JBLE- Eustis, Virginia

2023 – 2028

Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan

For

Virginia General Permit for Small Municipal Separate Storm Sewer Systems VPDES Permit #VAR040035

1 November 2024

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BMP	Best management practice
EPA	Environmental Protection Agency
GIS	Geographic information system
JBLE–Eustis	Joint Base Langley-Eustis – Eustis
L2	Level 2
lbs/ac/yr	Pounds per acre per year
lbs/yr	Pounds per year
lbs/ft/yr	Pounds per foot per year
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
POC	Pollutant of concern
TMDL	Total Maximum Daily Load
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

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) within the bay (EPA, 2010). A TMDL is the maximum amount of a pollutant that a waterbody 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). Part II.A of the Joint Base Langley-Eustis–Eustis (JBLE–Eustis) MS4 permit (Permit No. VAR040035) requires the base to prepare a Chesapeake Bay TMDL Action Plan (the Action Plan) that demonstrates the current efforts and future plans to meet the required nutrient reductions. The plan must be submitted to the Virginia Department of Environmental Quality (VDEQ) for review and approval and available for public review and comment.

The Action Plan is a description of the installation's plan to meet 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 0-1.

Table 0-1. 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–Eustis 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, and the 100% reduction goals of the third cycle. The methodology used to calculate the pollutant loads and credits is based on VDEQ Guidance Memo No. 20-2003 (Guidance Document) (VDEQ, 2021).

1.2 Installation Description

JBLE–Eustis, formerly Fort Eustis, is located adjacent to the City of Newport News, Virginia which is part of the Norfolk, Hampton, and Newport News metropolitan area. The base is mainly located on Mulberry Island, a small peninsula bordered by the James River to the west, Warwick River to the east, and Skiffes

Creek toward the north. Smaller waterbodies on or bordering the base include Jail Creek, Morrisons Creek, Island Creek, Bailey Creek, and Eustis Lake. The base occupies approximately 8,000 acres and houses a variety of military organizations and support activities on the installation. Most of the development is located at the northern end of the base, while the southern portion of the peninsula remains largely undeveloped and is managed as forest for military training purposes. A golf course and an airfield are located near the center of the base. A site location map is presented as Figure 1-1.

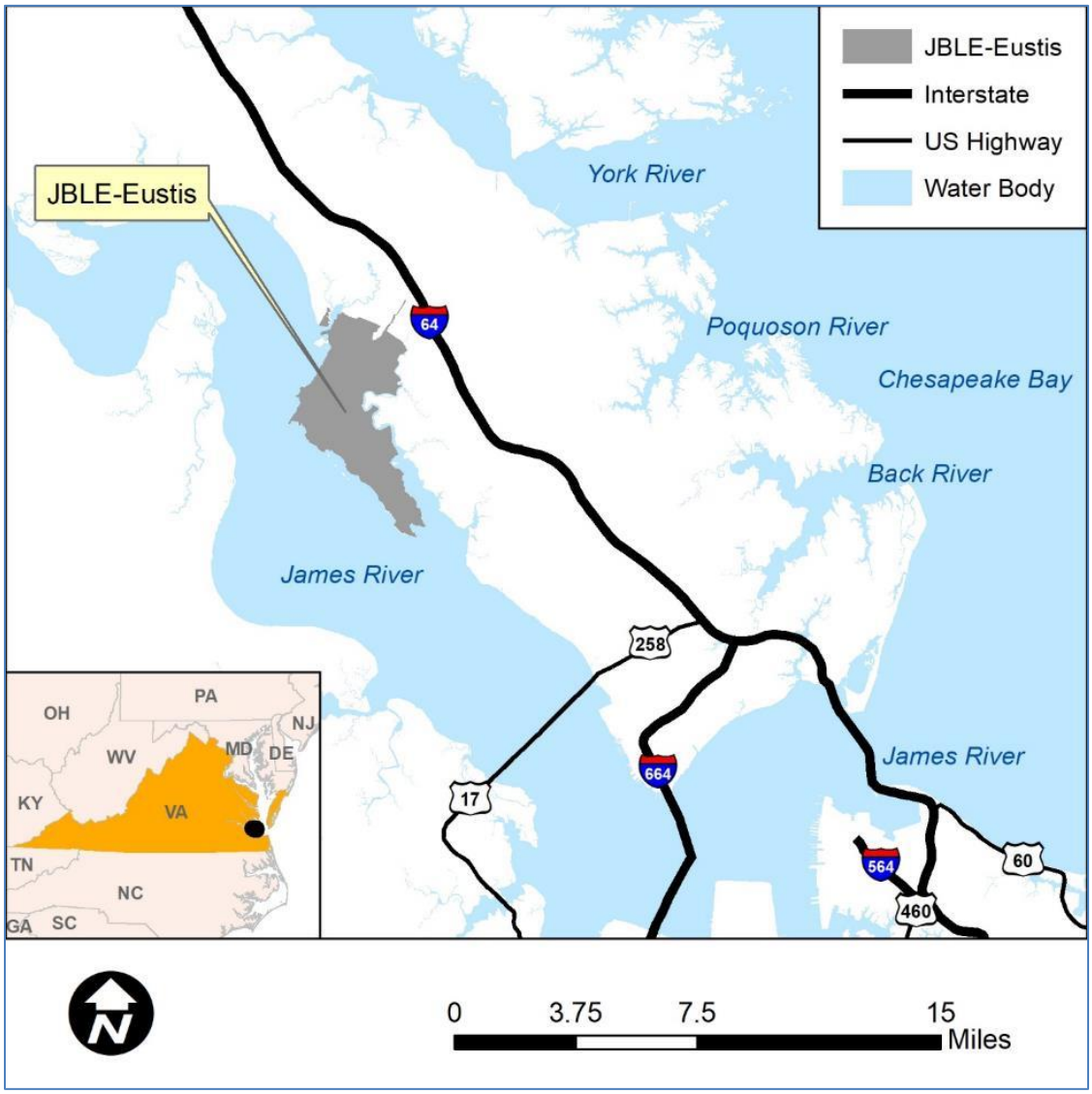

Figure 0-1. Site Location Map, JBLE–Eustis

2.0 STORMWATER PROGRAM AUTHORITY and GUIDANCE

JBLE–Eustis is authorized to discharge stormwater from the installation in accordance with two separate permits issued by the VDEQ: The Industrial Stormwater VPDES Permit (Permit No. VA002521, effective 01 September 2022) and the MS4 Permit (Permit No. VAR040035). The most recent MS4 permit became effective on 01 November 2023 and will expire on 31 October 2028.

