

CHESAPEAKE BAY TMDL ACTION PLAN

PHASE 3

NASA Langley Research Center

MS4 Permit #VAR040092

Table of Contents

Purpose	1
LaRC Background	1
Current Program and Existing Legal Authority	2
New or Modified Legal Authority	4
Means and Methods to Address Discharges from New Sources.....	4
Means and Methods to offset Grandfathered projects after July 1, 2014.....	5
Existing Source Loads and Calculated Total Pollutant of Concern (POC) Required Reductions.....	5
Previous Permit Cycle Reduction Achievements (July 1, 2009 to October 31, 2023).....	7
List of Implemented BMPs through Permit Cycle 2 (July 1, 2009 to October 31, 2023)	8
Future Means and Methods to Meet the Required Reductions and Schedule.....	10
Summary Table: Load Reductions through Permit Cycle 3 (to October 31, 2028).....	13
Real and Projected Costs	14
Public Participation	17
Signed Certification Statement.....	17

Purpose

The Chesapeake Bay Total Maximum Daily Load (TMDL) condition within the General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (VAR040092), requires the National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) to develop a TMDL Action Plan (“Action Plan”) and submit it to the Virginia Department of Environmental Quality (DEQ) for approval. This submittal is the third phase of the Action Plan and satisfies the Special Condition requirements covering the period of November 1, 2023 to October 31, 2028. This Action Plan demonstrates LaRC’s ability to ensure compliance with the Special Condition, and includes the means/methods to meet or exceed an additional 60% of Level 2 (L2) scoping run reductions for existing development by the end of this permit cycle (2028). In combination with the 40% reduction of L2 that has already been achieved, a total reduction no later than October 31, 2028, of 100% of L2 will be achieved. Level 2 implementation equates to an average reduction of 9.0% of nitrogen loads, 16% of phosphorus loads, and 20% of sediment loads from impervious regulated acres and 6.0% of nitrogen loads, 7.25% of phosphorus loads, and 8.75% of sediment loads from pervious regulated acres beyond 2009 progress loads and beyond urban nutrient management reductions for pervious regulated acreage.

LaRC Background

NASA LaRC is situated near the southern end of the lower Virginia Peninsula, approximately 150 miles south of Washington, D.C. and 50 miles southeast of Richmond, Virginia. The cities of Hampton, Poquoson, Newport News, and York County form a major metropolitan statistical area around LaRC. The Center contains several wind tunnels, research facilities, and administrative offices. The Center owns and operates 764 acres of property. LaRC is located within close proximity to several surface water bodies within the tidal zone of the Chesapeake Bay.

LaRC is considered to be in the York River drainage basin, specifically river segment YLO_7370_0000. This river segment is part of the Mobjack Bay segmentshed which is part of the overall York River basin. The Brick Kiln Creek runs along the western boundary of LaRC, joining the northwest branch of the Back River, and drains approximately 40 percent of the Center. Tabbs Creek, which drains a majority of the rest of the Center, flows in a northerly direction to join the Back River near the confluence of its northwest and southwest branches. A small portion of the property in the south drains to Tides Mill Creek. The local waterways are influenced by tides in the Chesapeake Bay. The waters in the local streams are designated by the State as Class IIa, estuarine waters where shellfish can be found.

Current Program and Existing Legal Authority

LaRC has a robust stormwater management program that has the required regulatory mechanisms in place to ensure compliance with the MS4 General Permit, the Chesapeake Bay TMDL Special Condition, and this Action Plan. The following is a list of applicable mechanisms and a brief description:

- **Langley Procedural Requirements (LPR) 8500.1 “Environment and Energy Program Manual”** - This LPR sets forth procedural requirements and responsibilities to ensure that LaRC personnel comply with the Center’s environmental and energy management program. This is the closest document LaRC has to a traditional “ordinance.” Chapter 5 of LPR 8500.1 covers the Water Quality Program including TMDLs and LaRC policy to comply with the Chesapeake Bay TMDL and to reduce pollutant loadings to the maximum extent practicable. The document also details responsibilities for Center personnel to ensure water quality regulations and goals are met.
- **DEQ-approved NASA LaRC Standards and Specifications for Erosion and Sediment Control (ESC) and Stormwater Management (SWM)** – This is the foundation of LaRC’s program. LaRC has Annual Standards and Specifications for ESC and SWM that are integral components of LaRC’s design, construction, maintenance, and management of the Center’s facilities and operations. The primary regulatory driver for NASA LaRC Annual Standards and Specifications is the Virginia Stormwater Management Program (VSMP) regulations (9 VAC 25-870), the General VPDES Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-880/VAR10), Erosion and Sediment Control Law (9 VAC 25-840), and LaRC’s MS4 permit (VAR040092)*. The NASA LaRC Annual Standards and Specifications for ESC and SWM has been developed to provide detailed information regarding LaRC’s compliance with all regulatory requirements. This program guide discusses staffing, covers all the necessary design standards, discusses how LaRC reviews and approves stormwater-related Plan submittals, and how LaRC enforces its program.

**Note: The Virginia State Water Control Board approved regulatory updates in June 2023 that consolidate Virginia’s erosion and sediment control and stormwater management programs. These regulations will be combined into a single regulation, the Virginia Erosion and Stormwater Management Regulation, which will become effective July 1, 2024. NASA LaRC will update the NASA LaRC Annual Standards and Specifications for ESC and SWM prior to the effective date of the new, consolidated regulation.*

- **LaRC Master Plan and Revitalization Plan** – As this Action Plan will show, LaRC is going through a significant transformation. Through long-term Master Planning, the Center is transforming and creating the LaRC of 2050. This transformation requires significant demolition of older, unsustainable facilities. LaRC has planned to demolish over 100 structures throughout this

process and is on target to meet this goal. Many of these demolished impervious areas are being transitioned back to green space and the overall LaRC footprint is being pulled into a central campus concept. These reductions in impervious surface are an essential element to TMDL compliance for LaRC. In addition, any new construction under this revitalization program is required to be environmentally sustainable with a Leadership in Energy and Environmental Design (LEED) silver or greater rating, and compliant with EISA Section 438 requirements. All new construction is also required to meet State stormwater design standards, at a minimum.

- **Environmental Management System (EMS)** – LaRC has an active EMS. LaRC’s EMS is a system that does the following: (1) incorporates people, procedures, and work practices into a formal structure to ensure that the important environmental impacts of the organization are identified and addressed; (2) promotes continual improvement, including periodically evaluating environmental performance; (3) involves all members of the organization, as appropriate; and (4) actively involves senior management in support of the EMS. LaRC senior management approved the creation of the Environmental Management Committee (EMC) in July 2009. The EMC meets quarterly and reports annually to the Center Leadership Council regarding the status, progress, and challenges of LaRC’s Environmental Management System. The EMS is as an excellent tool to assist in Chesapeake Bay TMDL compliance and continues to be used to bring the TMDL visibility to senior management.
- **Additional Guidance Documents – (NASA LaRC Design Standards FES-ENVENE; NASA LaRC Environmental Master SPEC Section 01 35 40.00 99; NASA LaRC Seeding SPEC Section 32 92 19.00 99)** – These three documents are incorporated by reference into the NASA LaRC Annual Standards and Specifications for ESC and SWM. In combination, these documents guide NASA on proper ESC and SWM program implementation. The NASA LaRC Environmental Design Standards FES-ENVENE primarily apply to design aspects of projects. They are implemented into project requirements and into contract award packages to ensure projects are designed in accordance with all applicable requirements. The NASA LaRC Master SPEC Section 01 35 40.00 99 and NASA LaRC SPEC Section 32 92 19.00 99 primarily apply to construction and land disturbance activities to ensure projects are constructed in compliance with all applicable requirements and that best management practices for erosion and stormwater management are utilized throughout the duration of the project.
- **EISA Section 438** - Section 438 states that federal projects exceeding 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature rate, volume, and duration of flow. This is another driver for projects that help achieve compliance with the Chesapeake Bay TMDL.

New or Modified Legal Authority

No new legal authorities are needed to ensure implementation of the Action Plan or compliance with the Chesapeake Bay TMDL. LaRC has implemented the necessary regulatory controls to ensure compliance.

Means and Methods to Address Discharges from New Sources

LaRC has determined that there are no needed offsets for increased loads from new sources that initiated construction on or after July 1, 2009.

