FINAL
Chesapeake Bay Phase II
Total Maximum Daily Load Action Plan

JBLE-Langley Virginia

Permit Year 3: 1 July 2020 - 30 June 2021

JBLE-Langley
633 CES/CEIE
37 Sweeney Blvd
JBLE-Langley VA 23665

October 2021

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633 CES/CEIE	633d Civil Engineer Squadron / Environmental Element
ABW	Air Base Wing
ACC	Air Combat Command
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
BMP	Best management practice
CFR	Code of Federal Regulations
EOS	Edge of Stream
EPA	Environmental Protection Agency
GIS	Geographical information system
HSG	Hydrologic soil group
JBLE–Langley	Joint Base Langley Eustis – Langley Air Force Base
L2	Level 2
lbs/ac/yr	Pounds per acre per year
lbs/yr	Pounds per year
lbs/ft/yr	Pounds per foot per year
MCM	Minimum control measure
MS4	Municipal Separate Storm Sewer System
NACA	National Advisory Council for Aeronautics
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
POC	Pollutant of concern
TMDL	Total Maximum Daily Load
TN	Total nitrogen
TP	Total phosphorous
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
VGIN	Virginia Geographic Information Network
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WIP	Watershed Implementation Plan

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Chesapeake Bay TMDL Action Plan Requirements Cross-Reference Table		
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1.0 INTRODUCTION

1.1 Purpose and Objective

In 2010, the United States Environmental Protection Agency (EPA) established the Chesapeake Bay Total Maximum Daily Load (TMDL) to address excess nitrogen, phosphorus and total suspended solids (pollutants of concern or POCs) in the bay (EPA, 2010). A TMDL is the maximum amount of a pollutant that a water body can assimilate and still support its designated use. The Chesapeake Bay watershed encompasses over 64,000 square miles across the District of Columbia and large sections of Delaware, Maryland, New York, Pennsylvania, West Virginia and Virginia.

In the Phase I and Phase II Chesapeake Bay Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL, the Commonwealth of Virginia committed to a phased approach to reducing nutrients and suspended solids discharging from Municipal Separate Storm Sewer Systems (MS4). Section I.D of the Joint Base Langley Eustis – Langley Air Force Base (JBLE–Langley) MS4 permit (Permit No. VAR040140, effective 01 November 2018) requires the base to prepare a Chesapeake Bay TMDL Action Plan that demonstrates future plans to meet the required nutrient and suspended solids reductions. The plan must be submitted to the Virginia Department of Environmental Quality (VDEQ) for review and approval.

The Action Plan is an annual report on the progress made by the base in meeting the Chesapeake Bay TMDL pollutant reduction requirements, specifically the Level 2 (L2) scoping run as specified in the 2010 Phase I WIP (VDEQ, 2010). The L2 reductions are to be met in phases corresponding to the permit cycles, as outlined in Table 1-1.

Table 1-1. Pollutant Percent Reduction Requirements by Permit Cycle

Permit Cycle	Timeframe	Cycle Percent Reduction	Cumulative Percent Reduction
1	2013-2018	5%	5%
2	2018-2023	35%	40%
3	2023-2028	60%	100%

The Action Plan presents the JBLE–Langley estimated load contribution, required load reductions and pollutant reduction credits. The plan also reports progress made toward meeting the 35% pollutant reduction requirement (cumulative 40% pollutant reduction) for the second permit cycle. The methodology used to calculate the pollutant loads and credits is based on VDEQ Guidance Memo No. 20-2003 (Guidance Document) (VDEQ, 2021a).

1.2 Installation Description

JBLE–Langley is located on the Chesapeake Bay in the southern end of the lower Virginia peninsula, just north of the City of Hampton, Virginia and south of the City of Poquoson, Virginia (Figure 1-1). JBLE–Langley is the oldest continuously active air base in the United States and is home to the 633d Air Base Wing (ABW), Headquarters Air Combat Command (ACC), the 480th Intelligence Wing and other tenant units. The 633d ABW flies the F-22A Raptor and T-38 aircraft.

In 1916, the National Advisory Council for Aeronautics (NACA), the predecessor to the National Aeronautics and Space Administration (NASA), established a joint proving ground for Army, Navy and NACA aircraft. In 1917, the site was designated Langley Field in honor of one of the early pioneers of flight, Samuel Pierpont Langley.

At the outbreak of World War II, Langley took on a new mission – to develop special detector equipment used in anti-submarine warfare. Langley units were pivotal in the sinking of enemy submarines off the United States coast during the war. On 25 May 1946, the Headquarters of the newly formed Tactical Air Command was established at Langley. The Command's mission was to organize, train, equip and maintain combat-ready forces capable of rapid deployment to meet the challenges of peacetime air sovereignty and wartime air defense. In January 1948, Langley Field officially became Langley Air Force Base (AFB). Today, the host unit is the 633d ABW, with the mission of maintaining combat capability for rapid global deployment to conduct air superiority operations. On 01 June 1992, JBLE–Langley became the Headquarters of ACC, as Tactical Air Command was deactivated as part of the Air Force's restructuring. Langley AFB became a joint-base with Fort Eustis on 01 October 2010, forming Joint Base Langley Eustis.

1.3 Plan Organization

This TMDL Action Plan is organized into the following sections:

- Section 1.0 presents an overview of the plan purpose and objective, installation description and plan organization.
- Section 2.0 describes the JBLE–Langley industrial and MS4 stormwater programs.
- Section 3.0 discusses the JBLE–Langley MS4 service area.
- Section 4.0 provides the load reduction calculations.
- Section 5.0 discusses the pollutant credit calculations.
- Section 6.0 provides a summary of load reductions and credits for the second cycle.
- Section 7.0 discusses the public notice process.
- Section 8.0 contains a list of references used during preparation of this plan.

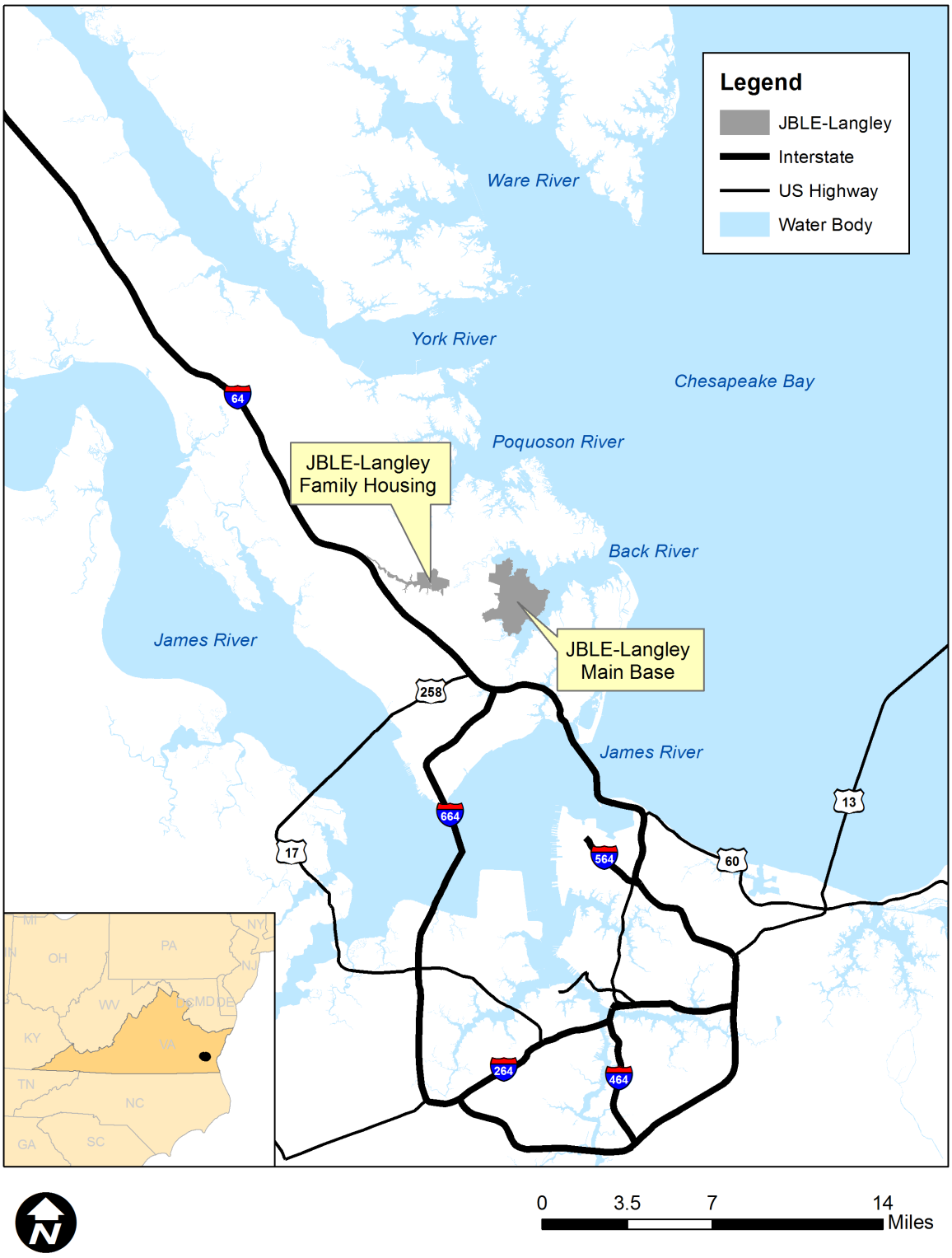

Figure 1-1. Site Location Map, JBLE–Langley

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2.0 STORMWATER PROGRAM OVERVIEW

JBLE–Langley is authorized to discharge stormwater from the installation in accordance with two permits issued by the VDEQ as discussed in the subsections below.

