

NASA Langley Research Center

Municipal Separate Storm Sewer System (MS4) Program Plan

Permit effective: 11/1/2018

Permit Year 3: July 1, 2020 to June 30, 2021

Permit #VAR040092



Submitted to the Virginia Department of Environmental Quality in compliance with Permit No. VAR040092

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1 Introduction

This document represents NASA Langley Research Center’s (LaRC) plan to meet the requirements of 9 VAC 25-890-40 “General Virginia Stormwater Management Program (VSMP) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems.” This Program Plan has been significantly updated and ensures LaRC’s compliance with the General Permit during Year 3 (July 1, 2020 – June 30, 2021).

NASA LaRC has reviewed and assessed existing stormwater management operations and policies at the Center against the General Permit requirements including the six minimum control measures and the Total Maximum Daily Load (TMDL) special conditions requirements. Based on that review, NASA LaRC has developed an appropriate and cost effective Program Plan with the goal of minimizing stormwater pollution to the maximum extent practicable (MEP). This Program Plan outlines how LaRC will implement and enforce this Plan. The Environmental Management Office (EMO) is the organization primarily responsible for implementing this Plan.

2 MS4 Program Plan

This section of NASA LaRC’s MS4 Program Plan describes how LaRC will implement and demonstrate compliance with each of the six stormwater minimum control measures (MCM) listed in Part I E of the MS4 General Permit (VAR040092). For each MCM, the Program Plan discusses LaRC’s program, the goals of the program (now and into the future), addresses the requirements of the permit, and indicates program elements for compliance.

MCM 1: Public Education and Outreach

LaRC is a non-traditional permit holder (Federal facility) with no resident population. In terms of public education, and in keeping with EPA guidance, LaRC defines “public” as the employee and contractor population located within the fence line of the Center.

LaRC’s MS4 Public Education Outreach Program has **three primary goals**:

- Increase the public’s knowledge of how to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns;
- Increasing the public’s knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and
- Implementing a diverse program with strategies that are targeted toward individuals or groups most likely to have significant stormwater impacts.

Strategies for Public Outreach and Education – Part I E 1 d

LaRC will use two or more of the strategies listed in Table 1 below to communicate with the public the high-priority stormwater issues identified in accordance with Part I E 1 b including how to reduce stormwater pollution.



Table 1 Strategies for Public Outreach and Education	
Strategies	Examples (provided as examples and are not meant to be all inclusive or limiting)
Traditional written materials	Informational brochures, newsletters, fact sheets, or recreational guides for targeted groups
Signage	Temporary or permanent signage in public places or facilities, vehicle signage, bill boards, or storm drain stenciling
Media materials	Information disseminated through electronic media, radio, televisions, movie theater, or newspaper
Speaking engagements	Presentations to NASA community, school, church, industry, trade, special interest, or community groups
Training materials	Materials developed to disseminate during workshops offered to local citizens, trade organization, or industrial officials

Education Priorities Rational and Target Audience – Part I E 1 f

LaRC’s MS4 Public Education and Outreach Plan, as required by the General Permit, emphasizes at least three high-priority stormwater issues. These priorities were selected because they are currently the most pressing stormwater-related impacts that LaRC encounters. The following describes the high priorities selected, the rationale behind the selection, the target audience, strategies utilized from Table 1, and the anticipated time periods that messages will be communicated:

Priority 1 – Best Management Practices (BMPs) during Maintenance of Mechanical Processes

Rationale: NASA LaRC is continuing to educate personnel on ways to reduce water pollution from every day activities, including water that may be generated or handled during maintenance of mechanical processes. Examples of maintenance activities that have the potential to impact water quality include draining of cooling towers and boilers, washing of equipment, chiller tubes and pumps, and dewatering of basements and sumps. Education and outreach will focus on BMPs to reduce the potential for harmful products from entering the storm drain system and avoid negative impacts to sensitive local waterways.

Target Audience: Facility Environmental Coordinators (FECs), and Jacobs maintenance staff (LaRC’s primary maintenance contractor)

Strategies from Table 1 of Part I E 1 d: Media materials

Anticipated time periods messages will be communicated or made available to the public: Throughout the permit year, including but not limited to annual stormwater and FEC trainings, quarterly MS4 articles, and targeted training.



Responsible Party: LaRC EMO personnel

Measurable Goal: Tracking the number of “hits” for any article or outreach item posted to the program website and daily @LaRC web announcements.