The Industrial Stormwater VPDES Permit includes specific stormwater management requirements for the following sectors: air transportation, water transportation, scrap and waste recycling facilities, material recovery facilities, and transportation and warehousing. The areas of the base covered by the Industrial Stormwater Permit are excluded from the MS4 permit area, as permitted by the Guidance Document.

The Air Force has established an environmental, safety, and occupational health policy, AF Policy Directive 90-8, Environment, Safety & Occupational Health Management and Risk Management. The JBLE Environmental Policy Statement supplements this broader policy with installation-specific requirements in accordance with DoDI 4715.17, Environmental Management Systems. The purpose of this document is to define the JBLE-Eustis Environmental Policy Statement in order to protect built and natural infrastructure, protect the environment where 733d Mission Support Group (MSG) personnel and Mission Partners live and work, and ensure sustainability of the missions of the 733d MSG and Mission Partners.

2.1 New Authorities

MS4 General Permit Part II.A.12.(1)

The JBLE-Eustis Environmental Policy Statement is signed by the current deputy installation commander. This role is typically a 2-year assignment, therefore requiring updated signatures at least every two years. The latest memorandum is available on the installation's environmental website and was signed 25 October 2024.

2.2 Public Input

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 keeps the most current Action Plan on its website, https://www.jble.af.mil/Units/Army/Eustis-Enviromental. The draft Action Plan was provided for public review 23 Sept 2024 – 21 Oct 2024 and no public comment was received.

3.0 LOAD REDUCTION CALCULATIONS

MS4 General Permit Part II.A.12.(2)

Pollutant load reductions for existing sources (stormwater infrastructure and best management practices (BMPs) by the installation as of 30 June 2009), new sources from oversized BMPs (programmed and built between 01 July 2009 and 30 June 2022), and any grandfathered projects are discussed in the subsections below.

3.1 MS4 Service Area

A determination of the base pollutant load requires an estimate of the permittee's MS4 service area as of 30 June 2009. The MS4 service area was delineated based on land coverage derived from 2009 aerial imagery obtained from the Virginia GIS Clearinghouse (Virginia Geographic Information Network [VGIN], 2009), and the U.S. Census Bureau.

The MS4 service area consists of all impervious (regulated urban impervious) and pervious (regulated urban pervious) areas within the MS4 boundary that aren't already covered under the Industrial Permit VA002521. This third phase reduction is 100% of the of the L2 Scoping Run based on lands within the 2000 and 2010 expanded Census urbanized areas. A desktop review of the base topography revealed no receiving/exporting sheet flow runoff from/to adjacent permittees. The final MS4 service area boundary was used to calculate existing source loads and load reduction requirements.

A summary of the installation's land cover is presented in Table 3-1.

Table 0-1. Land Cover Summary for JBLE - Eustis

Land Cover	Acres
Impervious	1,094.13
Pervious	365.50
Industrial	855.33
Forested	2,180.58
Agricultural	18.5
Wetlands	3,000.13
Lakes, Streams	562.10
Total	8,076.27