2.1 Industrial Stormwater Program Overview

In November 1990, federal stormwater discharge requirements (known as the Phase I National Pollutant Discharge Elimination System [NPDES] Program) were promulgated as part of the NPDES under the Clean Water Act (55 Federal Register 48062-48901). These regulations, as stated in Title 40 of the Code of Federal Regulations (CFR) Parts 122, 123 and 124, require the owners of "facilities that discharge stormwater associated with industrial activity" to apply for a stormwater permit if stormwater is discharged to (1) waters of the United States or (2) MS4s.

NPDES permits are issued either by a United States EPA Regional office or by states that have been granted NPDES permitting authority. JBLE–Langley is located in the Commonwealth of Virginia, which has NPDES permitting authority. VDEQ administers the commonwealth's NPDES program and issues Virginia Pollutant Discharge Elimination System (VPDES) permits. The VDEQ requirements for stormwater permitting are located in the Virginia Administrative Code (VAC) 9VAC25 and are not substantially different from the federal guidelines contained in 40 CFR 122.

A facility is subject to the regulations only if its activities fit the definition of "industrial" as specified by the 11 categories in 40 CFR 122.26(b)(14)(i)-(xi). The industrial stormwater VPDES permit issued to JBLE–Langley (Permit No. VAR052285, effective 01 July 2014), incorporates the definition of industrial activity from 40 CFR 122.26. The primary industrial activities of JBLE–Langley fall within the following sectors: 1) air transportation 2) scrap and waste recycling facilities, material recovery facilities and 3) transportation and warehousing. VPDES Permit No. VAR052285, issued to JBLE–Langley, includes specific stormwater management requirements for each of these three sectors.

2.2 MS4 Program Overview

Discharges from MS4s are regulated under the Virginia Stormwater Management Act, the Virginia Stormwater Management Program (VSMP) Permit regulations and the Clean Water Act as point source discharges. MS4 regulations were developed and implemented in two phases. Implementation of the first phase began in the early 1990s and required that operators of MS4s serving populations of greater than 100,000 people (per the 1990 decennial census) apply for and obtain a permit to discharge stormwater from their outfalls. The second phase of MS4 regulations became effective 23 March 2003 and required that operators of small MS4s in "urbanized areas" (as defined by the latest census) obtain a permit to discharge stormwater from their outfalls.

VDEQ issued MS4 Permit No. VAR040140 to JBLE–Langley which became effective on 03 August 2017 and expired on 30 June 2018 (VDEQ, 2017); however, it was administratively continued until the issuance of the new permit. The reissuance of the permit for the second permitting cycle became effective on 01 November 2018 and expires on 31 October 2023. The permit requires JBLE–Langley to develop, implement, and enforce an MS4 Program designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable to protect water quality. The permit requires the base to implement six minimum control measures (MCM) as follows:

- MCM 1: Public education and outreach on stormwater impacts
- MCM 2: Public involvement/participation
- MCM 3: Illicit discharge detection and elimination
- MCM 4: Construction site stormwater runoff control
- MCM 5: Post-construction stormwater management in new development and development on prior developed lands
- MCM 6: Pollution prevention/good housekeeping for municipal operations

In addition to implementing these MCMs, Part II, *TMDL Special Conditions*, of the MS4 Permit No. VAR040140 requires JBLE–Langley to prepare a Chesapeake Bay TMDL Action Plan that demonstrates future plans to meet the required nutrient and suspended solids reductions.

Each year the base submits to VDEQ an MS4 Annual Report documenting progress toward implementing the MCMs and special conditions identified in the installation MS4 Program Plan.

3.0 MS4 SERVICE AREA

A determination of the base pollutant load requires an estimate of the area served by the permittee's MS4 as of 30 June 2009. This was accomplished by creating a geographic information system (GIS) land cover shapefile based on 2009 aerial imagery obtained from the Virginia GIS Clearinghouse (Virginia Geographic Information Network [VGIN], 2009). The following land cover types were manually delineated across the entire base: impervious, pervious, forest, agriculture (a six-acre horse pasture), natural areas (mostly tidal wetlands and marshes) and open water. Impervious areas included buildings, roads, parking lots, sidewalks, railroads, and airfield runways. Pervious areas included turf and landscaped areas. Forested lands included trees with a minimum diameter at breast height (varying according to tree population density) and a minimum contiguous area of 30 meters x 30 meters, as specified in the Guidance Document.

The MS4 service area was conservatively classified as impervious (regulated urban impervious) or pervious (regulated urban pervious). The base is fully covered by the 2010 U.S. Census urban area, so no adjustment to the MS4 service area due to non-overlapping U.S. Census urban area was required. A desktop review of the base topography revealed no receiving/exporting sheet flow runoff from/to an adjacent permittee, so no adjustment to the MS4 service area was necessary.

The Guidance Document allows for land covered under another VPDES permit to be excluded from the MS4 service area. Portions of the base were covered under the new industrial permit VAR052285 as of 01 July 2019. The industrial drainage areas covered under permit VAR052285 were delineated to account for this area. Under the new permit, outfalls 024, 050, and 083, comprising 356.6 acres in total, were reclassified from industrial to MS4 area. Both the MS4 service area boundary and the Industrial VPDES permit boundary were updated to reflect this permitting change. The industrial and MS4 drainage area boundaries were applied to both the 2009 and 2021 land covers during the delineation process.

The land cover delineation process outlined above was repeated using the 2019 basemap imagery available from ArcGIS (ESRI, 2019). The 2019 ArcGIS basemap imagery was chosen to develop the 2021 land cover layer because it is the most recent data available. The 2021 land cover layer was then combined with the industrial layer to identify "unregulated areas." The final 2021 land cover layer was used to calculate loads due to New Sources (see Section 4.2) and BMP credits (see Section 5.0). A summary of the base's land cover is presented in Table 3-1.

Table 3-1. Land Cover Summary for the 2009 and 2021 Timeframes

Land Use	Acres (2009)	Acres (2021)
Regulated Urban Impervious	566.7	586.8
Regulated Urban Pervious	1,214.6	1,203.2
Regulated Forest	317.8	308.7
Regulated Pasture	12.5	12.9
Regulated Natural Area	542.9	542.9
Regulated Water	247.5	247.4
Unregulated Impervious	313.0	297.9
Unregulated Pervious	406.2	421.3
Unregulated Forest	0.0	0.0
Unregulated Pasture	0.0	0.0
Unregulated Natural Area	19.4	19.4
Unregulated Water	0.0	0.0
Total	3,640.6	3,640.6

Note:
Minor calculation discrepancies are accounted for in rounding

Maps of the industrial permitted areas, 2009 land cover, MS4 service area, and 2021 land cover are presented as Figures 3-1 through 3-4, respectively.