Priority 2 – LaRC’s Illicit Discharge Detection and Elimination (IDDE) Program and Reporting Resources

Rationale: Although LaRC personnel have been made aware of the pollution potential of illicit discharges, increased education and outreach will further reduce the potential for pollution on Center. Continued outreach on LaRC’s IDDE Program and advertisement of reporting resources available to all LaRC personnel will help increase awareness of risks associated with different sources of pollution, improve knowledge of the negative impacts resulting from illicit discharges into the storm system, and enhance personnel participation in reporting pollution concerns.

Target Audience: All NASA LaRC personnel

Strategies from Table 1 of Part I E 1 d: Media materials; speaking engagements; training materials

Anticipated time periods messages will be communicated or made available to the public: Throughout the permit year, including but not limited to annual stormwater and FEC trainings, quarterly MS4 articles, and meetings with FECs during annual multi-media audits.

Responsible Party: LaRC SPEEB personnel

Measurable Goal: Tracking the number of “hits” for any article or outreach item posted to the program website and daily @LaRC web announcements; tracking training attendance and feedback; documenting any increases or decreases of observable litter in the storm sewer system.

Priority 3 – Chesapeake Bay and Back River TMDL Education

Rationale: Meeting the reductions required under the Chesapeake Bay TMDL will be a long-term challenge, as laid out in the DEQ-approved Chesapeake Bay TMDL Action Plan. Additionally, LaRC is under a bacterial TMDL for the Back River watershed. The Center Operations Directorate (COD) will be the primary organization responsible for meeting the challenges of the Chesapeake Bay TMDL. COD is responsible for managing long term maintenance of SWM facilities, grounds maintenance, ensuring projects are designed appropriately, etc. Targeted outreach and training for COD personnel is needed to create awareness and understanding of these current and future requirements so they continue to be incorporated in plans for building construction and renovation as well as infrastructure improvements. General outreach and educational materials will also be provided for interested NASA LaRC employees for tips and habits they can carry out at their homes.

Target Audience: NASA LaRC employees, with emphasis on COD personnel

Strategies from Table 1 of Part I E 1: Media materials; speaking engagements; training materials

Anticipated time periods messages will be communicated or made available to the public: Throughout the permit year, including but not limited to annual stormwater and FEC trainings, quarterly MS4 articles, and targeted COD training.



Responsible Party: LaRC SPEEB personnel

Measurable Goal: Tracking the number of “hits” for any article or outreach item posted to the program website and daily @LaRC web announcements; tracking training attendance and feedback.

Public Contact Information – Part I E 1 c (4)

Any individual interested in finding out more information about the high-priority public education and outreach program, or any other aspects of LaRC’s stormwater program, should contact the following:

Peter Van Dyke, LaRC Water Program Manager
(757) 864-7517
Peter.vandyke@nasa.gov

Sarat Calamur, LaRC Water Program Support
(757) 864- 4791
sarat.c.calamur@nasa.gov

LaRC will provide this information with each outreach activity and maintain up-to-date contact information on the public website, <https://environmental.larc.nasa.gov/water/ms4/>.

Annual Reporting Requirements – Part I E 1 g

LaRC will include the following information in each annual report:

- (1) A list of the high-priority stormwater issues addressed in the public education and outreach program.
- (2) A list of the strategies used to communicate each high-priority stormwater issue.



MCM 2: Public Involvement and Participation

NASA LaRC understands the importance of engaging with the public, participating in local events, and promoting participation with the surrounding communities. NASA management strongly encourages public involvement and these efforts are strongly supported.

Public Input on the MS4 Program – Part I E 2 a (2)

LaRC will notify the “public” (employees and contractors) and provide for receipt of comments on LaRC’s MS4 Program Plan through the internal @LaRC system. This notification will be made twice during the permit year, in October and March, to ensure adequate time for public comment and consideration. EMO will respond to all public comments received and maintain documentation of comments and responses.

Additionally, the public is encouraged to provide comments or input on the MS4 Program at any time. This can be done through the public webpage: <https://environmental.larc.nasa.gov/water/ms4/>

MS4 and Stormwater Pollution Prevention Webpages – Part I E 2 b

NASA LaRC maintains webpages dedicated to the MS4 program and stormwater pollution prevention. The following information is included in the webpages and will be maintained throughout the permit:

- (1) The effective MS4 permit and coverage letter;
- (2) The most current MS4 Program Plan or location where the MS4 Program Plan can be obtained;
- (3) The annual report for each year of the term covered by this permit no later than 30 days after submittal to the department;;
- (4) A mechanism for the public to report potential illicit discharges, improper disposal, or spills to the MS4, complaints regarding land disturbing activities, or other potential stormwater pollution concerns in accordance with part I E 2 a (1); and
- (5) Methods for how the public can provide input on the MS4 program in accordance with part I E 2 a (2).