There were four major redevelopment/construction projects that disturbed over one acre during this time period; however, due to NASA's aggressive LEED goals and the Federal Energy Independence and Security Act (EISA) Section 438 design standards, these facilities provided more stormwater treatment and stormwater quantity reduction than required. Additionally, these projects are considered redevelopment projects. *Note: Outside of the four redevelopment projects discussed above, there were a number of regulated demolition projects (as discussed and highlighted in the previous section) that were over one acre in size. However, these sites are all compliant (no offset of new sources needed) since they went from an impervious condition to a 100% pervious grass condition. No further reductions are needed from the demolition projects over one acre.*

The previous regulatory mechanisms discussed adequately ensure that the necessary means and methods are in place to address discharges from new sources. In particular, NASA's DEQ-approved Annual Standards and Specifications for ESC and SWM detail these means and methods and ensure compliance with Technical Criteria Part II b of the SWM regulations. In addition, LaRC has a specific Environmental Construction Specification (Section 01 35 40.00 99) that ensures all construction contracts on Center are compliant with the most current state stormwater regulations. The construction specification requires sites with over an acre of land disturbance to submit an ESC Plan, SWM Plan, Stormwater Pollution Prevention Plan (SWPPP), Virginia Runoff Reduction Method (VRRM) spread sheets, and Construction General Permit (CGP) coverage (when applicable). Lastly, neither specification allows any land disturbing activities to occur until all required Plan submittals are reviewed and approved by NASA's certified Dual Combined Administrator for ESC and SWM.

Means and Methods to offset Grandfathered projects after July 1, 2014

LaRC made a management decision to not grandfather any projects that began construction after July 1, 2014. All applicable projects that started after July 1, 2014 met or will meet Technical Criteria Part II B design requirements per LaRC's Annuals Standards and Specifications for ESC and SWM.

Existing Source Loads and Calculated Total Pollutant of Concern (POC) Required Reductions

The first step in determining source loads POC reductions was to perform an in-depth analysis of the size and extent of the regulated MS4 as of June 30, 2009. LaRC utilized extensive GIS resources to accurately determine the total regulated urban pervious and impervious surface acres. Forested acres were excluded from the land use totals through GIS. Many of the buildings that were present in 2009 had been demolished. As such, great effort was given to "rebuild" the impervious state for the 2009 TMDL Base map. Demolished buildings and structure "polygons" in the GIS system were added back in and compared against previous year aerial photos to ensure that an adequate picture of the Center on June 30, 2009, was developed. LaRC's GIS team also built an impervious surfaces tool that allows staff to easily visualize the types of impervious surfaces in each outfall drainage basin. The tool generates automatic data reports. A breakdown of LaRC's 764 acreage is summarized in the table below:

Size and Extent of the MS4	
Regulated Urban Impervious	217.66
Regulated Urban Pervious	250.77
Excluded Forested Lands	295.57
Total	764 Acres

The POC loads and required reductions have been calculated using the tools described in the TMDL Guidance document.

The sections below cover load and cumulative reductions calculations in accordance with Part II A3, A4, and A5. NASA LaRC has confirmed that only Part II A 3 applies.

The following table showcases the existing source loads:

NASA Langley - Source Loads and Reduction Requirements (York River and Poquoson Coastal Basin)							
Sub source	Pollutant	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)	2009 Loading Rate (lbs/acre/yr)	Total POC Load Based on 2009 Progress Run (lbs/yr)	Percentage of MS4 required Chesapeake Bay total L2 loading reduction (%)	100% cumulative reduction required by 10/31/2028 (lbs/yr)	Sum of 100% cumulative reduction required (lbs/yr)
Regulated Urban Impervious	Total Nitrogen (TN)	217.66	7.31	1591.09	9.00%	143.2	258.3
Regulated Urban Pervious		250.77	7.65	1918.39	6.00%	115.1	
Regulated Urban Impervious	Total Phosphorous (TP)	217.66	1.51	328.67	16.00%	52.6	61.9
Regulated Urban Pervious		250.77	0.51	127.89	7.25%	9.3	
Regulated Urban Impervious	Total Suspended Solids (TSS)	217.66	456.68	99400.97	20.00%	19880.2	21477.2
Regulated Urban Pervious		250.77	72.78	18251.04	8.75%	1597.0	

Previous Permit Cycle Reduction Achievements (July 1, 2009 to October 31, 2023)

The table below summarizes the total reductions achieved as of the end of Permit Cycle 2. NASA LaRC achieved significantly more than the required 40% reductions during the first two cycles. A listing of implemented BMPs that generated these load reductions is in the subsection below.

