

BACK RIVER TMDL ACTION PLAN

NASA Langley Research Center

MS4 Permit #VAR040092

04/30/2021

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Purpose:

In accordance with the requirements of MS4 Permit #VAR040092, NASA Langley Research Center (LaRC) is required to develop an action plan to address bacterial contamination in the Back River. The Virginia Department of Environmental Quality (DEQ) established Total Maximum Daily Loads (TMDL) for bacteria for the Back River in York County and the cities of Hampton, Poquoson, and Newport News, Virginia in 2018. The TMDL was approved by the Environmental Protection Agency (EPA) on February 9, 2018 and can be found on the DEQ’s website at <https://www.deq.virginia.gov/water/water-quality/tmdl-development/approved-tmdls>

A copy of this LaRC TMDL Action Plan is stored within the LaRC Environmental Management Office (EMO) and can be found online at: <https://environmental.larc.nasa.gov/water/back-river-tmdl/>

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 proximity to several surface water bodies within the tidal zone of the Chesapeake Bay.

LaRC is 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 most 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.

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 federal, state and local regulations. This is the closest document LaRC has to a traditional “ordinance.” Chapter 5 of LPR 8500.1 covers the Water Quality Program, including Chesapeake Bay TMDL compliance and pollutant loading reduction to the maximum extent practicable. The document also details responsibilities for Center personnel to enforce water quality regulations.
- **DEQ-approved NASA LaRC Standards and Specifications for Erosion and Sediment Control (ESC) and Stormwater Management (SWM)** – 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 drivers for NASA LaRC Annual Standards and Specifications are 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 document highlights certified staff, design standards, discusses how LaRC reviews and approves stormwater-related plan submittals, and how LaRC enforces its program.
- **LaRC Master Plan and Revitalization Plan** – 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 follow EISA 438 and achieve Leadership in Energy and Environmental Design (LEED) silver or greater rating. All new construction is required to meet Virginia water quality and quantity standards.

- **Environmental Management System (EMS)** – LaRC has an active EMS that: (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 periodic evaluation of 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 an excellent tool to ensure Chesapeake Bay TMDL compliance and will be used to highlight the Back River TMDL as well.
- **Additional Guidance Documents – (NASA LaRC Design Standards FES-ENVENE; NASA LaRC Environmental Master SPEC Section 01 35 40.00 40)** – These two documents are incorporated by reference into the NASA LaRC Annual Standards and Specifications for ESC and SWM. In combination, these documents outline proper ESC and SWM requirements for design and construction. The NASA LaRC Environmental Design Standards FES-ENVENE is 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 41 primarily applies to construction activities to ensure projects are constructed in compliance with all applicable requirements and that best management practices 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.

Required TMDL Action Plan Elements (Requirements of Part II B 3)

Wasteload Allocation (WLA) (Part II B 3 c):

The fecal coliform existing and allowable loads are summarized in the following tables excerpted from “Total Maximum Daily Loads of Bacteria for Back River in York County and the Cities of Hampton, Poquoson, and Newport News, Virginia,” published on June 21, 2017 by VADEQ.

Table E.5 provides daily waste load allocations for all MS4 permit holders in the watershed. NASA LaRC’s allowable daily waste load is 2.80E+10, requiring a reduction of 35.5%. Similarly, Table E.6 provides annual waste load allocations per MS4 in the watershed. NASA LaRC’s allowable annual load is 4.58E+12, requiring a reduction of 35.4%.