The webpages dedicated to the MS4 program and stormwater pollution prevention can be found at: <https://environmental.larc.nasa.gov/water/ms4/>. Personnel are able to report any concerns or potential pollution activities through contact information provided on the webpages, or by completing our online water pollution reporting form found at: <https://environmental.larc.nasa.gov/reporting-water-pollution/>. Additionally, information on how to report is included in outreach material and water quality trainings.

Notice to LaRC employees that the Program Plan and Annual Report have been updated and published to the webpage will be made through the internal @LaRC system. This system allows for notification to all employees. Records of these actions will be kept on file with EMO and in the @LaRC archives.

Public Involvement Opportunities – Part I E 2 c

LaRC will participate, through promotion, sponsorship, or other involvement, in four or more activities per year from two or more of the categories listed in Table 2 below to provide an opportunity for public involvement to improve water quality and support local restoration and clean-up projects.



Table 2 Public Involvement Opportunities	
Public Involvement Opportunities	Examples (Provided as an example and are not meant to be all inclusive or limiting)
Monitoring	Establish or support citizen monitoring group
Restoration	Stream or watershed clean-up day, adopt-a-waterway program
Educational events	Booth at a community fair, demonstration of stormwater control projects, presentation of stormwater materials to schools to meet applicable education Standards of Learning or curriculum requirements, watershed walks, participation on environmental advisory committees
Disposal or collection events	Household hazardous chemicals collection, vehicle fluids collection
Pollution prevention	Adopt-a-storm drain program, implement a storm drain marking program, promote use of residential stormwater BMPs, implement pet waste stations in public areas, adopt-a-street program

Public Involvement Opportunity 1 – LaRC’s Annual Earth Day and Arbor Day Events

Category from Table 2: Educational event

Description: During April, LaRC will hold annual events in observance of Earth Day and Arbor Day, which may include an on-site expo, local tours, and presentations. The expo event features valuable information on Center programs for energy and water conservation, sustainable design including green infrastructure at LaRC, recycling, hazardous materials and waste management, stormwater pollution prevention, and displays from local environmental groups. Through these events, personnel will have the opportunity to network and interact with exhibitors, participate in tours to local sustainable places, and attend presentations where they can continue to learn about restoration initiatives and pollution prevention practices. The events will be promoted through the @LaRC system, public blog, Center-wide emails, media displays in the cafeteria, and an LED sign near the Center’s gated entrances.

Anticipated time period when activity will occur: April 2021

Metric to determine if activity is beneficial to water quality: Number of visitors (“hits”) received for Center-wide advertisements on @LaRC; estimated number of participants in attendance of the expo.

Public Involvement Opportunity 2 – Plastic Bags and Film Recycling

Category from Table 2: Disposal or collection events

Description: LaRC will continue to partner with the York/Poquoson Master Gardeners to recycle plastic bags and film packaging. Collecting and recycling this material prevents the waste from entering our local waterways and landfills, and also educates participants on the importance of



pollution prevention. The event will be promoted through the @LaRC system, public blog, and collection boxes placed in high-traffic areas.

Anticipated time period when activity will occur: October 2020, April 2021

Metric to determine if activity is beneficial to water quality: Weight of plastic material collected for recycling. Historically, LaRC has averaged between 100 to 300 pounds of recycled material from each collection event.

Public Involvement Opportunity 3 – Clean the Bay Day

Category from Table 2: Restoration

Description: Clean the Bay Day is an annual stream and shoreline cleanup program where citizen volunteers participate to remove debris and litter from local creeks, streams, rivers, and the Chesapeake Bay. NASA LaRC participates in this event through promotion and encouraging participation of LaRC personnel and their friends, families, and neighbors. LaRC advertises the event and provides links to local cleanup opportunities via the @LaRC announcement page.