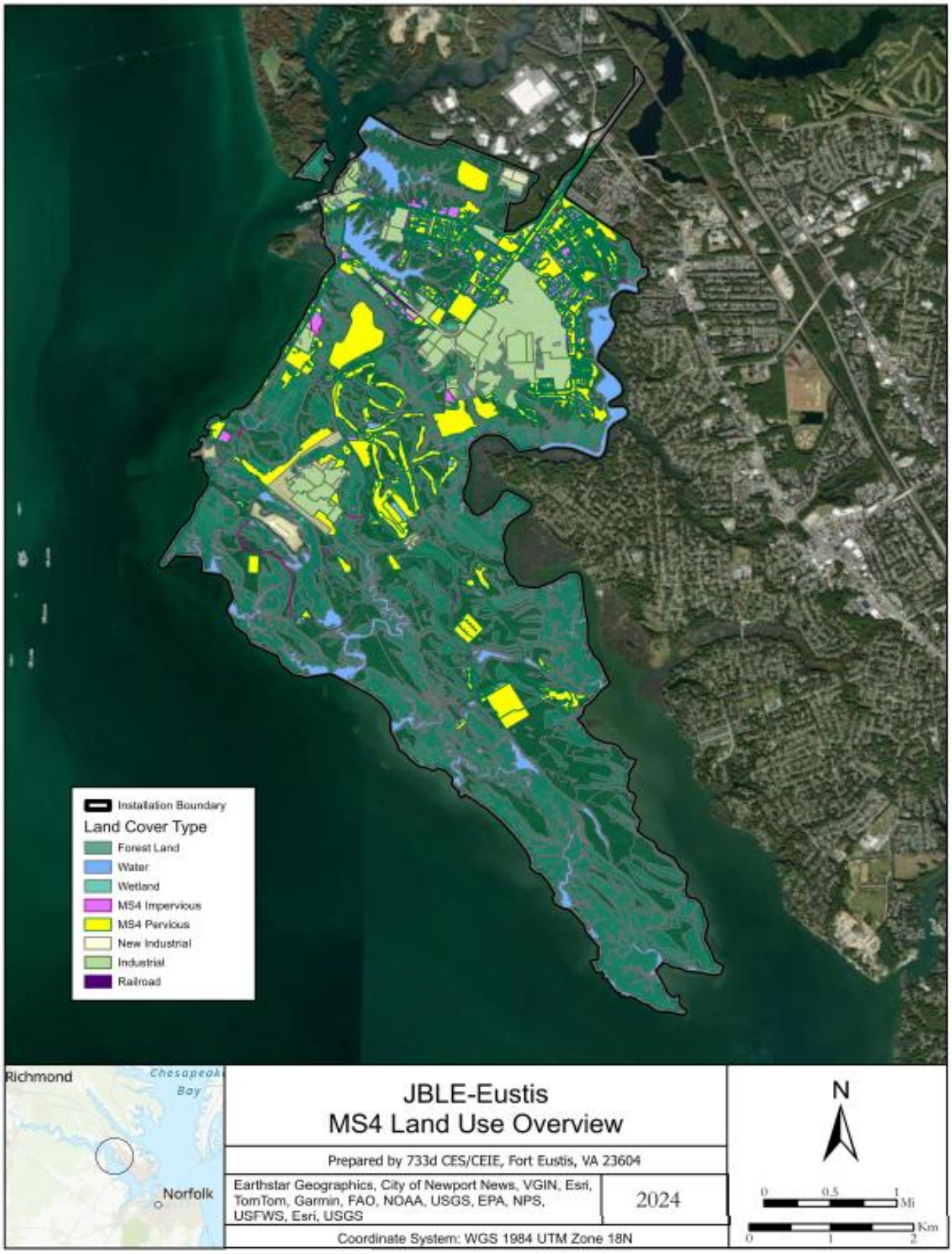

Figure 0-1. JBLE–Eustis MS4 Service Area

3.2 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 third permit cycles (cumulative 100% of the L2 scoping reduction) were calculated using the Table 3a (James River Basin) template of the Guidance Document (VDEQ, 2021).

Table 3.2. Existing Source Loads and Reduction Requirements [Table 3a]

A	B	C	D	E	F	G	H
Pollutant	Subsource	Loading Rate (lbs/ac/yr) [1]	MS4 Service Area within the 2010 CUA (acres)	Loads (lbs/yr)[2]	Percentage of MS4 required Chesapeake Bay total L2 loading	100% cumulative reduction required by 6/30/2028 (lbs/yr)[3]	Sum of 100% cumulative reduction (lbs/yr)[4] required by 6/30/2028
Nitrogen	Regulated urban impervious	9.39	365.50	3,432.05	9%	308.88	767.76
	Regulated urban pervious	6.99	1,094.13	7,647.97	6%	458.88	
Phosphorous	Regulated urban impervious	1.76	365.50	643.28	16%	102.92	142.59
	Regulated urban pervious	0.50	1,094.13	547.07	7%	39.66	

Notes and Acronyms:
[1] Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.
[2] Column E = Column C x Column D.
[3] Column G = Column E x Column F.
[4] Column H = The sum of the subsource cumulative reduction required by 6/30/28 (lbs/yr) as calculated in Column G.

CUA – Census urbanized area
lbs/ac/yr – Pounds per acre per year
lbs/yr – Pounds per year3.3 New Source Loads

An offset of increased loads is required for development or redevelopment projects for which construction was initiated after 01 July 2009 that disturb one acre or greater and utilize an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. If the new source did not have an average impervious land cover condition greater than 16% for the design of post development stormwater management facilities, no additional offsets are required beyond those for existing development. Similarly, if a new source disturbs less than 1 acre, no additional offsets are required beyond those for existing development. All new construction on JBLE–Eustis conformed with the Virginia Runoff Reduction Method (VRRM) and has already been accounted for utilizing BMPs from the Virginia BMP Clearinghouse and therefore no offset of increased loads is necessary, and no grandfathered projects in accordance with 9VAC25-870-48 have been identified from the 2014 timeframe.

4.0 TOTAL REDUCTIONS ACHIEVED

MS4 *General Permit Part II.A.12(3)*

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, storm drain cleaning, stream restoration and riparian buffers, and nutrient management plans. The base's current pollutant credit portfolio includes post-construction BMPs, street sweeping, storm drain cleaning, and shoreline restoration to meet the pollutant reduction requirement for the second permit cycle as noted in the subsections below.

4.1 Existing Structural BMPs

A GIS inventory of existing post-construction BMPs and their drainage areas within JBLE–Eustis was developed to help calculate existing credits for the Action Plan. Only BMPs installed by 01 July 2009 account for the baseline calculations and are implemented under conditions of redevelopment, stricter development requirements, or oversizing were eligible for credits as described in Appendix V.E of the Guidance Document (VDEQ, 2021). BMPs implemented to meet the minimum VSMP technical criteria phosphorous removal requirement for new development or other minimum regulatory requirements are not eligible for credit, however any additional pollutants captured beyond the required minimum may be eligible. 733d CES/CEIE personnel have begun to search for design records of the BMPs within this timeframe to establish any additional credits that may be counted but have not completed this task as of the date of this Action Plan. CEIE staff will continue to review BMP records. A summary of the existing post-construction BMPs included in this Action Plan are given in Table 4-1

Table 4-1. Summary of Existing BMP Types

BMP Type	Timeframe Implemented		
	01 Jan 2006 to 30 June 2009	01 July 2009 to 30 June 2023	Total
Bioretention	1	0	1
Dry Detention Pond	8	0	8
Grass Swales	3	0	3
Infiltration Basins	2	0	2
Wet Pond or Wetland	6	0	6
Total	**20**	**0**	**20**

Pollutant credits for each BMP were calculated using the methods described in the Guidance Document (VDEQ, 2021). First the BMP drainage areas were delineated using a 1-meter elevation layer from the United States Geological Survey's National Elevation Dataset (USGS, 2018).