Sub source	Pollutant	Total Required Reduction (lbs)	Load Reductions Required by End of Permit Cycle 1 (5%) (lbs/yr)	Load Reductions Achieved by End of Permit Cycle 1 (lbs/yr)	Load Reductions Required by End of Permit Cycle 2 (40%) (lbs/yr)	Cumulative Cycle Load Reductions Achieved by End of Permit Cycle 2 (lbs/yr)	Cumulative Progress, Cycles 1 & 2 (%)
Regulated Urban Impervious	TN	143.2	7.16	96.1	57.3	152.2	76%
Regulated Urban Pervious		115.1	5.76	26.6	46.0	52.0	
Regulated Urban Impervious	TP	52.6	2.63	9.7	21.0	19.3	66%
Regulated Urban Pervious		9.3	0.46	4.5	3.7	8.9	
Regulated Urban Impervious	TSS	19880.2	994.01	7816.4	7952.1	11646.8	73%
Regulated Urban Pervious		1597.0	79.85	762.6	638.8	1382.1	

List of Implemented BMPs through Permit Cycle 2 (July 1, 2009 to October 31, 2023)

Summary Narrative:

Several management practices were utilized and implemented during the first two permit cycles to achieve the required 40% reductions for existing sources. No nutrient trading was used.

In summary, a total of fifty-three (53) impervious structures were demolished and returned to a grass condition. While these areas are mowed periodically, they do not receive nutrient applications. The demolished structures equate to a total of 13.7 acres of impervious areas converted to turf, mixed open, or forest conditions. Street sweeping was utilized during all years of both permit cycles including all roads and parking surfaces on Center were swept on a quarterly basis. Additionally, 4.67 acres were converted to a forested condition. Stormwater retrofits were also completed via the installation of four tree-box filters around the Center during Permit Cycle 1.

List of implemented projects, dates of implementation and load reduction achieved:

Practice Implemented	Date of Implementation	TN Impervious Load Reduced (lbs/yr)	TN Pervious Load Reduced (lbs/yr)	TP Impervious Load Reduced (lbs/yr)	TP Pervious Load Reduced (lbs/yr)	TSS Impervious Load Reduced (lbs/yr)	TSS Pervious Load Reduced (lbs/yr)
Land Use Change - Impervious to Turf	7/1/2009 - 6/30/2010	9.39	0.00	0.00	0.00	763.19	0.00
Land Use Change - Impervious to Turf	7/1/2010 - 6/30/2011	1.69	0.00	0.00	0.00	137.10	0.00
Land Use Change/Impervious to Forest AND Forest Buffer	4/30/2011	3.71	1.16	0.23	0.14	209.70	21.68
Land Use Change - Impervious to Turf	7/1/2011 - 6/30/2012	0.56	0.00	0.00	0.00	45.70	0.00
Land Use Change - Impervious to Turf	7/1/2012 - 6/30/2013	2.68	0.00	0.00	0.00	242.21	0.00
Land Use Change - Impervious to Turf	7/1/2013 - 6/30/2014	3.20	0.00	0.00	0.00	260.49	0.00
Land Use Change/Turf to Forest AND Forest Buffer	4/23/2014	0.00	3.19	0.00	0.55	0.00	94.28