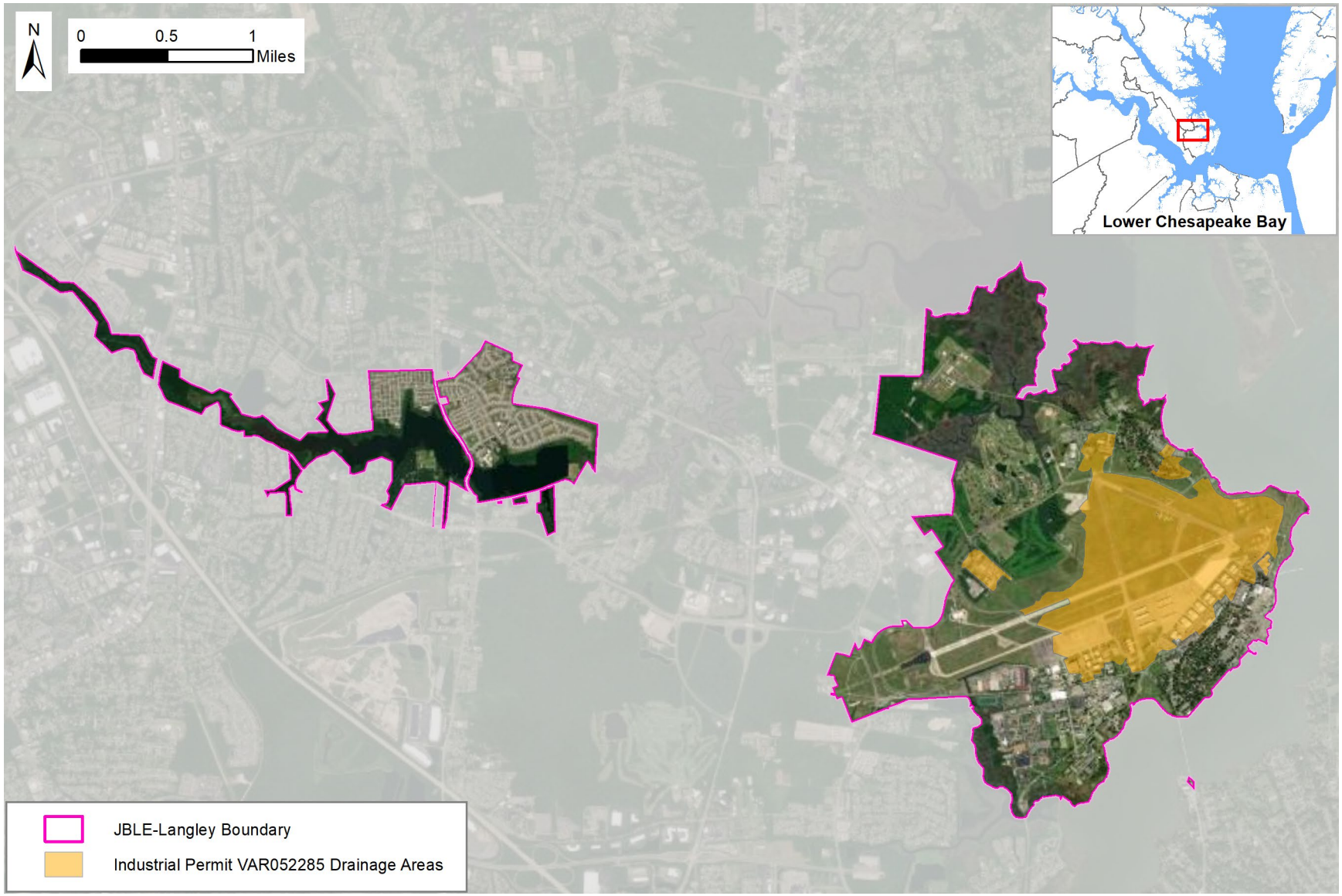

Figure 3-1. JBLE–Langley Industrial Permit VAR052285 Drainage Areas

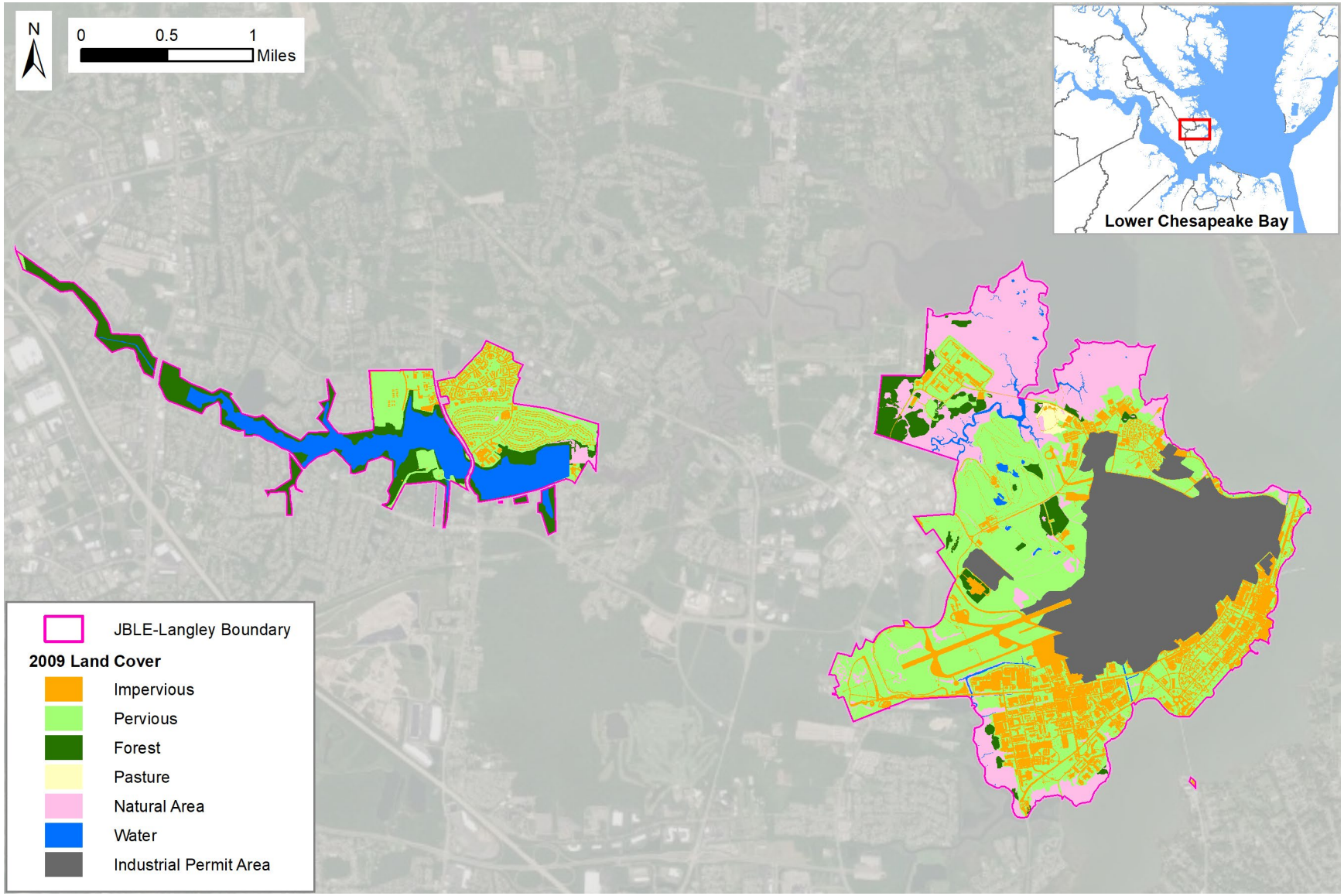

Figure 3-2. JBLE–Langley 2009 Land Cover

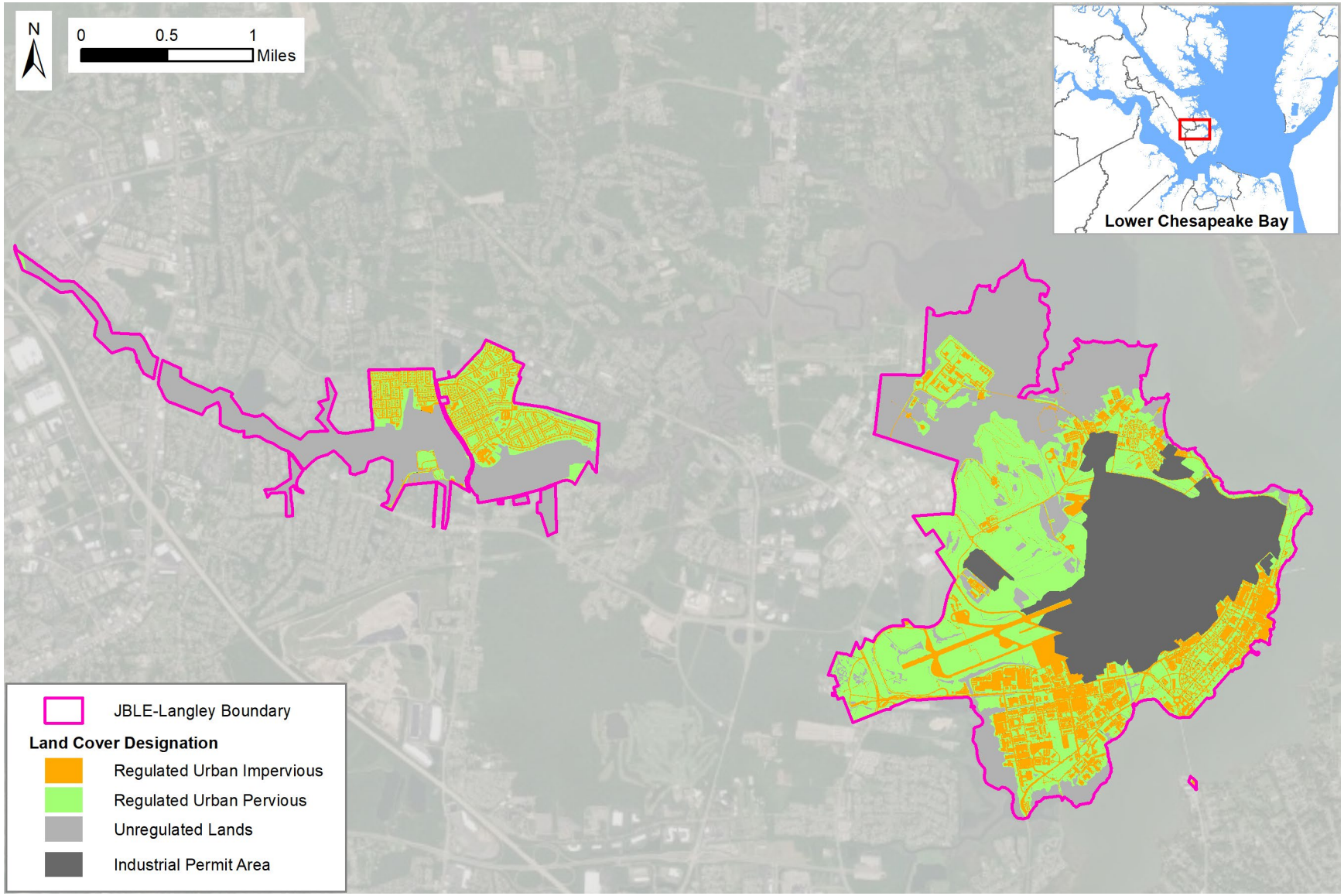

Figure 3-3. JBLE–Langley MS4 Service Area

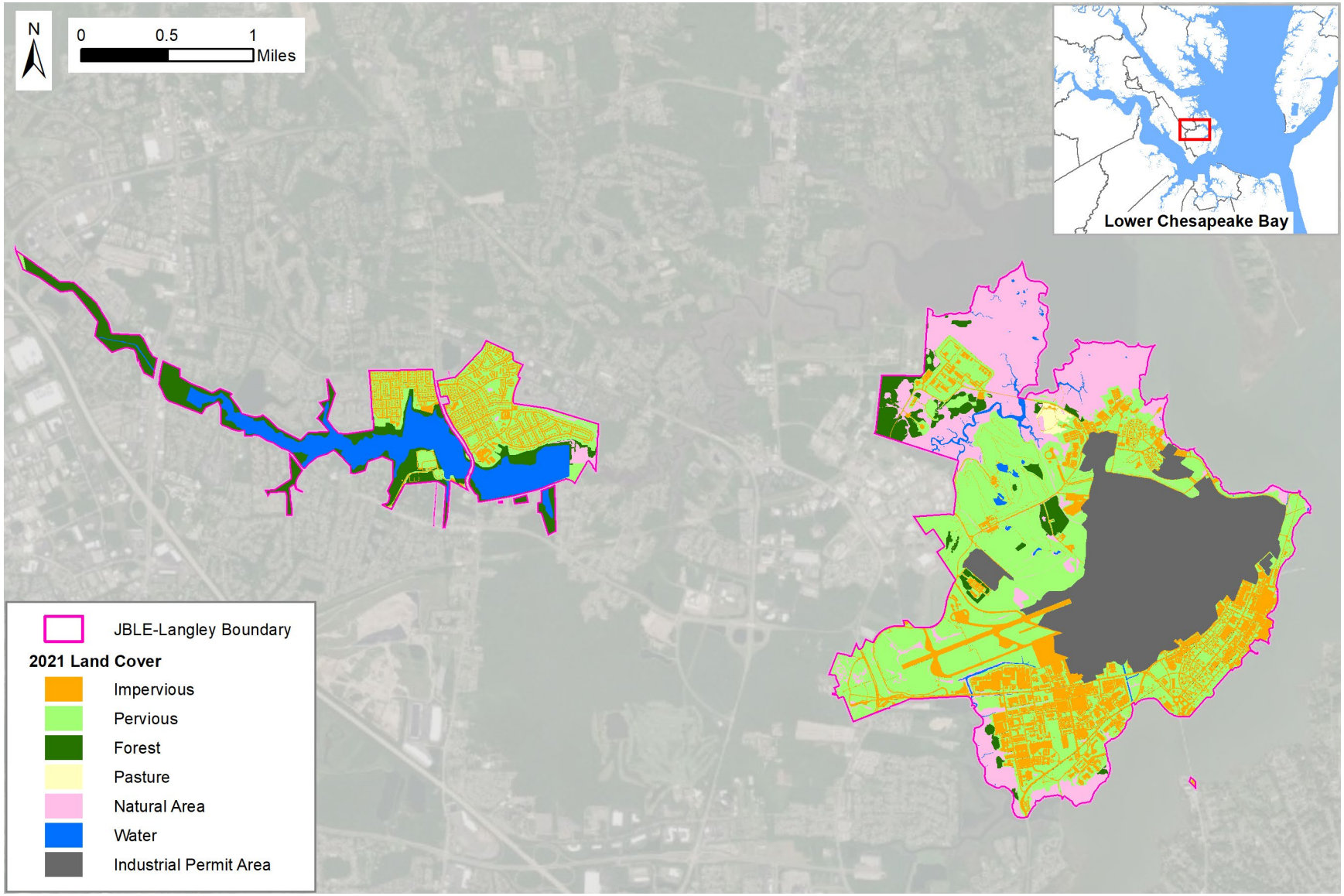

Figure 3-4. JBLE–Langley 2021 Land Cover

4.0 LOAD REDUCTION CALCULATIONS

Pollutant load reductions for existing sources (contributed by the base as of 30 June 2009) and new sources (contributed by the base between 01 July 2009 and 30 June 2021) are discussed in the subsections below. The estimated nitrogen, phosphorus, and TSS loads from existing sources are 13,433, 1,475, and 347,180 lbs/yr, respectively. The 100% cumulative load reduction required by 30 June 2028 for nitrogen, phosphorus, and TSS are 930, 182, and 59,492 lbs/yr, respectively.

4.1 Existing Source Loads

The existing source loads for the base (i.e., the pollutant loads contributed by the base as of 30 June 2009) and the required reductions for the second permit cycle (cumulative 40% of the L2 scoping reduction) were calculated using the Table 3d (York River Basin) template of the Guidance Document (VDEQ, 2021a), as presented in Table 4-1.

Table 4-1. Existing Source Loads and Reduction Requirements [Table 3d]

Pollutant	Land Cover (Subsource)	A	B	C	D	E	F	G
		Loading Rate (lbs/ac/yr)[1]	Existing Regulated Lands as of 30 June 2009 (acres)	Estimated Loads (lbs/yr)[2]	Total L2 Loading Reduction	100% Cumulative Reduction Required by 30 June 2028 (lbs/yr)[3]	Sum of 100% Cumulative Reduction Required by 30 June 2028 (lbs/yr)[4]	Sum of 40% Cumulative Reduction Required by 30 June 2023 (lbs/yr)[5]