Anticipated time period when activity will occur: Late May/early June 2021

Metric to determine if activity is beneficial to water quality: Number of visitors (“hits”) received for Center-wide advertisements on @LaRC; documenting any feedback received from LaRC participants

Public Involvement Opportunity 4 – Local Workshops

Category from Table 2: Pollution Prevention

Description: LaRC encourages the use of residential stormwater BMPs and will continue to promote several local workshops throughout the permit year. These local workshops include the Newport News rain barrel workshops (hosted by the Newport News Waterworks, the Newport News Master Gardeners, the VA Cooperative Extension Office, and the Newport News Public Works), the Bay Star Homes planting workshops, local oyster gardening workshops (hosted by the Chesapeake Bay Foundation), and more.

Anticipated time period when activity will occur: Frequently throughout the permit year

Metric to determine if activity is beneficial to water quality: Number of visitors (“hits”) received for Center-wide advertisements on @LaRC; documenting any feedback received from LaRC participants

Annual Reporting Requirements – Part I E 2 f

LaRC will include the following information in each annual report:

- (1) A summary of any public input on the MS4 program received (including complaints) and how the comments were responded to;
- (2) A webpage link to the MS4 program and stormwater website;
- (3) A description of the public involvement activities implemented by the permittee;



- (4) A report of the metric as defined for each activity and an evaluation as to whether or not the activity is beneficial to improving water quality; and
- (5) The name of other MS4 permittees who participated in the public involvement opportunities.

MCM 3: Illicit Discharge Detection and Elimination (IDDE)

LaRC has worked hard over the years to develop an effective IDDE program. This version of the Program Plan continues to support and build upon previous efforts taken to establish this program over the last decade.

MS4 Map and Information Table – Part I E 3 a

LaRC will continue to maintain a robust GIS-based MS4 map that includes a storm sewer map and information table.

LaRC's current storm sewer map shows all conveyances, channels, ditches, direction of flow, location of MS4 outfalls with unique identifiers, required outfall information, topography, delineated drainage basins for each outfall, and the named receiving water bodies. The information table associated with the storm sewer system map contains information for each outfall, including a unique identifier as specified on the map, the latitude and longitude of the outfall or point of discharge, the estimated regulated acreage draining area, the name of the receiving water, the 6th Order Hydrologic Unit Code of the receiving water, an indication as to whether the receiving water is listed as impaired in the Virginia 2016 305(b)/303(d) Water Quality Assessment Integrated Report, the predominant land use for each outfall, and the name of any applicable TMDLs.

The MS4 map layer can be found at (inside LaRC firewall only):

<https://gis-portal.ndc.nasa.gov/arcgis/home/webmap/viewer.html?webmap=be39d32f2db84c03a4df4ba57c2966c7>.

The associated information table is maintained by EMO and is available upon request.

In compliance with Part I 3 a (3), LaRC submitted to DEQ a GIS-compatible shapefile of the MS4 map and associated table. The map and information table will be updated no later than October 1 of each year.

Illicit Discharge Prohibition – Part I E 3 b

Illicit discharges are prohibited via Langley Procedural Requirements (LPR) 8500.1, also known as the "Environmental and Energy Program Manual." These policies are made available to Center personnel through the Langley Management System (LMS), the Environmental web site, and are also included in various Environmental Training sessions. The following statement is the Center's policy in LPR 8500.1 Section 5.2.3.1:

"5.2.3.1 The "Illicit Discharge Detection and Elimination" minimum control measure of Virginia's General MS4 Permit requires the Center to effectively prohibit non-stormwater discharges into the storm sewer system and implement appropriate enforcement procedures and actions. LaRC defines an illicit discharge as any discharge to the MS4 that is not composed entirely of stormwater, except for discharges allowed under the Center's VPDES permit, a discharge approved by DEQ in writing as a de minimis discharge that does not contain a significant amount of pollutants, waters used for firefighting operations/line flushing, and A/C condensate. Illicit discharges are not allowed on the Center and are subject to an array of enforcement actions."



IDDE Written Procedures – Part I E 3 c

NASA LaRC has written procedures to detect, identify, and address unauthorized non-stormwater discharges, including illegal dumping, to the MS4 with the goal of eliminating the unauthorized discharge. These procedures are written and maintained in LaRC’s IDDE Handbook. This handbook serves as an IDDE program summary and adequately addresses all of the requirements of General Permit Part I E 3 c. The Handbook discusses outfall screening, methodologies, inspection protocols, time frames, and source elimination.

Please see Appendix A for a copy of NASA LaRC’s IDDE Handbook.