Land Use Change - Impervious to Turf	7/1/2014 - 6/30/2015	3.71	0.00	0.00	0.00	301.62	0.00
Tree Box Filter #1	3/11/2015	0.25	0.24	0.22	0.07	31.79	4.54
Tree Box Filter #2	3/11/2015	0.10	0.32	0.05	0.05	12.33	5.90
Tree Box Filter #3	3/11/2015	0.06	0.37	0.02	0.04	6.66	6.91
Tree Box Filter #4	3/11/2015	0.11	0.04	0.07	0.01	13.97	0.74
Land Use Change - Impervious to Turf	7/1/2015 - 6/30/2016	29.67	0.00	0.00	0.00	2412.96	0.00
Land Use Change/Turf to Forest AND Forest Buffer	7/1/2015 - 6/30/2016	0.00	10.62	0.00	1.82	0.00	314.28
Land Use Change - Impervious to Turf	7/1/2016 - 6/30/2017	8.94	0.00	0.00	0.00	726.63	0.00
Land Use Change/Turf to Forest AND Forest Buffer	7/1/2016 - 6/30/2017	0.00	10.62	0.00	1.82	0.00	314.28
Land Use Change - Impervious to Turf	7/1/2018 - 6/30/2019	3.09	0.00	0.00	0.00	251.35	0.00
Land Use Change - Impervious to Turf	7/1/2020 - 6/30/2021	6.86	0.00	0.00	0.00	557.54	0.00
Land Use Change/Pervious to Forest AND Forest Buffer	7/1/2021 - 6/30/2022	0.00	13.28	0.00	2.28	0.00	392.85
Land use change - Impervious to Mixed Open	7/1/2022-6/30/2023	14.20	0.00	0.65	0.00	369.60	0.00
Land use change - Turf to Forest AND forest buffer	7/1/2022-6/30/2023	0.00	7.48	0.00	1.31	0.00	226.68
Land use change- Turf to Mixed Open	7/1/2022 - 6/30/2023	0.00	3.73	0.00	0.68	0.00	0.00
Land use change- Turf to Mixed Open	7/1/2022 - 6/30/2023	0.00	0.93	0.00	0.17	0.00	0.00
Catch Basin Cleaning	Annual Credit	32.00	0.00	7.00	0.00	0.00	0.00
Street Sweeping	Annual Credit	0.00	0.00	2.00	0.00	2652.00	0.00

Future Means and Methods to Meet the Required Reductions and Schedule

This Action Plan describes the management practices and programs that will be implemented between November 1, 2023 and October 31, 2028 to achieve the remaining 60% reduction for existing sources. LaRC will use the following types of practices and reductions for this permit cycle (2023 through 2028). Nutrient credits may be used if necessary if a determination is made that any project included in this plan is no longer feasible.

1) Project/BMP: Land Use Change - Impervious to Grass/Mixed Open Credit

From November 1, 2023 to October 31, 2028, a total of ten (10) impervious structure are listed in the Center's Demolition Plan. All areas will be returned to at least a lawn condition, and some areas are planned to convert to mixed open space. These land use changes will equate to a total of 12.48 acres of impervious area converted to green space.

Planned Demolitions, 2023-2028	
Building	Name
1256 Complex	Combined Loads Test (COLTS) Facility
1202	Research Lab
1202A	Pearl Young Conference Center
1299	Research Complex
1220	Research Lab
1159	Polytechnics Test Facility
1188	Component Cleaning Facility
1189	Contractor Support Facility
1209	Office Facility

2) Project/BMP: Street Sweeping Program – Annual credit

LaRC has an established street sweeping program that is accomplished through a ground's maintenance contract. All roads and parking surfaces (102 acres) on Center are swept on a quarterly basis (one pass every twelve weeks). Developed using the qualifying street lanes method to reflect the *Guidance Memo No, 20-2003 – Chesapeake Bay TMDL Special Condition Guidance*, dated November 12, 2020.

BMP efficiency can be found in the table and information on the description and practice can be found in the referenced final report.

Lane Miles/Acres	Practice #	Description	Passes	TSS Removal % Efficiency	TN Removal % Efficiency	TP Removal % Efficiency
102	SCP-6	AST - 1P12W	4	2	0	1
**Assume annual load from impervious cover of 1,300 lbs/ac/year (sediment), 15.5 lbs/ac/yr (nitrogen) and 1.93 lbs/ac/yr (phosphorus)				TSS Removed (lbs)	TN Removed (lbs)	TP Removed (lbs)
				2652	0	2.0

3) Project/BMP: Storm Drain Cleaning Credit

Loads were developed using the storm drain cleaning credit method to reflect the *Guidance Memo No, 20-2003 – Chesapeake Bay TMDL Special Condition Guidance*, dated November 12, 2020. LaRC has an established catch basin cleaning program that is completed through a ground’s maintenance contract. All 761 catch basins at LaRC are cleaned twice annually. BMP efficiency can be found in the table and information on the description and practice can be found in the referenced final report.

