.23	-786.24
Coca Cola Building	Permeable Pavers	38.0356/-78.4873	FY16	-3.97	-0.57	-825.38
Blue Ridge Commons	Bioretention	38.0234/-78.4944	FY16	-0.05	-0.02	-9.26
City Hall Green Roof	Green Roof	38.0299/-78.4773	2008	-1.58	-0.31	-135.05
1012 Druid Ave	Bioretention	38.0167/-78.4772	2007	-1.03	-0.14	-46.50
Pen Park	Bioretention	38.0548/-78.4536	2006	-15.45	-2.24	-900.80
Willoughby	Bioretention	38.0158/-78.4994	2007	-17.96	-3.02	-1,139.32
Woolen Mills Self Storage	Ext. Detention Pond	38.0229/-78.4625	2007	-46.77	-10.74	-4,818.15
Rock Creek	Stream Restoration	38.02317/-78.50182	FY17	-19.84	-17.99	-11,870.76
Meadowcreek Golf Course	Stream Restoration	38.05582/-78.44941	2010	-12.75	-11.56	-7,629.60
Meadow Creek	Stream Restoration	38.06384/-78.47599	2013	-541.40	-488.54	-320,496.92

Summary Page Ledger:

Management Practices and Retrofit Programs to Achieve 5% and 35% Reductions Required For Existing Development

		Location (Lat/Long)	Date of Implementation	Nitrogen	Phosphorus	Total Suspended Solids
1. Total 5% Reductions Required				150.52	34.70	15,398.65
2. Total 35% Reductions Required				1,053.57	242.83	107,790.62
3. Total Cumulative (40%) Reductions Required				1,204.09	277.53	123,189.27
4. Reduction Practices Implemented / To be Implemented						
Site Name	BMP Type					
Pen Park	Urban Nutrient Management	38.05494/-78.45036	FY18	-0.39	-0.01	0.00
Washington Park	Urban Nutrient Management	38.04138/-78.49126	FY18	-0.53	-0.02	0.00
Venable School	Urban Nutrient Management	38.03732/-78.49577	FY18	-0.59	-0.02	0.00
Azalea Park	Urban Nutrient Management	38.01057/-78.51649	FY18	-0.52	-0.02	0.00
Quarry Park	Urban Nutrient Management	38.01471/-78.4771	FY18	-0.22	-0.01	0.00
Quarry Park	Urban Nutrient Management	38.015/-78.4777	FY18	-0.45	-0.02	0.00
Quarry Park	Urban Nutrient Management	38.01497/-78.47657	FY18	-0.32	-0.01	0.00
Burnley Moran School	Urban Nutrient Management	38.03497/-78.46253	FY18	-0.36	-0.01	0.00
Charlottesville High School	Urban Nutrient Management	38.05279/-78.47378	FY18	-0.30	-0.01	0.00
Street Sweeping	Street Sweeping	City Wide	FY18	-970.67	-126.06	-204,848.48
5. Total Reductions Implemented / To be Implemented				-1,930.93	-699.46	-575,040.23
6. Total Reductions In Excess of 40% Reductions Required				(726.84)	(421.94)	(451,850.96)

Appendix E

Rock Creek Stream Restoration Project

The Rock Creek Stream Restoration Project exhibited moderate to severe streambank erosion along the left bank (looking downstream) of the project reach. Given that the streambed and right bank were relatively stable, the City is calculating credits for this project by dividing the entire length of the restored reach by two and using the resulting length, representing the equivalent of one bank or half the stream to apply the interim rates to and calculate the POC reductions. The following photos document the degraded condition of the left streambank.

Meadowcreek Golf Course Stream Restoration Project

The Meadowcreek Golf Course Stream Restoration Project exhibited severe streambank erosion, bed degradation, and moderate to severe incision. The following photos document the degraded condition of the stream.

Meadow Creek Stream Restoration Project

The Meadow Creek Stream Restoration Project is a Virginia Aquatic Resources Trust Fund project completed in partnership with the City, largely on City land. Meadow Creek exhibited severe streambank erosion, lateral instability, streambed instability, moderate to severe incision, and degraded riparian buffer conditions. The following photos document the degraded condition of the stream.

Appendix F: Historical Water Quality Best Management Practice Data

Practice Description			Practice Treatment: Area OR Amount Applied			Practice Location			
Date Installed	BMP Name	Practice Description	Total Acres Treated	Impervious Acres Treated	Measurement Unit	County Name	HUC12	Latitude	Longitude
2008	Charlottesville City Hall	Green Roofs	0.16	0.16	acres	Charlottesville	020802040401	38.0300	-78.4773
2008	Charlottesville City Hall	Green Roofs	0.20	0.20	acres	Charlottesville	020802040401	38.0298	-78.4774
2008	1901 Chesapeake St - Rivers Edge Development	Vegetated Open Channels, C/D Soils, no underdrain	18.31	3.47	acres	Charlottesville	020802040401	38.0235	-78.4553
2007	1012 Druid Av	Bioretention, underdrain, C/D soils	1.05	0.53	acres	Charlottesville	020802040402	38.0166	-78.4772
2007	156 Carlton Rd - Meade Carlton Center	Bioretention, underdrain, C/D soils	0.75	0.57	acres	Charlottesville	020802040401	38.0247	-78.4681
2006	1400 Pen Park Rd - Pen Park	Bioretention, underdrain, C/D soils	1.66	1.00	acres	Charlottesville	020802040401	38.0548	-78.4537
2007	1619-1625 Brandywine Dr	Bioretention, underdrain, C/D soils	17.25	3.43	acres	Charlottesville	020802040401	38.0603	-78.4848
2007	Harris Road - Willoughby Townes	Dry Extended Detention Ponds	3.49	1.78	acres	Charlottesville	020802040402	38.0158	-78.4995
2007	131 Franklin St - Woolen Mills Storage	Dry Extended Detention Ponds	8.02	5.09	acres	Charlottesville	020802040401	38.0228	-78.4625