Physical Interconnections – Part I E 3 d (2)

Langley Air Force Base (LAFB) is the only downstream MS4 that is physically interconnected with LaRC. LAFB is part of Joint Base Langley-Fort Eustis which is comprised of two geographically separate entities: LAFB in Hampton and Fort Eustis in Newport News. LAFB’s MS4 permit was issued in August 2016. Fort Eustis has an MS4 permit; however, it is not physically interconnected to NASA LaRC.

NASA LaRC and LAFB communicate frequently regarding upcoming projects, National Environmental Policy Act (NEPA) reviews, interconnections and possible project impacts. Both facilities also promote one another’s environmental outreach events, including cleanups, workshops, and speaker events.

Official written notification for this permit cycle was completed on 2/15/2019.

Annual Reporting – Part I E 3 e

LaRC will include the following information in each annual report:

- (1) A confirmation statement that the MS4 map and information table are up-to-date as of June 30th of the reporting year;
- (2) The total number of outfalls screened during the reporting period as part of the dry weather screening program; and
- (3) A list of illicit discharges to the MS4 including spills reaching the MS4 with information as follows:
 - (a) The source of illicit discharge;
 - (b) The date that the discharge was observed, reported, or both;
 - (c) Whether the discharge was discovered by the permittee during dry weather screening, reported by the public, or other method (describe);
 - (d) How the investigation was resolved;
 - (e) A description of any follow-up activities; and
 - (f) The date the investigation was closed.

MCM 4: Construction Site Stormwater Runoff Control

NASA LaRC has developed Annual Standards and Specifications for Erosion and Sediment Control (ESC) and Stormwater Management (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 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), EISA Section 438, and LaRC’s MS4 permit (VAR040092). The NASA LaRC Annual Standards and Specifications for ESC and SWM submittal have been developed to provide detailed information regarding LaRC’s compliance with all regulatory requirements.

VSMP Specifications and Standards – Part I E 4 c (2)

NASA LaRC’s Annual Standards and Specifications for ESC and SWM completely detail LaRC’s stormwater construction program. The Annual Standards and Specifications have been reviewed and approved by DEQ.

This document and a copy of the most recent approval letter can be found in Appendix D.

Legal Authorities/Oversight Requirements – Part I E 4 c (3)

LaRC primarily uses contractors for land disturbing activities such as construction, deconstruction/demolition, and renovation projects. Therefore, the most effective policy tool for LaRC is contract and specification language requiring compliance with our MS4 program, DEQ’s VSMP permit (9 VAC 25-880), DEQ’s Erosion and Sediment control regulations (9 VAC 25-840), and NASA LaRC’s Annual Standards and Specifications for ESC and SWM. Construction contracts include specific language requiring that the contractor remains compliant.

The NASA LaRC Environmental Specifications Section 01 35 40.00 41 is included in all construction contracts. This serves as LaRC’s “regulatory mechanism” to ensure compliance.

Please see section “3.3 Water Quality” of the NASA LaRC Environmental Specifications located in Appendix C for language requiring the contractor to comply with all applicable environmental requirements.

Inspection Procedures – Part I E 4 c (4)

Section 6.0 of NASA LaRC’s Annual Standards and Specifications for ESC and SWM addresses stormwater construction inspection procedures. This document also has the necessary documents and templates used during inspections such as inspection report forms and corrective action notices.

This document and all necessary written inspection procedures can be found in Appendix D.

Compliance and Enforcement Action – Part I E 4 c (5)

Section 7.0 of NASA LaRC’s Annual Standards and Specifications for ESC and SWM addresses LaRC’s stormwater construction program including strategies for requiring compliance through corrective action or enforcement action to the extent allowable.

This document can be found in Appendix D.



Roles and Responsibilities – Part I E 4 c (6)

Section 2.0 of NASA LaRC’s Annual Standards and Specifications for ESC and SWM completely details NASA roles and responsibilities as related to the construction stormwater management program. NASA LaRC does not rely on any other entity to implement portions of the MS4 Program Plan.

This document can be found in Appendix D.

Dual Combined Administrator(s) on Staff:

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(757) 864-7031

Jazmin.m.argarin@nasa.gov

Annual Reporting – Part I E 4 d

LaRC will include the following information in each annual report:

- (1) (a) A confirmation statement that land disturbing projects that occurred during the reporting period have been conducted in accordance with the current department approved standards and specifications for erosion and sediment control; and
(b) If one or more land disturbing projects were not conducted with the department approved standards and specifications, an explanation as to why the projects did not conform to the approved standards and specifications;
- (2) Total number of inspections conducted; and
- (3) The total number and type of enforcement actions implemented and the type of enforcement actions.