The credit was computed in three steps:

Step 1: Measure the mass of solids/organic matter that is effectively captured and properly disposed by the storm drain cleaning practice on an annual basis. The three-year average for collection was 26,280 pounds.

Step 2: Convert the initial wet mass captured into dry weight. The following default factors were used to convert wet mass to dry weight in the absence of local data. The conversion factors are 0.7 for wet sediments (CSN, 2011) and 0.2 for wet organic matter (Stack et al, 2013). Since the mass is a mixture, an average conversion factor of .45 was used.

Step 3: Multiply the dry weight mass by a default nutrient enrichment factor depending on whether the material captured is sediment or organic in nature.

Average Mass	Conversion Factor	Dry Weight	Nutrient Enrichment % P	Nutrient Enrichment % N
26280	*0.45	11826	0.06	0.27
*Nutrient enrichment for BMP and catch basin sediments used			TP Removed (lbs)	TN Removed (lbs)
			7.1	32

4) Project/BMP: Land Conversions (Land Use Change - Turf to Forest)

LaRC’s long-term Master Planning has included significant demolition of older, unsustainable facilities that have been transitioned back to green space. Overall, the LaRC footprint is being pulled into a central campus concept. These reductions in impervious surface have left significant green spaces in LaRC’s “North 40” area or flood-prone areas. These areas have no value in being mowed and would serve better as forested habitat. This has been a multi-stage project within the Reforestation Plan to convert grass to hardwood forested areas by planting seedlings (per Guidance Document Table V.F.2, a minimum number of seedlings per acre reclassify the land as forest land). LaRC works with the Virginia Department of Forestry to evaluate tree species, planting techniques and cost.

LaRC has several acres planned for reforestation during Permit Cycle 3. These areas will also take the Forest Buffer efficiency credit for upland acre treatment.

5) Project/BMP: Land Conversions (Land Use Change - Turf to Mixed Open)

LaRC will evaluate acreage in the North 40 that are not suitable for reforestation but are good candidates for conversion to Mixed Open space. LaRC does not apply nutrients to any vegetated areas.

6) Project/BMP: Installation of Structural BMPs (Virginia Stormwater Clearinghouse BMPs)

Other avenues may be pursued to generate the reductions required for the Bay TMDL, including the installation of structural BMPs.

LaRC has several areas that may be redesigned as a structural BMP, in accordance with established efficiencies and design specifications in the Virginia Stormwater BMP Clearinghouse. Examples include compost-amended grass channels, sheet flow to a conserved open space, and micro-bioretenion (rain gardens). LaRC will determine the necessity for these structural BMPs based on TMDL reduction progress and funding availability. LaRC will report updates through its Chesapeake Bay TMDL implementation annual status report.

7) Nutrient Credits

Nutrient credits may be used if necessary if LaRC determines that all other projects are no longer feasible. LaRC will report updates through its Chesapeake Bay TMDL implementation annual status report.

Summary Table: Load Reductions Planned through Permit Cycle 3 (to October 31, 2028)

POC	Reduction required by end of Permit Cycle 3 (lbs/yr)	Cumulative Total Load Reduction Achieved, 2009 through Permit Cycle 2 (lbs/yr)	Remaining Reductions Required in Permit Cycle 3 (lbs/yr)	Planned Load Reductions, Permit Cycle 3 (lbs/yr)				Progress towards 100% Required Reduction (%)
				Land Conversions	Street Sweeping	Catch Basin Cleaning	Other Methods (Structural BMPs or nutrient credits)*	
TN	258.3	204.2	54.1	116.2	0	32	--	>100%
TP	61.9	28.3	33.6	7.7	2	7.1	16.8	100%
TSS	21477.2	13029	8448.2	6439.6	2652	0	--	>100%

**Other methods, such as structural BMPs or nutrient credits, will be implemented as needed. LaRC will determine the necessity for these practices based on TMDL reduction progress and funding availability.*

Real and Projected Costs

The following table depicts costs (rounded) for TMDL compliance-related projects that have been implemented since July 1, 2009:

Time Period	Project	Cost (\$K)	Notes
July 1, 2009 – June 30, 2010	Demolition – Land Use Conversion of Impervious to Grass (total of 28 facilities)	1,336	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2009 – June 30, 2010	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2010 – June 30, 2011	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	20	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2010 – June 30, 2011	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2011 – June 30, 2012	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	46	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2011 – June 30, 2012	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2012 – June 30, 2013	Demolition – Land Use Conversion of Impervious to Grass (total of 10 facilities)	231	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2012 – June 30, 2013	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2013 – June 30, 2014	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	350	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2013 – June 30, 2014	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2013 – June 30, 2014	Forest Buffer	0.45	Labor was in-house Environmental staff. Only the costs of the trees.