Nitrogen	Regulated Urban Impervious	7.31	566.7	4,142	9%	372.78	930	372
	Regulated Urban Pervious	7.65	1,214.6	9,291	6%	557.46		
Phosphorus	Regulated Urban Impervious	1.51	566.7	856	16%	136.96	182	73
	Regulated Urban Pervious	0.51	1,214.6	619	7.25%	44.88		
Total Suspended Solids	Regulated Urban Impervious	456.68	566.7	258,785	20%	51,757	59,492	23,797
	Regulated Urban Pervious	72.78	1,214.6	88,395	8.75%	7,735		

Notes and Acronyms:
[1] Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.
[2] Column C = Column A x Column B.
[3] Column E = Column C x Column D.
[4] Column F = The sum of the subsource cumulative reduction required by 6/30/2028 (lbs/yr) as calculated in Column E.
[5] Column G = The sum of the subsource cumulative reduction required by 6/30/2023 (lbs/yr) calculated as 40% of Column F
Minor calculation discrepancies are accounted for in rounding.
lbs/ac/yr – Pounds per acre per year
lbs/yr – Pounds per year

4.2 New Source Loads

In addition to the existing source loads, the base is required to offset any additional New Source Loads from development that was initiated between 01 July 2009 and 30 June 2021. The New Source Loads for the base were calculated using the aggregate accounting method presented in Appendix II of the Guidance Document (VDEQ, 2021a). As the first step, the 2021 pollutant loads were calculated using Table II.3 in the Guidance Document (VDEQ, 2021a), as presented in Table 4-2.