MCM 5: Post-construction Stormwater Management

VSMP regulations, especially the new Technical Criteria Part II B, and the federal EISA Section 438 requirements have reinforced the importance of an effective post-construction stormwater management program. Permanent stormwater management facilities are used to limit/reduce pollutant loads and to maintain or restore predevelopment hydrology of the property with regard to temperature, rate, volume and duration of flow. NASA LaRC understands that these functional BMPs require long-term inspection and maintenance. LaRC has worked to develop a post-construction stormwater management program within the available resources of the Center. The efforts are combined among EMO, COD, Projects Engineering Branch (PEB), Maintenance and Operations Branch (MOB), and the Grounds Maintenance contract.

Legal Authorities – Part I E 5 h (3)

NASA LaRC ensures that required design criteria for stormwater runoff controls are implemented on development and redevelopment projects, and that adequate post-construction stormwater management is implemented primarily through NASA LaRC's Annual Standards and Specifications for ESC and SWM. This document has all the necessary written procedures for a successful program. In addition to the NASA LaRC Annual Standards and Specifications for ESC and SWM, projects are expected to comply with NASA LaRC Environmental Specifications Section 01 35 40.00 41, NASA Environmental Design Standards, and feedback through the design review process. These documents are incorporated by reference into NASA LaRC Annual Standards and Specifications for ESC and SWM. In combination these documents guide projects on proper ESC and SWM program implementation. The Environmental Design Standards apply to design work. The NASA LaRC Environmental Specifications Section 01 35 40.00 41 apply to construction activities.

Please see Appendix C for a copy of the NASA LaRC Environmental Specifications Section 01 35 40.00 41.

Please see Appendix D for a copy of the NASA LaRC's Annual Standards and Specifications for ESC and SWM.

Inspections and Maintenance Written Procedures – Part I E 5 h (4)

In compliance with Part I E 5 b, NASA LaRC has developed written inspection and maintenance procedures in order to ensure adequate long-term operation and maintenance of its stormwater management facilities.

NASA LaRC's Annual Standards and Specifications for ESC and SWM addresses post construction stormwater management. This document is being included by reference into MCM 5; the entire document should be considered when evaluating compliance with Permit requirements. Sections 3.1 – 3.9 of NASA LaRC's Annual Standards and Specifications for ESC and SWM address SWM facility design criteria. Section 10.0 of the document addresses post-construction SWM inspections. At a minimum, all SWM facilities shall be inspected at least annually, and shall include a Plan review prior to site visit, a field visit with photographs, and a completed SWM Facility inspection report form. Please see Appendix D for a copy of the NASA LaRC's Annual Standards and Specifications for ESC and SWM.

In addition to the NASA LaRC's Annual Standards and Specifications for ESC and SWM which help ensure compliance with planning and design, the contractual NASA LaRC Environmental Specifications Section 01 35 40.00 41 utilizes language to help ensure compliance with MCM 5 during construction. Section 3.3.4 of the specifications has written procedures for SWM facilities. Please see Appendix C for a copy of the NASA LaRC Environmental Specifications Section 01 35 40.00 41.

Moreover, NASA LaRC's Green Infrastructure Maintenance Handbook has been developed in order to ensure adequate long-term operation and maintenance of NASA LaRC's stormwater management facilities.



The handbook lists routine maintenance, non-routine maintenance, and industry best practice information for each system. Manufacturer specifications for proprietary systems are also included in the appendix section of the handbook. Please see Appendix B for a copy of NASA LaRC's Green Infrastructure Maintenance Handbook.

Roles and Responsibilities – Part I E 5 h (5)

NASA LaRC's Annual Standards and Specifications for ESC and SWM completely detail LaRC's stormwater post-construction program including roles and responsibilities. This document can be found in Appendix D.

Basic roles and responsibilities are as follows:

- MS4 MCM 5 Oversight – EMO is the primary entity responsible for updating and implementing the MS4 Program Plan, as well as advocating for funding to implement the programs.
- SWM Facility Design – Design Contractors, COD, PEB, and EMO all have roles and responsibilities to ensure that SWM facilities are properly designed. As discussed in LaRC's Annual Standards and Specifications for ESC and SWM, each of the entities is responsible for participating during LaRC's design process.
- SWM Facility Inspection – EMO and LaRC's construction inspection contractor are the primary entities on Center for SWM facility inspection. EMO and the support contractor conduct long-term maintenance inspections and inspections during construction.
- SWM Maintenance – EMO, COD, MOB and LaRC's grounds maintenance contractor all have various responsibilities related to SWM maintenance including performing oversight, obtaining funding and performing maintenance work.