Time Period	Project	Cost (\$K)	Notes
July 1, 2014 – June 30, 2015	Demolition – Land Use Conversion of Impervious to Grass (total of 1 facility)	400	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2014 – June 30, 2015	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2014 – June 30, 2015	Tree Boxes x4	180	This included design and installation of 4 units.
July 1, 2015 – June 30, 2016	Demolition – Land Use Conversion of Impervious to Grass (total of 3 facilities)	1,005	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2015 – June 30, 2016	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2015 – June 30, 2016	Land Use Conversion of Pervious to Forest	5.5	1-acre reforestation (hardwood)
July 1, 2016 – June 30, 2017	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	580	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2016 – June 30, 2017	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2016 – June 30, 2017	Land Use Conversion of Pervious to Forest	0.89	1-acre reforestation (pines and hardwood)
July 1, 2017 – June 30, 2018	Street Sweeping Program	5	Annual cost for street sweeping via contract.
July 1, 2017 – June 30, 2018	Land Use Conversion of Pervious to Forest	2.4	1-acre reforestation (pines and hardwood)
July 1, 2018 – June 30, 2019	Demolition – Land Use Conversion of Impervious to Grass (total of 1 facility)	637	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2018 – June 30, 2019	Street Sweeping Program	5	Annual cost for street sweeping via contract.

Time Period	Project	Cost (\$K)	Notes
July 1, 2019 – June 30, 2020	Street Sweeping Program	7	Annual cost for street sweeping via contract.
July 1, 2020 – June 30, 2021	Street Sweeping Program	7	Annual cost for street sweeping via contract.
July 1, 2021 – June 30, 2022	Land Use Conversion of Pervious to Forest	8	1.25-acre reforestation (hardwood)
July 1, 2021 – June 30, 2022	Street Sweeping Program	7	Annual cost for street sweeping via contract.
July 1, 2022 – June 30, 2023	Demolition – Land Use Conversion of Impervious to Grass	2,480	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2022 – June 30, 2023	Street Sweeping Program	7	Annual cost for street sweeping via contract.
Total cost paid		7,360	

The following table depicts estimated costs (rounded) for projects planned from November 1, 2023 to the close of the MS4 permit cycle 3 (October 31, 2028):

Time Period	Project	Cost (\$K)	Notes
2023-2028	Street Sweeping Program	35	Annual cost for street sweeping via contract for five years.
2023-2028	Facility Demolitions (Land Use Change)	16,440	10 structures
2023-2028	Land Use Conversion of Turf to Forest	10/acre	1-acre reforestation (hardwood)
2023-2028	Land Use Conversion of Turf to Mixed Open	0	No added cost
TBD	Other practices as needed (Installation of Virginia Stormwater Clearinghouse BMPs)	TBD	Cost will vary depending on practice
TBD	Other practices as needed (Nutrient Credits)	TBD	Cost will vary depending on number of credits and obtainment strategy

Public Participation

Prior to the submittal of the action plan required in Part II A 11 of 9VAC25-890-40 (General Permit) LaRC provided an opportunity for public comment on the LaRC's Stormwater Program and Chesapeake Bay TMDL Action Plan. The opportunity for public comment was provided no less than 15 days prior to the submittal of the plan to the DEQ and was completed via the communication website for LaRC employees and the public environmental website. This announcement page is viewable and accessible to all LaRC employees.

One comment was received verbally to the Water program office. The individual expressed an interest in seeing more native vegetation and clover in green spaces across the Center. NASA LaRC has plans to convert large lawn areas to mixed open/meadows and will incorporate native plantings into these areas to the maximum extent practical. No edits were made to the Plan based off the public feedback.

Signed Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

///TO BE SIGNED ON FINAL VERSION///

Kristen Poultney, Head, Environmental Management Office

Date