Table E.5: Existing and Allowable Maximum Daily Load by Jurisdiction: Combined WLA and LA

Jurisdiction	Existing Load (Counts/Day)	Allowable Load (Counts/Day)	Reduction (%)
York County	4.76E+11	3.72E+11	21.8%
City of Poquoson	9.66E+11	4.09E+11	57.7%
City of Hampton	6.36E+12	2.61E+12	59.0%
City of Newport News	4.34E+11	3.51E+11	19.1%
NASA Langley	4.34E+10	2.80E+10	35.5%
Langley AFB	2.10E+11	1.97E+11	8.1%
DOE-TJ Accelerator Facility	6.82E+09	6.82E+09	0.0%
TNCC	1.25E+10	1.25E+10	0.0%
VDOT	5.87E+10	5.87E+10	0.0%
Sum	8.57E+12	4.05E+12	52.8%

Table E.6: Existing and Allowable Annual Load by Jurisdiction: Combined WLA and LA

Jurisdiction	Existing Load (Counts/Year)	Allowable Load (Counts/Year)	Reduction (%)
York County	7.76E+13	6.07E+13	21.8%
City of Poquoson	1.57E+14	6.65E+13	57.6%
City of Hampton	1.04E+15	4.25E+14	59.1%
City of Newport News	7.08E+13	5.73E+13	19.1%
NASA Langley	7.09E+12	4.58E+12	35.4%
Langley AFB	3.51E+13	3.22E+13	8.3%
DOE-TJ Accelerator Facility	1.12E+12	1.12E+12	0.0%
TNCC	2.05E+12	2.05E+12	0.0%
VDOT	9.64E+12	9.64E+12	0.0%
Sum	1.40E+15	6.59E+14	52.9%

The fecal coliform estimated loads and load reductions by MS4 permit are summarized in Tables E.7 and E.8, respectively, for daily and annual loads for the Back River watershed. The total loadings comprise the total load in the entire watershed that includes non-listed segments. NASA LaRC's estimated daily waste load for fecal coliform is 1.82E+10, requiring a reduction of 35.00%, and NASA LaRC's estimated annual load is 2.98E+12, requiring a reduction of 34.93%.

Table E.7: Estimated Daily Loads and Load Reductions for Fecal Coliform by MS4 Permit¹

Watershed	Permit Number	MS4 Permit Holder	Existing Load (cfu/day)	Wasteload Allocation (cfu/day)	Percent Reduction(%) ²
Back River	VA0088633	City of Hampton	2.62E+12	1.65E+12	37.02
	VA0088641	City of Newport News	3.51E+11	2.68E+11	23.65
	VAR040024	City of Poquoson	4.09E+11	2.00E+11	51.10
	VAR040028	York County	3.72E+11	2.69E+11	27.69
	VAR040092	NASA Langley Research Center	2.80E+10	1.82E+10	35.00
	VAR040140	Langley Air Force Base	1.97E+11	1.85E+11	6.09
	VAR040079	DOE-TJ Accelerator Facility	4.77E+09	4.77E+09	0.00
	VAR040087	TNCC	1.04E+10	1.04E+10	0.00
	VAR040115	VDOT	5.87E+10	4.99E+10	14.99
		SUM		4.05E+12	2.66E+12

¹MS4 permits may address the TMDL WLAs for stormwater through the iterative implementation of programmatic BMPs.

² Percent reduction is based on average annual WLA, and is computed as a reduction from the baseline existing load

Table E.8: Estimated Annual Loads and Load Reductions for Fecal Coliform by MS4 Permit¹

Watershed	Permit Number	MS4 Permit Holder	Existing Load (cfu/year)	Wasteload Allocation (cfu/year)	Percent Reduction(%) ²
Back River	VA0088633	City of Hampton	4.27E+14	2.69E+14	37.00
	VA0088641	City of Newport News	5.73E+13	4.38E+13	23.56
	VAR040024	City of Poquoson	6.65E+13	3.26E+13	50.98
	VAR040028	York County	6.07E+13	4.40E+13	27.51
	VAR040092	NASA Langley Research Center	4.58E+12	2.98E+12	34.93
	VAR040140	Langley Air Force Base	3.22E+13	3.02E+13	6.21
	VAR040079	DOE-TJ Accelerator Facility	7.83E+11	7.83E+11	0.00
	VAR040087	TNCC	1.71E+12	1.71E+12	0.00
	VAR040115	VDOT	8.20E+12	8.20E+12	0.00
		SUM		6.59E+14	4.33E+14

¹ MS4 permits may address the TMDL WLAs for stormwater through the iterative implementation of programmatic BMPs.