NASA LaRC does not rely on any other entity to implement portions of the MS4 Program Plan.

Stormwater Management Facility Spreadsheet – Part I E 5 h (6)

LaRC will maintain an electronic spreadsheet of all owned stormwater management facilities that discharge into the MS4. The spreadsheet will also include all BMPs implemented to meet applicable TMDLs as required in Part II A and Part II B, and all parts identified in Part I E 5 d. The spreadsheet is maintained by EMO and is available upon request.

Annual Reporting – Part I E 5 i

In each Annual Report, LaRC will submit the following:

- (1) The total number of inspections conducted on stormwater management facilities owned or operated by the permittee;
- (2) A description of the significant activities performed on the stormwater management facilities owned or operated by the permittee to ensure it continues to perform as designed. This does not include activities such as grass mowing or trash collection;
- (3) A confirmation statement that the permittee submitted stormwater management facility information through the Virginia Construction Stormwater General Permit database for those land disturbing activities for which the permittee was required to obtain coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities in accordance with Part I E 5 f or a statement that the permittee did not complete any projects requiring coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities; and



- (4) A confirmation statement that the permittee electronically reported BMPs using the DEQ BMP Warehouse in accordance with Part I E 5 g and the date on which the information was submitted.

MCM 6: Pollution Prevention/Good Housekeeping

Over the last several MS4 permit cycles, LaRC has been building a quality stormwater pollution prevention (P2) program. LaRC uses a variety of operational and maintenance BMPs to ensure that Center operations are accomplished in a way that minimizes or prevents pollutant discharges. MAXIMO is a tool used by LaRC in conjunction with the CMOE program to track work orders, plan jobs, and track costs of jobs. LaRC has installed several oil alarm systems in vulnerable locations to protect the stormwater network. These alarms are tracked within MAXIMO to ensure that they are operational and performing their function of pollution prevention.

In addition to the MS4 permit and MAXIMO, LaRC operates under an individual VPDES permit that covers cooling tower blowdown, compressor blowdown, and a few select processes. This permit has a DEQ approved Operations and Maintenance (O&M) manual that covers many aspects of this MCM as well as maintenance procedures. This VPDES O&M manual is included by reference into the MS4 Program Plan.

Written Procedures for Operations and Maintenance Activities – Part I E 6 a

In compliance with MS4 requirements, LaRC implements the following written procedures for activities at facilities owned or operated by LaRC, such as road, street and parking lot maintenance; equipment maintenance; and the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers.

These written procedures are designed to:

1. Prevent illicit discharges;
2. Ensure the proper disposal of waste materials, including landscape wastes;
3. Prevent the discharge of wastewater or permittee vehicle wash water or both into the MS4 without authorization under a separate VPDES permit;
4. Require implementation of best management practices when discharging water pumped from utility construction and maintenance activities;
5. Minimize the pollutants in stormwater runoff from bulk storage areas (e.g., salt storage, topsoil stockpiles) through the use of best management practices;
6. Prevent pollutant discharge into the MS4 from leaking municipal automobiles and equipment; and
7. Ensure that the application of materials, including fertilizers and pesticides, is conducted in accordance with the manufacturer's recommendations.

Daily Operations Pollution Prevention and Good Housekeeping Program

Outfall Booms and Treatment Devices

Inspections are performed and documented at least quarterly at MS4 outfalls by EMO. If any abnormal conditions are identified, a Work Order is sent to the LaRC maintenance contractor to correct the problem promptly. Absorbent pads and booms are placed at Outfalls 003, 008, 009, and 012 as a cautionary pollution prevention measure. The Center's maintenance contractor performs weekly preventive maintenance (PM) at these four outfalls. The weekly PM consists of: (1) Making a visual inspection at the outfall; (2) Inspecting the outfall for oil and/or trash; (3) Removing any trash accumulated in the outfall; (4) Replacing the oil boom and/or absorbent pads as needed; and (5) Reporting any abnormal conditions or corrective actions needed to EMO.