Table 4-2. New Source Loads [Table II.3]

Land Cover (Subsource)	Pollutant	Regulated Lands as of 30 June 2021 (acres)	Loading Rate (lbs/ac/yr)	Estimated Loads as of 30 June 2021 (lbs/yr)	
Regulated Urban Impervious	Nitrogen	586.8	7.31	4,289.6	13,494.3
Regulated Urban Pervious		1,203.2	7.65	9,204.7	
Regulated Urban Impervious	Phosphorus	586.8	1.51	886.1	1,499.7
Regulated Urban Pervious		1,203.2	0.51	613.6	
Regulated Urban Impervious	Total Suspended Solids	586.8	456.68	267,983.3	355,554.2
Regulated Urban Pervious		1,203.2	72.78	87,570.9	

Note and acronyms:
Minor calculation discrepancies are accounted for in rounding.
EOS – Edge of Stream
lbs/ac/yr – Pounds per acre per year
lbs/yr – Pounds per year

The difference or Total Load Change between 2009 (Table 4-1) and 2021 (Table 4-2) was calculated using Table II.4 in the Guidance Document (VDEQ, 2021a), as presented in Table 4-3.

Table 4-3. Load Changes from New Sources [Table II.4]

Land Cover (Subsource)	Pollutant	Estimated Loads as of 30 June 2009 (lbs/yr)	Estimated Loads as of 30 June 2021 (lbs/yr)	Total Load Change (lbs/yr)	
Regulated Urban Impervious	Nitrogen	4,142.30	4,289.60	147.3	60.6
Regulated Urban Pervious		9,291.40	9,204.70	-86.7	
Regulated Urban Impervious	Phosphorus	855.7	886.1	30.4	24.6
Regulated Urban Pervious		619.4	613.6	-5.8	
Regulated Urban Impervious	Total Suspended Solids	258,784.7	267,983.3	9,198.6	8,374.0
Regulated Urban Pervious		88,395.5	87,570.9	-824.6	

Note and Acronym:
Minor calculation discrepancies are accounted for in rounding.
lbs/yr – Pounds per year

Using Table II.5 in the Guidance Document, the Total Load Change from Table 4-3 is adjusted by any credits earned from BMPs implemented during the 2009–2020 timeframe to arrive at the Net Load Change. BMPs installed after 01 July 2009 were included in this analysis when they were implemented under conditions of redevelopment, as described in Appendix V.E of the Guidance Document (VDEQ, 2015). Section 5.1 provides additional information about credits from existing BMPs earned during the 2009–2020 timeframe. The base is required to offset 40% of the Net Load Change by the end of the second permit cycle, as shown in Table 4-4. Currently the base does not need to offset the Net Load Change since reductions from BMPs installed after 01 July 2009 are larger than the Total Load Change, as shown in Table 4-4.

Table 4-4. Net Load Changes from New Sources [Table II.5]

Pollutant	Total Load Change (lbs/yr)	Reductions from BMPs Installed between 01 July 2009 and 30 June 2020 (lbs/yr)	Net Load Change (lbs/yr)	Required Reduction by End of Second Permit Cycle	Additional Reductions Required between 01 July 2020 and 30 June 2023 (lbs/yr)[1]
Nitrogen	61	179	-119	40%	0
Phosphorus	25	27	-2.5	40%	0
Total Suspended Solids	8,374	10,805	-2,431	40%	0

Note and Acronym:

[1] A zero value indicates reductions from BMPs installed after 01 July 2009 are higher than the Total Load Change and no additional reductions are required to offset the Net Load Change.

Minor calculation discrepancies are accounted for in rounding.
lbs/yr – Pounds per year

4.3 Grandfathered Project Loads

Grandfathered projects are those in accordance with 9VAC25-870-48 (previously numbered 4VAC50-60-48) with an approved site plan prior to 01 July 2012, a state permit issued after 01 July 2014, land disturbance activities commencing after 01 July 2014 that disturb one acre or greater, and where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities and results in an increased pollutant load (VAC, 2014). The base is required to offset any additional pollutant loads due to grandfathered projects. No grandfathered projects were identified.

4.4 Summary of Load Reduction Requirements

A summary of the JBLE–Langley required load reductions is presented in Table 4-5. The values presented in this table represent the 40% reduction requirement to be achieved by 30 June 2023.

Table 4-5. Summary of the Second Permit Cycle Required Load Reductions

Pollutant	Second Permit Cycle Required Reductions (lbs/yr)			
	Existing Sources	New Sources[1]	Grandfathered Projects	Total
Nitrogen	372	-48	0.0	325
Phosphorus	73	-1.0	0.0	72
Total Suspended Solids	23,797	-973	0.0	22,824

Notes and Acronym:
[1] Credits from BMPs installed during the New Sources timeframe have already been accounted for in this column. Minor calculation discrepancies are accounted for in rounding.
lbs/yr – Pounds per year

5.0 CREDIT CALCULATIONS (MEANS AND METHODS)

The Guidance Document outlines multiple options available to permittees to meet the Chesapeake Bay TMDL pollutant reduction requirements. These options include post-construction BMPs, enhancement of existing BMPs, land use change BMPs, street sweeping programs, stream restoration and riparian buffers, and nutrient management plans. Subsequent guidance on credits associated with shoreline restoration are presented in a document titled *Recommendation of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (Forand et al., 2017) and street sweeping are presented in a document titled *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* (Donner et al., 2016). The base's current pollutant credit portfolio includes post-construction BMPs, street sweeping, and shoreline restoration to meet the 40% pollutant reduction requirement for the second permit cycle as noted in the subsections below. The load reduction credits were calculated using the methods presented in the Guidance Document and the expert panel guidance (Forand et al., 2017 and Donner et al., 2016).

5.1 Existing BMPs (Post-2006)

A GIS inventory of existing post-construction BMPs present at JBLE–Langley and their drainage areas was developed to help calculate existing credits for the Action Plan. BMPs installed between 01 January 2006 and 30 June 2009 were included in this analysis. BMPs installed prior to 01 January 2006 are not eligible for credit and were thus excluded from consideration for this Action Plan. BMPs installed after 30 June 2009 were tracked separately to facilitate the calculation of New Source loads.

A two-step process using GIS and Excel was used to determine the pollutant credit for each BMP. First, drainage areas for BMPs were delineated in ArcGIS using a stormwater infrastructure layer provided by the base and a 1-meter elevation layer from the United States Geological Survey's National Elevation Dataset (USGS, 2018). The BMP drainage area layer was then intersected with the 2021 land cover layer to calculate land cover acreages within each BMP drainage area. The land cover acreages were multiplied by the land cover loading rates provided in Table 3d (for impervious and pervious lands) and Table III.1 (for forested lands) and then summed to determine the pollutant load attributed to the drainage area. The load was then multiplied by the pollutant removal efficiency for each BMP type to determine the load removed (i.e., credit). BMP efficiencies provided in Table V.C.1 of the Guidance Document were used for this analysis (VDEQ, 2021a). The efficiency of some BMP types depends on the underlying hydrologic soil group (HSG). GIS data from the Natural Resources Conservation Service (NRCS) Web Soil Survey was used to determine the soil group for each BMP (NRCS, 2017). The above process was implemented for all three POCs.

Eight (8) Filterra Bioretention Systems were installed as part of the LaSalle Gate and Visitor Center redevelopment in 2013. Total phosphorous (TP) removal efficiency for Filterra Systems is provided on the Virginia Stormwater BMP Clearinghouse (VDEQ, 2021b). Total nitrogen (TN) and total suspended solids removal efficiencies were calculated for the eight (8) Filterra Systems using BMP efficiencies provided for bioretention in Table V.C.1 of the Guidance Document (VDEQ, 2021a).