Pollutant loads within the BMP drainage areas were calculated using the land cover layer and the land cover loading rates provided in Table 3d (for impervious and pervious lands) and Table III.1 (for forested lands) of the Guidance Document (VDEQ, 2021). The pollutant reduction credits for all three POCs were then determined using the BMP efficiencies provided in Table V.C.1 of the Guidance Document (VDEQ, 2021). The combined pollutant removal effects of BMP treatment trains (BMPs in series, where the effluent of an upstream BMP is treated by a downstream BMP) were also considered in the load reduction calculations. A summary of credits from existing post-construction BMPs is given in Table 4-2.

Table 4-2. Summary of Credits from Existing Post-Construction BMPs

BMP Timeframe	Number of BMPs	Credits (lbs/yr)	
		Nitrogen	Phosphorus
2006–2009	20	533.91	148.34
2009–2023	0	0	0

Acronym:
lbs/yr – Pounds per year

Several BMPs are owned and maintained by the installation that do not drain to the MS4 areas, but instead drain the industrial areas that are managed by the other VPDES permit and are not included in the TMDL calculations and are not part of this report.

See Appendix A for a list of all BMPs implemented prior to November 1, 2023.

4.2 Nutrient Management Planning

The installation has developed two nutrient management plans – a mandatory one for the Pines Golf Course, and an optional one for the Military Family Housing (MFH) area.

Table 3.2 Summary of Credits from Nutrient Management Planning Activities

NMP	Expiration	Credits (lbs/yr)	
		Nitrogen	Phosphorus
The Pines Golf Course	30 June 2026	0	0
MFH	13 Sep 2027	68.89	2.46

Acronyms:
lbs/yr – Pounds per year

4.3 Storm Drain Cleaning

The installation removes debris from outfalls on an annual basis. The base follows the Standard Operating Procedure provided in Appendix B to keep track of the mass of debris that is removed

and to ensure the debris is disposed properly to avoid washing back into the watershed. The percent composition of the debris was estimated using the methods described by Law, DiBlasi and Ghosh (2008), where sediment, organic matter, and trash accounted for 39.0%, 52.1%, and 8.9% of the debris respectively. The method used to calculate credits for the storm drain cleaning BMP is described in Appendix V.G of the Guidance Document (VDEQ, 2021). A summary of the Storm Drain Cleaning BMP credits is provided in Table 4-3.

Table 4-3. Summary of Storm Drain Cleaning

Wet Weight (lbs/yr)	Dry Weight (lbs/yr)		Nutrients Removed (lbs/yr)					
			Sediment		Organic Matter		Total	
Debris Collected	Sediment	Organic Material	TN	TP	TN	TP	TN	TP
15,400.0	4,204.2	1,604.7	11.4	2.5	17.8	1.9	29.2	4.4

Acronyms:
lbs/yr – Pounds per year
TN – Total nitrogen
TP – Total phosphorus

4.4 Land Use Change

In 2019 CEIE-Natural Resources Branch began restoring turf and unused portions of the Installation and Golf Course into native forb and grassland habitats. Resulting restorations are beneficial to wildlife, troop morale, and offer a net reduction in chemical applications and cost of maintenance.

Several locations qualify for Land Use Conversion credits as these restored areas will be more efficient at slowing run-off and removing pollutants from rainwater. A total of 5.6 acres were converted to mixed open habitat in 2024. An additional 30.7 acres will begin conversion in 2025, as well as first mixed open to forest conversion with Lee Blvd reaching well over the 300 stems per acres required for the forest category. This site was planted with Long Leaf Pine, hybrid chestnut, and oak seedlings collected from the installation. Regeneration of persimmon, cherry, oak, and hickory has begun, and these trees will be maturing from seedling to sapling within this permit cycle.

When calculating the amount of turf to mixed open to utilize for credit, only those areas within the MS4 area are included, and any other land type such as industrial areas are excluded from the calculations. 41.33 acres of restoration are currently available for credit, as shown in Figure 4-1. The land use change credited at all locations is based on the turf to mixed-open land use, and the credit reductions were calculated per Appendix V.H of the Guidance Document (VDEQ, 2021). A summary of land use change credits is presented in **Error! Reference source not found.**.