² Percent reduction is based on average annual WLA, and is computed as a reduction from the baseline existing load

Significant Sources of Bacteria Discharging to LaRC’s MS4 (Part II B 3 d):

The following are sources of bacteria discharging to LaRC’s MS4 that are not covered under a separate permit. Nonpoint sources are the dominant pollutant source in the watershed. However, NASA LaRC has no septic systems, pets, marinas, or livestock within its property.

- **Urban Wildlife:** The largest contributor to bacterial discharges at LaRC is from wildlife. Typical wildlife on the Center includes deer, racoon, muskrat, fox, ducks/birds/geese, and coyotes.

NASA acreage represents 1.14% of the watershed, as seen in Table E.2.

Table E.2: List of Municipal Separate Storm Sewer System Permits (MS4)

Watershed	Permit Number	MS4 Permit Holder	Phase	Regulated Service Area (Ac)	Percent of Watershed (%)
Back River	VA0088633	City of Hampton ¹	I	13,710.07	37.15
	VA0088641	City of Newport News ¹	I	2,531.01	6.86
	VAR040024	City of Poquoson ¹	II	1,250.14	3.39
	VAR040028	York County ¹	II	2,218.40	6.01
	VAR040092	NASA Langley Research Center ²	II	419.83	1.14
	VAR040140	Langley Air Force Base ²	II	1,903.36	5.16
	VAR040079	DOE-TJ Accelerator Facility ²	II	36.98	0.10
	VAR040087	TNCC ²	II	80.88	0.22
	VAR040115	VDOT ²	II	387.01	1.05
	SUM				22,537.68

¹ estimated based on regulated service area

² estimated based on urban land uses including (High Intensity, Medium Intensity, Low Intensity, Open Space)

It should be noted that a significant portion of LaRC’s storm sewer system is tidal or tidally influenced. This means that the waters of the Back River are transported by the tide into LaRC’s storm sewer system. Tidal waters may transport downstream pollutants, including those from other localities and sources, into LaRC’s MS4 system. This impact to water quality is difficult if not impossible to quantify and may mean that flows through the drainage system could still contain bacteria even if LaRC were to remove 100% of the upstream sources from its service area.

Best Management Practices Designed to Reduce Bacteria in Accordance with Parts II B 4, B 5, and B 6 (Part II B 3 e):

Urban Wildlife: The northern portion of LaRC's property is largely undeveloped forest, wetland, or grass fields and therefore is prime wildlife habitat. The following strategies will be used as Center-wide initiatives for bacteria reduction stormwater control/management, in accordance with Section II B 4 in the MS4 permit:

- Educate the public on how to reduce unnatural food sources accessible to wildlife in urban areas.
 - At NASA LaRC, this will include targeted outreach for dumpsters, picnic areas, facilities, and recreational areas. Continued education on LaRC's policy to not feed wildlife at any location on the Center will continue to be an important component of future strategies to reduce bacteria loading.
- Clean out storm drains to remove waste from wildlife.
 - Continue cleaning out all LaRC storm drains at least twice per year to remove and properly dispose of organic debris and any waste from wildlife.
- Implement a program for removing animal carcasses from roadways and properly disposing of the same
 - Maintain LaRC's program for removing and properly disposing of animal carcasses from roadways, building areas, and other personnel areas.
- Continue stormwater ditch cleaning and vegetation removal that attract wildlife and present safety concerns.
 - Continue habitat control under bird/animal aircraft strike hazard (BASH) initiatives along LaRC's aircraft taxiway to discourage bird nesting in stormwater ditches.
 - Maintain LaRC's policy that prohibits stormwater retention practices or ponds to discourage Canadian geese. All LaRC stormwater practices are required to have infiltration/bioretenion and hold water for less than 24-hours.