The effect of BMP treatment trains (BMPs in series, where the effluent from an upstream BMP enters the drainage area of a downstream BMP) was also considered. The cumulative effect of BMPs in series is less for a given pollutant than the sum of individual BMPs not in series. This is because the removal efficiency of a downstream BMP is applied to runoff that is cleaner. One benefit of treatment trains is the potential to maximize the load removal efficiency across multiple POCs. For example, pairing an upstream BMP with a high sediment removal rate with a downstream BMP that carries a high nutrient removal rate may be an excellent use of available space in a developed area.

Credits for BMPs implemented on unregulated lands may be awarded, provided any necessary baseline is first met (Part III.2 of the Guidance Document). No credits have been claimed for BMPs implemented on unregulated lands because the criteria for receiving credits were not achieved.

Part III.3 of the Guidance Document describes that permittees may not receive credit for BMPs that were installed after 30 June 2009 and that were implemented to meet the minimum VSMP technical criteria phosphorous removal requirement for new development or other minimum regulatory requirements. However, permittees may receive credit for those BMPs under circumstances of redevelopment, stricter development requirements, or oversized BMPs. BMPs installed after 30 June 2009 were included in this analysis when they were implemented under conditions of redevelopment, as described in Appendix V.E of the Guidance Document (VDEQ, 2021a). Credits from BMPs implemented after 30 June 2009 were calculated separately in order to track net load change due to new source loads (Table 4-4). The effects of BMP treatment trains and unregulated land were also accounted for BMPs implemented during 2009–2020. Summaries of post-construction BMP types and credits are presented in Table 5-1 and Table 5-2, respectively. BMPs implemented prior to 01 July 2020 and their associated reductions are listed in Appendix A.

Table 5-1. Summary of Existing Post-Construction BMP Types

BMP Type	Timeframe Implemented		Total
	01 Jan 2006 to 30 June 2009	01 July 2009 to 30 June 2020	
Dry Detention Pond	0	11	11
Dry Extended Detention Pond	3	1	4
Swale	2	17	19
Wet Pond or Wetland	1	0	1
Filterra Bioretention Systems	0	8	8
Total	**6**	**37**	**43**

Table 5-2. Summary of Credits from Existing Post-Construction BMPs

BMP Timeframe	Number of BMPs	Credits (lbs/yr)		
		Nitrogen	Phosphorus	Total Suspended Solids
2006–2009	6	22	2.8	1,299
2009–2020	37	189	28	11,266

Acronym:
lbs/yr – Pounds per year

A map of existing post-construction BMP locations is presented as Figure 5-1.

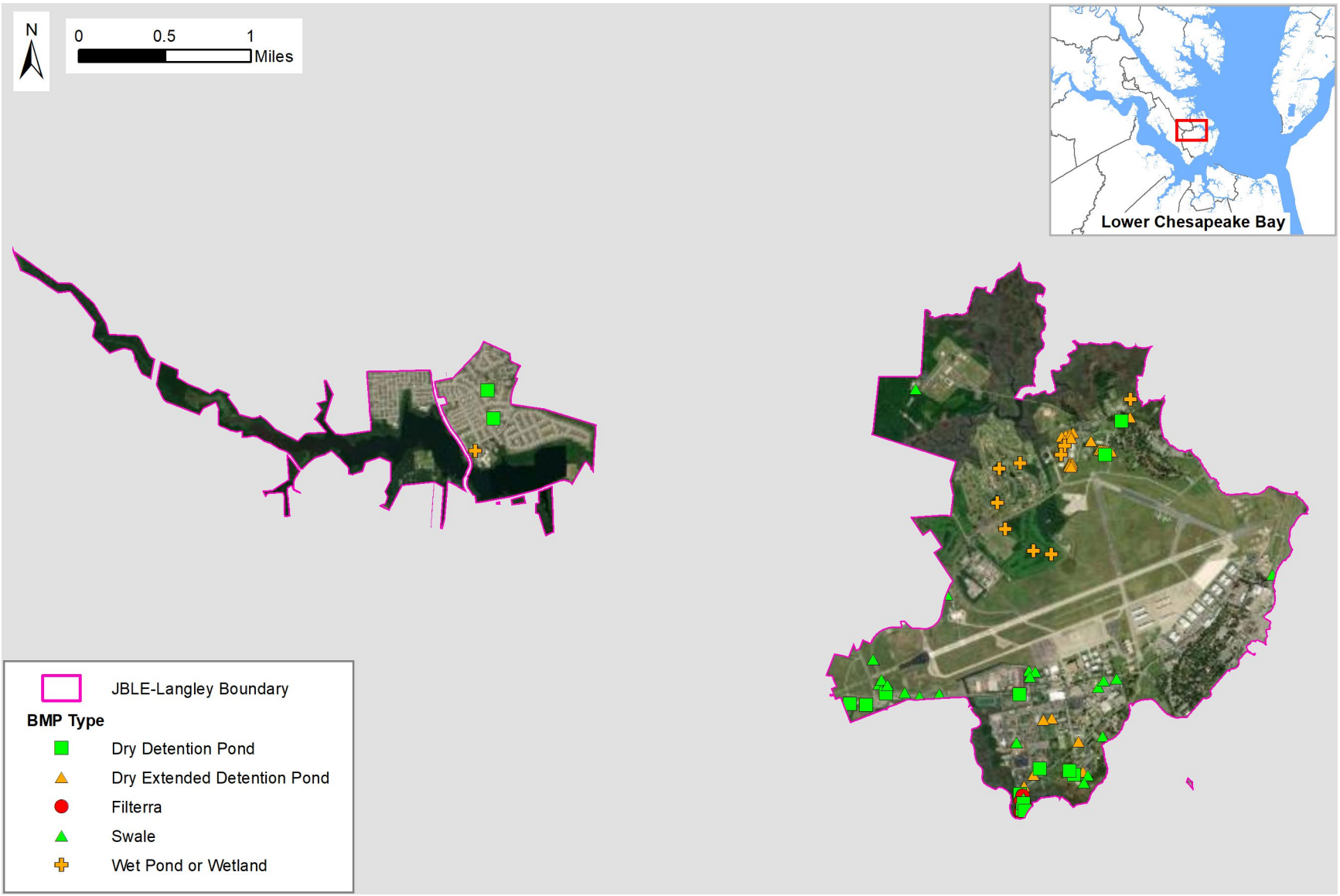

Figure 5-1. JBLE–Langley Existing Post-Construction BMPs

5.2 Street Sweeping

The base performs vacuum powered street sweeping on the airfield, primary roads, secondary roads, and parking lots on a regular basis. Street sweeping credits are calculated based on the methodology described in *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* (Donner et al., 2016). Data on frequency and linear miles of roads sweep was provided by the base and used to calculate load reduction credits. A summary of annual street sweeping miles swept during 01 July 2019 through 30 June 2020, along with associated credits, is presented in Table 5-3. A map of the streets serviced as part of the base's street sweeping program is presented in Figure 5-2.

Table 5-3. Summary of Annual Street Sweeping Credits

Lane-Miles Swept	Acres Swept	Credits (lbs/yr)		
		Nitrogen	Phosphorus	Total Suspended Solids
2,325.5	2,818.8	833.4	304.0	404,851.4

Note and Acronym:
lbs/yr – Pounds per year
Street sweeping credits are calculated based on the methodology described in *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* (Donner et al., 2016)

Figure 5-2. MS4 Area Serviced by Street Sweeping During 01 July 2019 through 30 June 2020

5.3 Land Use Change

Two land use change BMP opportunities were identified on the base at Eaglewood Golf Course as illustrated in Figure 5-3. At both locations, brush and trees are growing in place of managed turf. The land use change credited at these locations is thus based on the turf to mixed-open land use, and the credit reductions were calculated per Appendix V.H of the Guidance Document. A summary of land use change credits is presented in Table 5-4.