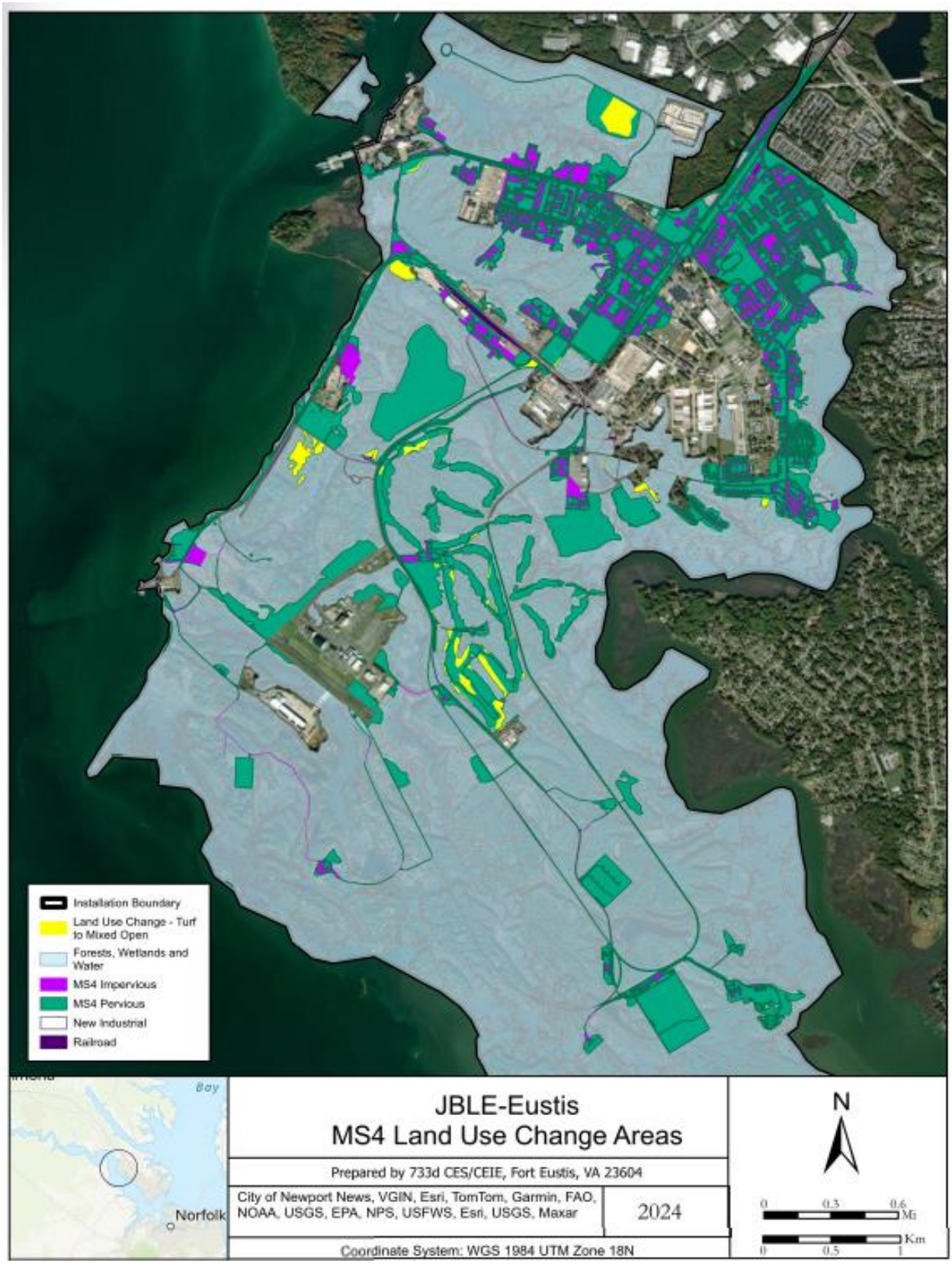

Figure 4-1. Land Use Change BMPs

The Environmental Restoration Program at JBLE-Eustis actively works to remediate the installation's historic effects on the natural enviornmnet. One of the remediation sites now in long-term monitoring is the former skeet shooting range on the upland and wetland edge of Bailey Creek in the Skiffes Creek watershed.The clean- up activites were completed in years past and the area was recently planted with native wetland and upland vegetation, grass and tree species. The move to natives from turf provides another opportunity for pollutant credits.

Table 4-4. Summary of Land Use Change Credits

Pollutant	Turf to Mixed Open Area (acres)	Skeet Range Restoration	Credit (lbs/yr)
Nitrogen	41.33	4.15	267.87
Phosphorus	41.33	4.15	50.94

Acronym:
lbs/yr – Pounds per year

Additional land use change projects are underway and in planning stages. There will be buildings demolished, thereby becoming turf areas, turf areas changed into mixed use vegetation, and mixed use growing ultimately into forest consisted of both pine and hardwood and managed by 733d CES/CEIE.

Table 4-6. Planned Land Use Change

Future Conversions					Conversion		
Location	Est.	Acres	Latitude	Longitude	From	To	Anticipated
TA17C	2021	23.8	37.146981	-76.611029	Mixed Open	Forest	2031
Lee Blvd LLPs	2021	1.6	37.166247	-76.602331	Mixed Open	Forest	2025
Irwin Street LLPs	2021	0.7	37.144709	-76.573197	Mixed Open	Forest	2027
Driving Range LLPs	2020	2.5	37.136892	-76.599711	Mixed Open	Forest	2027
Driving Range Loblolly	2022	2.0	37.136344	-76.59933	Mixed Open	Forest	2030
Matthew Jones House Plantation	2019	5.2	37.15957	-76.603199	Mixed Open	Forest	2030
Landfill 15	2024	26	37.170133	-76.586362	Turf	Mixed Open	2029
IRP Shotgun Range	2023	4.7	37.166646	-76.586076	Turf	Mixed Open	2025
Turkey Island Bivuoac Sites	2022	16.1	37.114892	-76.597464	Mixed Open	Forest	-
	Total	52..2					

4.5 Shoreline Management

Pollutant load reductions from shoreline restoration activities were calculated using loading rates presented in *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (Forand et al., 2017). The report states that when shoreline management practice parameters are not available, the default values of 0.01218, 0.00861, and 42.0 pounds per linear foot per year should be used to determine pollutant load reductions for nitrogen, phosphorus, and total suspended solids respectively. A summary of shoreline management credits is presented in Table 4-5.

Table 4-5. Summary of Shoreline Management Reductions

Pollutant	Shoreline Restoration (linear feet)	Loading Rate (lbs/ft/yr)[1]	Credit (lbs/yr)
Nitrogen	40	0.01218	0.5
Phosphorus	40	0.00861	0.3

Note and Acronyms:
[1] Source: Forand et al., 2017
lbs/ft/yr – Pounds per foot per year
lbs/yr – Pounds per year

Currently, an installation Shoreline Management Study is being conducted by the Virginia Institute of Marine Science (VIMS) and will be completed in Permit Year 2024. This study will provide guidance and direction for future shoreline projects on the installation's 22-miles of eroding coastline. Future projects currently in design include a Harrison Road living shoreline and protection of a shoreline cultural resource site, both being designed by VIMS, and a living shoreline in the vicinity of Third Port, being designed by the Chesapeake Bay Foundation. In addition, an installation-wide National Environmental Protection Act (NEPA) Environmental Assessment (EA) will also be completed by 2025 and will help to push implementation projects through at a more efficient rate.