Note: Although Illicit Discharges to the MS4 is not a significant source of bacteria for LaRC, there is always a risk for sanitary sewer overflow or spills. These events may occur by blockages and/or breaks in the sewer lines and could release discharges of raw sewage from the sanitary sewer system. LaRC has a robust Illicit Discharge Detection and Elimination (IDDE) program and maintains a proactive outreach strategy. LaRC conducts dry-weather screening across the Center's outfalls beyond the requirements of the MS4 permit. LaRC will continue these actions, both through outreach and field inspections, in order to identify and eliminate illicit discharges, connections, and leaks infiltrating to the MS4. Furthermore, LaRC is seeking opportunities to improve its sanitary sewer system and repair/replace aged piping that may be of higher risk for failure. LaRC conducts annual maintenance on pump stations and closely monitors flows to minimize risks of overflows.

Calculations Requires in Accordance with Parts II B 4, B 5, or B 6 (Part II B 3 f):

Not applicable.

Outreach Strategy (Part II B 3 g; Part II B 4 b)

Ensuring that LaRC conforms to its environmental policy requires the commitment of LaRC's senior leadership, the efforts of the Environmental staff in the Environmental Management Office (EMO), and the cooperation of the 3,000+ employees who work at the Center. LaRC relies on Center personnel to manage facilities, maintain equipment, and perform work activities in a manner that is conformant with environmental requirements, sustainable, and environmentally responsible. Communication with Center personnel is key to ensuring their support and participation in the continual improvement of LaRC's environmental program. The goal is to encourage personnel to participate in environmental initiatives, conform to environmental requirements, consider how their actions affect the environment, and ensure effective communication between the Environmental Office and LaRC stakeholders. The environmental message should be clear and consistent and aligned with the broader Center Operations Directorate (COD), LaRC, and NASA message and values. LaRC maintains an internal website that includes news, articles, and blogs called @LaRC. A newsletter with the newest information and blog posts is sent out daily. This website is a bedrock of the communication strategy and allows EMO to reach all LaRC personnel.

Communication Objectives:

- 1) Increase employee knowledge about preventing stormwater pollution, placing priority on reducing food sources accessible to wildlife.
- 2) Increase employee knowledge about best management practices, including but not limited to debris removal from storm drains, removal and disposal of animal carcasses, and stormwater ditch maintenance.

Table 1 outlines the planned outreach to enhance education on methods to eliminate and reduce discharges of the pollutant, in accordance with Part II B 4 b:

Table 1. Planned Outreach

Mechanism	Distribution Details
Annual Training	<ul style="list-style-type: none">• Stormwater and Water Quality training to general LaRC audience (available to 3,000+ employees), with an added emphasis on fecal bacteria pollution awareness• Targeted training to LaRC's Ground Maintenance Contractor
Educational Articles	<ul style="list-style-type: none">• Generate and distribute via @LaRC and public environmental website
@LaRC Posts	<ul style="list-style-type: none">• Advertisements for Stormwater and Water Quality Training opportunities• Advertisements for new educational articles
Website Update	<ul style="list-style-type: none">• Include information on LaRC's Back River TMDL Action Plan and management strategies to reduce fecal bacteria

Schedule of Implementation (Part II B 3 h)

NASA LaRC will implement the fecal bacteria load reducing components described in this Action Plan. Planned actions for the current permit cycle are listed in Table 2 below. Planned actions for upcoming permit cycles will be included in the annual MS4 reporting requirements.