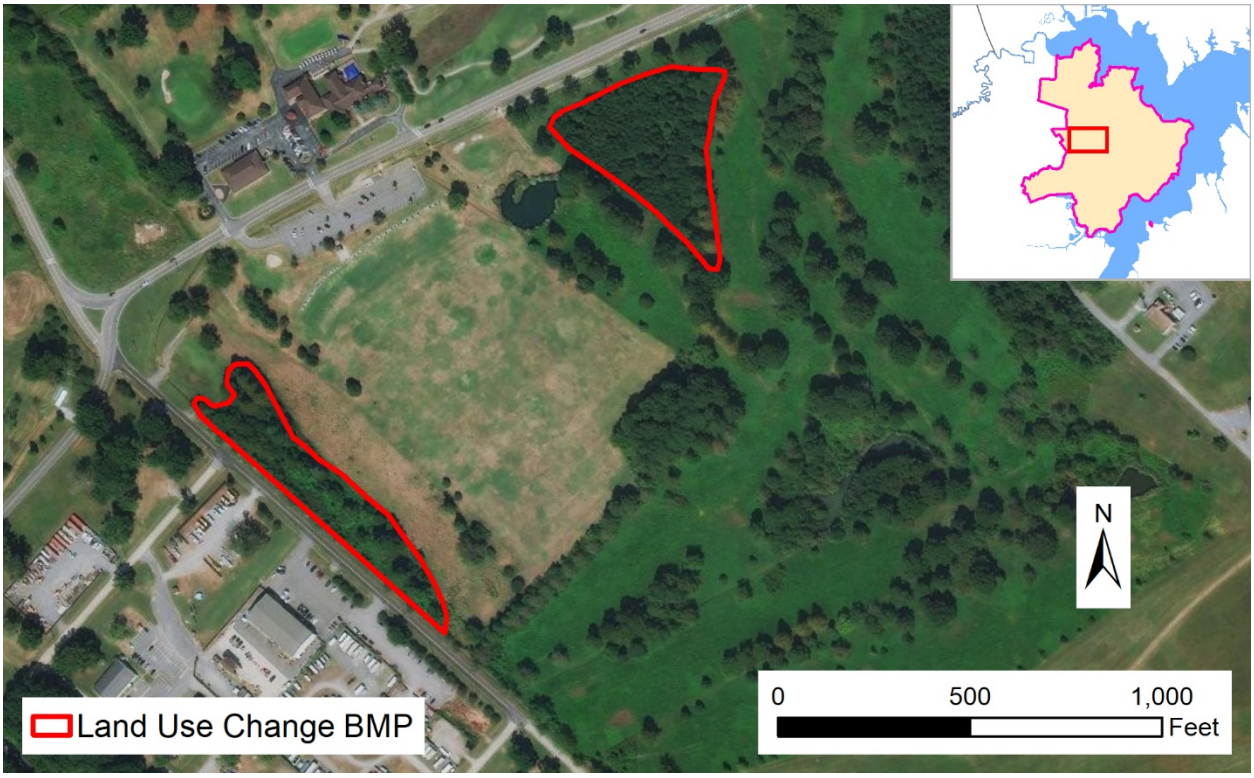

Figure 5-3. Land Use Change BMPs

Table 5-4. Summary of Land Use Change Credits

Pollutant	Turf to Mixed Open (acres)	Credit (lbs/yr)
Nitrogen	5.22	32.4
Phosphorus	5.22	5.9
Total Suspended Solids	5.22	0

Acronym:
lbs/yr – Pounds per year

5.4 Shoreline Management

Pollutant load reductions from shoreline restoration activities were calculated using the procedure outlined in *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (Forand et al., 2017). A total of four shoreline management projects were implemented prior to 01 July 2020; two of which included marsh grass plantings (Figure 5-4). Shoreline erosion rates were estimated by calculating the average distance between historic shoreline GIS data ranging from 1980 to 2009, obtained from the Virginia Institute of Marine Science (VIMS, 2021). All other parameters used in estimating pollutant load reductions, including the bulk density, sand reduction factor, nutrient to sediment ratio, denitrification rate, accretion rates, and vegetative uptake of nutrients were derived from the Expert Panel report (Forand et al., 2017). A summary of shoreline management credits assigned to restoration projects completed prior to 01 July 2020 is presented in Table 5-5.

Figure 5-4. Areas of Shoreline Management

Table 5-5. Summary of Shoreline Management Credits

Shoreline Restoration (ft)	Average Bank Height (ft)	Marsh Plantings (acres)	Erosion Rate[1] (ft/year)	Credits (lbs/yr)										
				Protocol 1			Protocol 2	Protocol 3		Protocol 4		Total		
				TN	TP	TSS	TN	TP	TSS	TN	TP	TN	TP	TSS
5,400	4	0.000	0.6	118.6	83.8	408,800	0.0	0.0	0.0	0.0	0.0	118.6	83.8	408,800
3,150	4	0.000	0.3	34.6	24.4	119,233	0.0	0.0	0.0	0.0	0.0	34.6	24.4	119,233
725	5	0.015	0.015	0.5	0.4	1,715	1.3	0.1	105	0.1	0.0	1.9	0.4	1,821
1,566	10	0.622	0.3	43.0	30.4	148,190	52.9	3.3	4,331	4.3	0.2	100.1	33.9	152,521
Total				**196.6**	**139.0**	**677,938**	**54.2**	**3.4**	**4,436**	**4.4**	**0.2**	**255.1**	**142.5**	**682,374**

Note and Acronyms:
[1] Source: Virginia Institute of Marine Science (personal communication, 21 May 2021).
ft – Feet
TN – Total Nitrogen
TP – Total Phosphorus
TSS – Total Suspended Solids
lbs/yr – Pounds per year

5.5 Future BMPs

One stream restoration project along Brick Kiln Creek is funded for implementation in 2023 totaling 1,500 linear feet. Additional shoreline improvement and BMP retrofit projects on the base are planned for 2025. The base also has a statement of work to plant 204 trees. Because all of these projects were or will be implemented after 30 June 2020 no credit is being claimed. Future BMPs with their associated reductions are listed in Appendix B.

The base will continue to investigate the applicability and feasibility of additional BMPs and BMP types in order to meet the pollutant load reduction requirements of the Chesapeake Bay TMDL. Opportunities for effective retrofit options will be explored and prioritized to make the best use of available resources.

5.6 BMP Costs

The current JBLE–Langley pollutant credit portfolio includes post-construction BMPs, street sweeping, and shoreline restoration. The base uses a third-party contractor to sweep identified streets and parking lots on a regular basis. A summary of BMP implementation costs for projects completed between 01 July 2009 and 30 June 2020 is presented in Table 5-6.

Table 5-6. Summary of BMP Implementation Costs for Projects Completed Between 01 July 2009 and 30 June 2020

BMP Strategy	Implementation Costs
Post-construction BMPs	Not available
Street Sweeping	$17,490 per year
Land Use Change BMPs	Not available
Shoreline Management	$400,000

5.7 Summary of Load Reduction Credits

A summary of pollutant credits by BMP strategy is presented in Table 5-7.

Table 5-7. Summary of Load Reduction Credits by BMP Strategy

Pollutant	Credits (lbs/yr)					
	Post-construction BMPs		Street Sweeping	Land Use Change	Shoreline Management	Credits from Existing BMPs[1]
	Completed between 01 Jan 2006 and 30 June 2009	Completed after 01 July 2009				
Nitrogen	22	179	833	32	255	1,143
Phosphorus	2.8	27	304	5.9	143	455
Total Suspended Solids	1,299	10,805	404,851	0	682,374	1,088,525

Note and Acronym:
[1] Does not include credits related to New Sources that were previously accounted for in Table 4-4 [Table II.5]
lbs/yr – Pounds per year

6.0 PROGRESS SUMMARY

Part II (TMDL Special Conditions) of the MS4 Permit requires the base to meet the Chesapeake Bay TMDL requirements by reducing total nitrogen, total phosphorus, and total suspended solids loads by 40% of the Chesapeake Bay L2 scoping reductions by 30 June 2023. The base's load contribution, required load reductions, and pollutant credits outlined in this Action Plan were calculated using the methodology described in VDEQ's Guidance Document (VDEQ, 2021a). A summary of the required load reductions is presented in Table 6-1 and the second permit cycle pollutant credits are presented in Table 6-2.

Table 6-1. Summary of Permit Cycles 1, 2 and 3 Reduction Requirements

Pollutant	Required Load Reduction by 2018 (lbs/yr)	Required Load Reduction by 2023 (lbs/yr)	Required Load Reduction by 2028 (lbs/yr)
Nitrogen	41	325	812
Phosphorus	9.0	72	179
Total Suspended Solids	2,853	22,824	57,060

Acronym:
lbs/yr – Pounds per year

Table 6-2. Summary of Second Permit Cycle Reduction Requirements and Credits

Pollutant	Second Permit Cycle Cumulative Percent Reduction Requirement	Required Load Reduction by 2023 (lbs/yr)	Credits from Existing BMPs (lbs/yr)[1]	Second Permit Cycle Target Met?
Nitrogen	40%	325	1,143	Yes
Phosphorus	40%	72	455	Yes
Total Suspended Solids	40%	22,824	1,088,525	Yes

Note and Acronym:
[1] Does not include credits related to New Sources that were previously accounted for in Table 4-4 [Table II.5]
lbs/yr – Pounds per year

If the BMPs considered in this analysis are maintained and fully functional to provide the design performance, it is the conclusion of this analysis that the base currently meets both its second and third permit cycle reduction requirement goals for all the POCs. The base will continue to investigate the applicability and feasibility of additional BMPs and BMP types in order to continue to meet the future milestone pollutant load reduction requirements of the Chesapeake Bay TMDL.