4.6 Summary of Load Reduction Credits

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

Table 4-7. Summary of Permit Cycle 3 Load Reduction Credits by BMP Strategy

Pollutant	Credits (lbs/yr)					
	Land Use Change	Storm Drain Cleaning	BMPs Installed before 01 July 2009	NMP	Required Reduction by 30 Jun 2028	Total Actual Reductions by 30 Jun 2028
Nitrogen	267.87	29.2	533.91	68.89	767.76	899.87
Phosphorous	50.94	4.4	148.34	2.46	142.59	206.14

Acronym:
lbs/yr – Pounds per year

5.0 BMPs TO BE IMPLEMENTED 2023 -2028

MS4 General Permit Part II.a.12.b(5)

The base will continue to investigate the applicability and feasibility of additional BMPs and BMP types to meet the pollutant load reduction requirements of the Chesapeake Bay TMDL. Plans are underway to convert additional turf areas into native species grass lands in the coming years. The base is also planning additional shoreline restoration projects that include living shorelines and nature-based resiliency. Opportunities for effective BMP retrofit options will be explored and prioritized to make the best use of available resources.

A breakout of the calculation of the reductions expected to be achieved by the BMP calculated and reported in accordance with the methodologies established in MS4 Permit Part II.A.8 for each pollutant of concern is listed in Table 5-3.

Table 5.1 Expected POC Reductions

BMP Type	BMP Project	Area (acres unless otherwise noted)	N % Removal Efficiency	P % Removal Efficiency	lbs. N Removed	lbs. P Removed	Schedule
MS4 General Permit Part II.a.12.b(5)(a)	*MS4 General Permit Part II.a.12.b(5)(b)*	*MS4 General Permit Part II.a.12.b(5)(c)*	*MS4 General Permit Part II.a.12.b(5)(d)*		*MS4 General Permit Part II.a.12.b(5)(e)*		*MS4 General Permit Part II.a.12.b(5)(f)*
BMP Retrofit to Level 2 wet pond	Lake Eustis Retrofit: MS4 acres draining to wet pond	163.42	0.2	0.45	32.68	73.54	PY27
Street Sweeping	Street Sweeping (SCP-5): 1383.6 lane miles; AST- 1 P8W	1,384	0.007	0.02	150	53	Investigating Feasibility
Storm Drain Cleaning (in annual lbs.)	Storm Drain Cleaning (in annual lbs.)	15,400	0.0027	0.0006	9.24	41.58	Annually
Building Demolition	Demo of at least 15 Buildings	Varies	5.47	0	17.56	0	Varies
Land Use Change	Land Use Change: Conversion of turf to mixed/open	53	5.89	1.12	312.17	59.36	Varies
Land Use Change	Land Use Change: Conversion of mixed/open to forest	4.5	0.48	0.27	2.16	1.215	Varies
BMPs post-2009: Construction General Permit	Varies	Varies	Varies	Varies	Unknown	Unknown	Varies
Shoreline Restoration	CBF Living Shoreline Project at Third Port	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Shoreline Restoration	Harrison Road Living Shoreline	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Septic Disconnect	Mulberry Island Rd and Harrison Rd sanitary sewer extension	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Outfall Restoration	Four Outfalls in Bailey Creek Watershed	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

Appendix A

BMPs Implemented Prior to 01 November 2023

BMP Name	BMP Type	Impervious	Pervious	MS4	Lat	Long	TMDL AP	Year Installed	TN	TP
WR_WB_001	Wet Pond	19.702	11.95	Y	37.16418110	-76.56998674	CB	2008	53.70	18.29
WR_DE_002	Detention	0.300	0.90	Y	37.16212832	-76.57108258	N	2011	0.46	0.10
WR_PP_003	Pavers	0.110	0.06	Y	37.16205367	-76.57165244	N	2011	0.15	0.29
WR_PP_004	Pavers	0.100	0.02	Y	37.16171464	-76.57183497	N	2011	0.11	0.22
WR_PP_005	Pavers	0.040	0.00	Y	37.16164836	-76.57167113	N	2011	0.04	0.08
EL_WB_006	Wet Pond	89.82	117.33	Y	37.16194800	-76.60061500	CB	pre-2009	332.71	97.54
WR_DE_007	Detention	0.730	0.41	Y	37.16121440	-76.57105691	N	2011	0.49	0.15
WR_DE_008	Detention	0.730	0.41	Y	37.16121440	-76.57105691	N	2010	0.49	0.15
WR_DE_009	Detention	0.520	0.33	Y	37.16182851	-76.57093335	N	2011	0.36	0.11
WR_BB_010	Grass Swale	0.400	0.19	Y	37.16072595	-76.56640587	N	2010	0.51	0.08
WR_BB_011	Grass Swale	0.880	0.30	Y	37.16022694	-76.56642017	N	2010	1.04	0.17
WR_VS_012	Grass Swale	2.400	5.39	Y	37.15871527	-76.57010633	CB	2007	6.02	0.69
WR_DB_013	Detention	2.300	1.19	Y	37.16035547	-76.57059497	CB	2008	1.50	0.46
WR_VS_014	Grass Swale	1.042	0.73	Y	37.16014704	-76.57172546	CB	2008	1.49	0.22
WR_VS_015	Grass Swale	0.940	0.10	Y	37.15962995	-76.57254632	CB	2008	0.95	0.17
WR_FT_016	Filterra	0.200	0.00	Y	37.16121717	-76.57435761	N	2009	1.22	0.23
BC_DE_017	Detention	0.630	0.01	Y	37.16247747	-76.57636255	N	2011	0.30	0.11
BC_BB_018	Bioretention	0.140	0.06	Y	37.16253870	-76.57673816	N	2011	0.35	0.12
BC_BB_019	Bioretention	0.510	0.07	Y	37.16321482	-76.57684549	N	2011	1.06	0.42
BC_BB_020	Infiltration	0.190	0.09	Y	37.16355014	-76.57750423	N	2011	0.48	1.09
BC_BB_021	Infiltration	0.310	0.11		37.16340654	-76.57762472	N	2011	0.74	1.66
WR_IB_022	Infiltration	0.330	0.71	Y	37.15891904	-76.57610997	N	2009	1.61	3.63
WR_VS_023	Grass Swale	1.130	0.47	Y	37.15884009	-76.57313357	N	2010	1.39	0.22
WR_VS_024	Grass Swale	2.230	1.77	Y	37.15868626	-76.57363948	N	2010	3.33	0.48
WR_VS_025	Grass Swale	2.650	0.94	Y	37.15792512	-76.57471194	N	2010	3.15	0.51
WR_VS_026	Grass Swale	2.340	0.06	Y	37.15753995	-76.57499565	N	2010	2.24	0.41
WR_VS_027	Grass Swale	2.130	-0.43	Y	37.15718882	-76.57532343	N	2010	1.70	0.35
WR_WB_028	Wet Pond	14.200	-3.81	Y	37.15739800	-76.57213010	N	2010	21.34	10.39
WR_DB_029	Detention	4.200	3.58	y	37.15670279	-76.56992497	CB	2006	3.22	0.92
WR_FT_030	Filterra	0.180	0.18	N	37.15674102	-76.57685614	N	2011	1.92	0.26
WR_FT_031	Filterra	0.180	0.29	N	37.15679428	-76.57675184	N	2011	2.42	0.30
WR_FT_032	Filterra	0.180	0.18	N	37.15667746	-76.57678959	N	2011	1.92	0.26
WR_FT_033	Filterra	0.180	0.29	N	37.15667485	-76.57671403	N	2011	2.42	0.30
WR_FT_034	Filterra	0.180	0.32	N	37.15566039	-76.57743451	N	2011	2.55	0.31
WR_FT_035	Filterra	0.180	0.32	N	37.15569481	-76.57736555	N	2011	2.55	0.31
WR_FT_036	Filterra	0.190	0.01	N	37.15695097	-76.58070634	N	2016	1.21	0.22
WR_FT_037	Filterra	0.270	0.01	N	37.15672478	-76.58090165	N	2016	1.69	0.31
WR_BB_038	Bioretention	1.670	2.34	N	37.15612600	-76.58082700	N	2010	6.41	1.85
WR_BB_039	Bioretention	2.900	1.97	N	37.15537680	-76.57977220	N	2016	8.20	2.74
WR_BB_040	Bioretention	1.460	0.16	N	37.15527890	-76.57955240	N	2016	0.00	1.19
WR_BB_041	Bioretention	1.410	1.42	N	37.15618010	-76.57932700	N	2014	4.63	1.44