Table 2. Actions for Permit Cycle: Nov 1, 2018 through Oct 31, 2023

Action		Schedule/Frequency
Finalize and publish LaRC’s Back River TMDL Action Plan to the public website; advertise to LaRC personnel via the @LaRC employee notification system		May 2021
Complete the public website update to include information on the Back River TMDL		June 2021
Publish an educational article to the public website; advertise to LaRC personnel via the @LaRC employee notification system		At least one article annually
Complete training on stormwater and water quality, with added emphasis on pollutants and urban wildlife	LaRC Facility Environmental Coordinator (FEC) training	At least two “in person” classes annually; virtual training available anytime
	Illicit Discharge Specific Stormwater Management Training for the Center’s primary maintenance contractor personnel and any interested LaRC personnel	Annually
	LaRC Waste Management and Spill Response Training	At least three “in person” classes annually; virtual training available anytime
	Grounds Maintenance Contractor Stormwater Management (Best Management Practices) Training	Biannually
	Maintenance-Specific Stormwater Management Training for maintenance personnel performing roadway and recreational area maintenance	Biannually

LaRC will maintain documentation of each training event conducted, to include the date of the event, the number of employees in attendance, and the objective of the training, for a minimum of three years after the training event.

Public Comment Opportunity (Part II B 7):

In accordance with Section II B 7 in the MS4 permit, LaRC shall provide an opportunity for public

comment proposed to meet the local TMDL action plan requirements for no less than 15 days. The public comment period shall be completed prior to the submittal of the action plan.

LaRC solicited input via the employee @LaRC announcement system (accessible to all LaRC employees), from 5/6/2021 to 5/24/2021, for a total of 19 days. The following is a summary of public comment received on the Back River TMDL Action Plan (public comment was received from one individual):

Public Input Received	Response and Implementation
<p>Public Comment #1 (05/12/2021): BMP Section:</p> <ul style="list-style-type: none"> • “Educate the public on how to reduce food sources accessible to urban wildlife.” <ul style="list-style-type: none"> ○ Perhaps wording the objective as “Educate the public on how to reduce unnatural food sources accessible to wildlife in urban areas.” The targeted outreach looks to fit this well by focusing on dumpsters, picnic areas, and recreational areas. Readers could infer that the Center wants to reduce natural food sources in habitats. • Continued education on LaRC’s policy to not feed wildlife could be useful. Education and best practices on dumpsters, picnic areas, and recreational areas is good, but some personnel may deliberately feed animals as well outside of those areas. • “Implement a program for removing animal carcasses from roadways and properly disposing of the same.” The BMP listed addresses proper collection. Should a note about proper disposal be added or mention that it is required through a contract? • Clean out of storm drains, ditch cleaning, vegetation removal and carcass collection are campus-wide initiatives. May be worth indicating the whole Center is covered as the reader may assume the BMPs only apply to the northern portion of the Center per the opening sentence. <p>In regard to birds:</p> <ul style="list-style-type: none"> • You could consider noting BASH initiatives (habitat control) to discourage bird nesting in the stormwater ditch. Also, the Center prohibits stormwater retention practices or ponds to discourage Canadian geese. All stormwater practices are infiltration/bioretention (less than 24 hour water holding). 	<p>LaRC concurs with the comments and appreciates the additional details and ideas. All suggested edits were incorporated into LaRC’s Final TMDL Action Plan.</p>

Additionally, LaRC’s Back River TMDL Action Plan will remain posted on the public environmental website and the public will be invited to provide comments to the LaRC Environmental Management Office anytime.

MS4 Program Implementation (Part II B 8, 9):

NASA LaRC's MS4 Program Plan incorporates this TMDL Action Plan by reference. Each annual Program Plan shall include the date of the most recent TMDL Action Plan and will identify the location where a copy of the local TMDL Action Plan may be obtained.

Additionally, LaRC's Annual Report for the MS4 Program, provided to the DEQ by October 1st of each year, will include a progress report of the previous year's actions and the planned actions for the upcoming permit year.

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."



Kristen Poultney, Head, Environmental Management Office

Date