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7.0 PUBLIC COMMENTS

The base encourages the public's participation in the development and implementation of this Chesapeake Bay TMDL Action Plan. In keeping with this objective, the base has uploaded this Action Plan to its website, https://www.jble.af.mil/About-Us/Units/Air-Force/Langley-Environmental/ which is also linked to on the base's Facebook page, https://www.facebook.com/JointBaseLangleyEustis/. Comments received will be taken into consideration when finalizing the Action Plan with VDEQ.

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8.0 REFERENCES

Donner, S., Frost, B., Goulet, N., Hurd, M., Law, N., Maguire, T., Selbig, B., Shafer, J., Stewart, S. and Tribo, J. 2016. *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices*. Chesapeake Bay Program Office. Accessed at https://www.chesapeakebay.net/channel_files/23064/final_street_cleaning_expert_panel_report.pdf.

EPA. 2010. *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment*. 29 December 2010.

ESRI. 2019. ArcGIS Basemap – World Imagery. October 3, 2019. Accessed April 15, 2020.

Forand N., Dubois K., Halka J., Hardaway S., Janek, G., Karrh, G., Koch, E., Linker, L., Mason, P., Morgereth, E., Proctor, D., Smith, K., Stack, B., Stewart, S. and Wolinski, B. 2017. *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects*. Chesapeake Bay Program Office. Accessed at https://www.chesapeakebay.net/documents/LONG_SHORELINE_MGMT_EPR_05152018.pdf.

NRCS. 2017. *Web Soil Survey*. Accessed at http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

Schueler, T. and Stack, B. 2014. *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*. Accessed at: http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2013/10/stream-restoration-short-version.pdf.

USGS. 2018. *The National Elevation Dataset*. 2018. Accessed at https://pubs.er.usgs.gov/publication/70201572.

VAC. 2014. 9VAC25-870-48, *Grandfathering*. Accessed at https://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-870-48.

VDEQ. 2010. *Chesapeake Bay TMDL Phase I Watershed Implementation Plan*. 29 November 2010.

VDEQ. 2014. *Authorization to discharge under the Virginia Pollutant Discharge Elimination System and The Virginia State Water Control Law. VPDES Permit Number VAR052285*. Permit effective 01 July 2014. Virginia Beach, Virginia. Virginia Department of Environmental Quality. Tidewater Regional Office.

VDEQ. 2017. *Authorization to discharge under the Virginia Stormwater Management Program and the Virginia Stormwater Management Act. VPDES Permit Number VA040140*. Permit effective 03 August 2017. Richmond, Virginia. Virginia Department of Environmental Quality.

VDEQ. 2018. *General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, General Permit No. VAR040140*, Joint Base Langley Eustis - Langley. Effective Date: 01 November 2018.

VDEQ. 2021a. *Guidance Memo No. 20-2003 – Chesapeake Bay TMDL Special Condition Guidance*. 6 February 2021.

VDEQ. 2021b. *Virginia Stormwater BMP Clearinghouse. Proprietary BMPs*. Accessed 26 March 2021 at: https://www.swbmp.vwrrc.vt.edu/.

VGIN. 2021. *Virginia GIS Clearinghouse*. Accessed 26 March 2021 at http://vgin.maps.arcgis.com/home/index.html.

VIMS. 2021. *Shoreline Change Data.* Virginia Institute of Marine Science. Acquired through written communication on 21 May 2021.

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Appendix A
BMPs Implemented Prior to 01 July 2020

Appendix A
BMPs Implemented Prior to 01 July 2020

BMP Type	Date Installed	Latitude	Longitude	Reductions within MS4 Service Area (lb/yr)		
				TN	TP	TSS
Dry Extended Detention Pond	2009	37.095154	-76.357777	0.00	0.00	0.00
Dry Extended Detention Pond	2009	37.095134	-76.357578	0.00	0.00	0.03
Swale	2012	37.075204	-76.381677	8.14	0.63	174.20
Dry Detention Pond	2012	37.074454	-76.380899	2.18	0.35	65.24
Swale	2012	37.075596	-76.381412	4.19	0.49	185.12
Swale	2012	37.074559	-76.378919	2.18	0.20	63.75
Swale	2012	37.075149	-76.380768	15.35	1.11	279.09
Swale	2006	37.077298	-76.382307	11.17	1.06	353.21
Dry Extended Detention Pond	2012	37.068089	-76.360049	1.58	0.24	197.15
Swale	2012	37.067783	-76.359543	1.28	0.12	41.41
Swale	2012	37.067149	-76.359937	3.03	0.39	157.85
Swale	2011	37.071124	-76.358036	102.17	16.31	7104.11
Dry Extended Detention Pond	2008	37.070605	-76.360561	2.99	0.50	424.85
Wet Pond or Wetland	2009	37.099553	-76.355622	1.21	0.18	34.92
Swale	2009	37.075795	-76.357977	6.40	1.09	485.96
Dry Detention Pond	2012	37.066115	-76.366665	0.19	0.04	10.72
Dry Detention Pond	2013	37.097146	-76.422676	3.14	0.78	194.94
Dry Detention Pond	2013	37.099525	-76.423368	2.70	0.59	137.02
Dry Detention Pond	2013	37.073517	-76.384716	1.06	0.24	59.18
Filterra Bioretention Systems	2013	37.06599	-76.366399	1.42	0.19	60.28
Swale	2013	37.065773	-76.366263	0.58	0.05	13.93
Filterra Bioretention Systems	2013	37.065537	-76.366565	2.00	0.29	91.35
Filterra Bioretention Systems	2013	37.065268	-76.366179	2.01	0.31	101.20
Swale	2013	37.065105	-76.366142	0.59	0.10	45.21
Swale	2013	37.064878	-76.366091	0.59	0.10	45.42
Filterra Bioretention Systems	2013	37.064769	-76.366065	1.68	0.30	89.80
Filterra Bioretention Systems	2013	37.06485	-76.366477	1.56	0.29	90.28
Filterra Bioretention Systems	2013	37.064776	-76.366458	0.81	0.18	57.55
Filterra Bioretention Systems	2013	37.06456	-76.366551	0.79	0.17	55.15
Filterra Bioretention Systems	2013	37.064524	-76.366518	0.33	0.07	21.42
Dry Detention Pond	2014	37.064843	-76.366374	0.21	0.07	19.41
Dry Detention Pond	2014	37.065324	-76.366276	0.13	0.04	12.65
Dry Detention Pond	2014	37.064687	-76.366071	0.12	0.04	11.23
Swale	2014	37.075978	-76.356662	7.67	1.29	572.65
Dry Detention Pond	2014	37.068124	-76.361469	0.41	0.11	28.04
Dry Detention Pond	2014	37.094835	-76.358209	0.00	0.00	0.01
Swale	2014	37.074228	-76.37739	3.72	0.59	258.39
Swale	2014	37.070439	-76.367066	7.72	1.25	546.32
Dry Detention Pond	2014	37.073444	-76.383001	0.19	0.06	15.20
Swale	2020	37.076015	-76.365774	1.40	0.18	72.27
Swale	2020	37.076529	-76.365902	2.05	0.33	145.52

Appendix A
BMPs Implemented Prior to 01 July 2020 (continued)

BMP Type	Date Installed	Latitude	Longitude	Reductions within MS4 Service Area (lb/yr)		
				TN	TP	TSS
Swale	2020	37.076441	-76.365216	4.94	0.47	155.93
Swale	2020	37.084908	-76.340358	0.97	0.19	86.63

Appendix B

BMPs to be Implemented Between 01 July 2020 and 31 October 2023

Appendix B
BMPs to be Implemented Between 01 July 2020 and 31 October 2023

BMP Type	Planned Installation Date	Project Name / Location	POC Removal Rate (lbs/ft/yr)			POC Reductions (lb/yr)		
			TN	TP	TSS	TN	TP	TSS
Shoreline Management	2025	Marina	0.01218	0.00861	42	16.4	11.6	56,700
Stream Restoration	2023	Brick Kiln Creek	Undetermined[(1)]					

Note:
[1] Calculations for Protocols 1-4 for the Urban Stream Restoration credit (Schueler and Stack, 2014) have not been conducted yet as these stream restoration projects are in the planning phase.