BMP Name	BMP Type	Impervious	Pervious	MS4	Lat	Long	TMDL AP	Year Installed	TN	TP
WR_DB_042	Detention	1.620	1.37	N	37.15506163	-76.58347728	N	2012	1.24	0.35
WR_DB_043	Detention	1.340	1.21	N	37.15424786	-76.58194895	N	2012	1.05	0.30
WR_DE_044	Detention	0.800	1.18	N	37.15336595	-76.58036248	N	2011	0.79	0.20
WR_DE_045	Detention	0.040	0.77	N	37.15416285	-76.58016977	N	2011	0.29	0.05
WR_FT_046	Filterra	0.320	-0.11	N	37.15337800	-76.57884450	N	2011	1.45	0.33
WR_FT_047	Filterra	0.310	0.13	N	37.15338840	-76.57826230	N	2011	2.48	0.40
WR_FT_048	Filterra	0.390	0.05	N	37.15270630	-76.57857060	N	2011	2.61	0.46
WR_FT_049	Filterra	0.160	0.02	N	37.15324040	-76.57757610	N	2011	1.07	0.19
WR_FT_050	Filterra	0.160	0.05	N	37.15330640	-76.57757430	N	2011	1.20	0.20
WR_FT_051	Filterra	0.210	0.00	N	37.15370480	-76.57689620	N	2011	1.28	0.24
WR_FT_052	Filterra	0.100	0.01	N	37.15368550	-76.57682730	N	2011	0.66	0.12
WR_BB_053	Bioretention	0.700	0.94	N	37.15290834	-76.57640809	N	2011	2.63	0.77
WR_BB_054	Bioretention	3.800	1.60	N	37.15410615	-76.57647674	N	2009	9.37	3.37
WR_BB_055	Bioretention	1.930	0.79	N	37.15370629	-76.57627154	N	2007	4.73	1.71
WR_DB_056	Detention	1.795	1.76	y	37.15342362	-76.57227005	CB	2006	1.46	0.40
WR_IB_057	Infiltration	0.400	0.28	Y	37.15368231	-76.57129056	N	2008	1.14	2.57
WR_IB_058	Infiltration	0.300	0.54	Y	37.15331695	-76.57092023	N	2008	1.32	2.97
WR_PP_059	PP	0.030	0.00	Y	37.15303377	-76.57126523	N	2008	0.03	0.06
WR_IB_060	Infiltration	1.600	1.42	Y	37.15211142	-76.57083934	N	2008	4.99	11.23
WR_WB_061	Retention	6.100	8.25	N	37.15146927	-76.57435328	N	2000	22.99	6.69
WR_BB_062	Bioretention	1.370	1.38	N	37.15190590	-76.57704870	N	2011	4.50	1.40
WR_SC_063	Stormceptor	0.210	0.04	N	37.15188527	-76.57773367	N	2012	0.11	0.23
WR_SC_064	Stormceptor	0.200	0.00	N	37.15150450	-76.57777151	N	2012	0.09	0.19
WR_SC_065	Stormceptor	0.360	0.00	N	37.15089401	-76.57772901	N	2012	0.17	0.34
WR_SC_066	Stormceptor	0.110	0.00	N	37.15056701	-76.57770096	N	2012	0.05	0.10
WR_SC_067	Stormceptor	0.200	0.00	N	37.14983317	-76.57951653	N	2012	0.09	0.19
WR_SC_068	Stormceptor	0.300	0.00	N	37.14978209	-76.58080066	N	2012	0.14	0.28
WR_BB_069	Bioretention	0.178	1.04	N	37.14937500	-76.57439400	N	2008	1.79	0.38
WR_BB_070	Bioretention	0.178	1.04	N	37.14907917	-76.57413940	N	2007	1.79	0.38
WR_BB_071	Bioretention	0.178	1.04	N	37.14912316	-76.57368844	N	2007	1.79	0.38
WR_BB_072	Bioretention	0.178	1.04	N	37.14926339	-76.57298812	N	2007	1.79	0.38
WR_BB_073	Bioretention	0.178	1.04	N	37.14975000	-76.57305192	N	2007	1.79	0.38
WR_DB_074	Detention	0.600	2.64	Y	37.14796217	-76.56908072	CB	2009	1.20	0.24
WR_DB_075	Detention	4.940	6.36	Y	37.14585270	-76.57671625	N	2009	4.54	1.19
WR_WB_076	Retention	0.900	2.72	N	37.14729138	-76.57811682	N	2010	5.49	1.32
WR_DE_077	Detention	0.600	0.10	Y	37.14342861	-76.57688944	N	2009	0.32	0.11
IC_VS_078	Grass Swale	0.601	0.15	y	37.14659103	-76.58971134	N	1991	0.67	0.11
IC_VS_079	Grass Swale	0.601	0.15	y	37.14663316	-76.59014234	N	1991	0.67	0.11
EL_WB_080	Retention	0.600	1.09	N	37.15585534	-76.59453709	N	2004	2.65	0.72
IC_DE_081	Detention	2.500	0.40	N	37.15942524	-76.60214326	N	2008	1.31	0.46
EL_PP_082	Pavers	0.050	0.00	Y	37.15842434	-76.58348306	N	2009	0.05	0.09

BMP Name	BMP Type	Impervious	Pervious	MS4	Lat	Long	TMDL AP	Year Installed	TN	TP
EL_PP_083	Pavers	0.061	0.00	y	37.15849991	-76.58362271	N	2008	0.06	0.12
EL_DB_084	Detention	0.370	0.23	Y	37.16056009	-76.58746244	N	2011	1.02	2.29
EL_WB_085	Retention	0.697	0.39	N	37.16136013	-76.58908388	CB	2006	1.86	0.64
EL_DE_086	Detention	1.000	1.16	Y	37.16192944	-76.59209343	CB	2006	0.87	0.23
EL_BB_087	Bioretention	3.201	-1.04	Y	37.16244861	-76.59209100	CB	2006	4.56	2.30
EL_DB_088	Detention	3.200	1.10	Y	37.16202320	-76.59413631	CB	2006	1.89	0.62
EL_DE_089	Detention	0.100	0.64	Y	37.16074461	-76.59498448	CB	2009	0.27	0.05
EL_DE_090	Detention	0.500	0.56	N	37.16278200	-76.59618800	N	2001	0.43	0.12
EL_DE_091	Detention	0.570	0.00	N	37.16345064	-76.59661824	N	2001	0.27	0.10
EL_BB_092	Bioretention	1.130	1.38	Y	37.16405849	-76.59130139	N	2008	4.05	1.21
EL_BB_093	Bioretention	0.980	0.81	Y	37.16484411	-76.59105203	N	2008	2.97	0.96
EL_BB_094	Bioretention	0.400	0.00	Y	37.16544939	-76.59102431	N	2008	0.75	0.32
EL_BB_095	Bioretention	0.380	0.02	Y	37.16540536	-76.59074258	N	2008	0.74	0.31
EL_BB_096	Bioretention	3.600	8.04	y	37.16369786	-76.58898553	CB	2008	18.01	4.66
EL_DE_097	Detention	0.300	1.32	y	37.16202100	-76.58518900	CB	2007	0.60	0.12
BC_IB_098	Infiltration	0.420	0.20	Y	37.16292259	-76.58452971	CB	2008	1.07	2.40
BC_IB_099	Infiltration	0.790	0.23	N	37.16313480	-76.58303120	N	2008	1.81	4.06
BC_DE_100	Detention	5.600	4.32	N	37.16390400	-76.58334200	N	2008	4.14	1.20
BC_DE_101	Detention	0.800	2.04	Y	37.16630006	-76.58796410	N	2008	1.09	0.24
BC_DB_102	Detention	4.550	1.04	Y	37.16703755	-76.58988719	N	2008	2.50	0.85
BC_IB_103	Infiltration	4.873	1.05	N	37.16727252	-76.59357082	CB	2004	10.62	23.90
BC_WB_104	Retention	3.280	5.30	N	37.16815600	-76.57981800	N	2007	13.57	3.79
IC_WB_105	Retention	6.400	13.59	N	37.14195589	-76.59927237	CB	2008	31.02	8.13
IC_WB_106	Retention	2.900	25.42	N	37.13785338	-76.58847912	CB	2008	40.99	8.02
MC_BB_107	Bioretention	0.500	0.08	Y	37.13101626	-76.59854855	N	2010	1.05	2.36
BC_VS_108	Grass Swale	1.300	-0.10	N	37.16307091	-76.58355011	CB	2008	1.15	1.01
WR_VT_109	Vortechs	21.789	28.21	N	37.14779700	-76.58695010	N	2007	20.09	5.25
JR_DB_110	Detention	0.080	0.82	Y	37.10889440	-76.58598208	N	2009	0.32	0.06
WR_SF_111	Stormfilter	0.431	0.19	Y	37.16481400	-76.59067900	N	2006	0.27	0.09
WR_SF_112	Stormfilter	0.304	0.08	Y	37.16458000	-76.59075200	N	2006	0.17	0.06
WR_SF_113	Stormfilter	0.280	0.10	Y	37.16406600	-76.59091400	N	2006	0.17	0.05
WR_SF_114	Stormfilter	0.285	0.07	Y	37.16401400	-76.59092700	N	2006	0.16	0.05