Street Sweeping

Street sweeping is LaRC’s preferred method to prevent stormwater pollution, as it is aimed at collecting debris and floatables prior to them being washed into the MS4 and discharged into local waterways. Pavement street sweeping is scheduled four times annually (Jan/Apr/July/Oct) through a contracted service company. Grounds maintenance oversees managing the street sweeping contract and reporting street sweeping data to EMO for tracking and reporting. Street sweeping data, including cubic yards of debris collected, can be viewed by contacting EMO.

Catch Basin Maintenance

LaRC has 761 catch basins on Center. Many of these are located in streets and parking areas. These basins catch routine sediment and debris that accumulates over time. The grounds maintenance contractor routinely cleans the basins and associated drain lines and disposes or composts the debris off Center on the same day of collection. Catch basin maintenance data, including cubic yards of debris collected, can be viewed by contacting EMO.



Ditch Maintenance

NASA LaRC has an extensive system of grass-lined ditches (~62,000 linear feet) and paved ditches (~2,800 linear feet). The grounds maintenance contractor has the responsibility for ditch maintenance. The contract has written procedures for ditch maintenance and requires that vegetative growth in drainage ditches be cut to a height of 2 inches on the bottom and sides. All wood and brush, cuttings, trash and debris are removed and disposed of the same day of cleaning. Mouths of ditches, inlets and outlets are cleared of sediment, vegetation and debris to allow unrestricted flow of water. Where ditch bottoms are paved, all mud and debris is removed from the paved surface and disposed of properly the same day of cleaning. All paved ditches surfaces are cleaned once per year per the contract. All non-paved ditches are cleaned and maintained four times per year. Ditch maintenance data, including cubic yards of debris collected, can be viewed by contacting EMO.

Leaf Collection Activities

The grounds maintenance contract requires leaf collection and removal of pine straw, pinecones, limbs and other debris across the Center three times per year (October, November and January). All leaf debris collected is composted on Center or at Big Bethel Landfill’s composting operation. Leaf collection data, including cubic yards of debris collected, can be viewed by contacting EMO.

Landscape Maintenance/Debris

LPR 8500.1 prohibits the grounds maintenance contractor from blowing or sweeping yard trimmings into the MS4. Grass clippings are returned to the lawn to restore important nutrients. The grounds maintenance contractor also periodically trims shrubs, bushes and trees. This type of woody debris is collected and composted off-Center at Big Bethel Landfill.

“Municipal” Yard Inspections

EMO inspects all yard-type areas, including the hazardous waste facility, throughout the year for evidence of illegal dumping, illicit connections to the storm sewer system, and flows during dry weather. EMO inspectors also look for good housekeeping and if any P2 practices could be implemented.

Multi-Media Environmental Audits

EMO conducts at least 40 multi-media environmental audits per fiscal year in facilities with the largest potential environmental issues. These audits include identifying potential improper discharges to the



stormwater system (e.g., leaking equipment, improperly maintained sump pumps or secondary containment for drums, etc.) and providing ways to reduce any identified issues.

Equipment Maintenance

Dewatering of Utility Construction and Maintenance Activities

Periodically LaRC needs to dewater utility pits, especially water from the steam tunnels. Many of these areas collect rainwater and steam condensate over time. LaRC's Center-wide maintenance contractor is responsible for dewatering activities and EMO has developed the following procedures that they must follow:

- For rainwater pump outs, the contractor pumps water to a grassy area for filtration through the grass away from any storm drainage conveyances (if possible).
- If water shows any signs of sediment-related issues, the dewatering operation must use a dewatering bag prior to discharge over a grassy area.
- If the water has any concerns for pollutants (heavy metals, oil/grease from hydraulic lines, etc.) the contractor notifies EMO to take a water sample for analysis by a local lab. Once the analysis of the water is complete, EMO makes the decision on the way to properly dispose of the water such as discharge to HRSD (with written approval), pump and haul off Center, or discharge to the ground (if no pollutants are present).
- For construction-related dewatering operations, the contractor must dewater in accordance with their approved SWPPP. Contractors are notified to work with EMO on developing a dewatering plan from construction areas. Typically, EMO requires dewatering bags or similar BMPs for this type of action.

Spill Containment Areas for Equipment Storage

The Building 1187 area is the primary storage area for many pieces of maintenance equipment such as emergency generators. This equipment is stored under a permanent canopy to limit exposure to stormwater. In addition, all of this equipment is stored in a large poured concrete/asphalt spill containment berm. The area also has easy access to spill containment kits. Employees working in this area are trained to look for illicit discharges and on proper spill response.



Salt Storage

NASA LaRC uses salt and brine solutions on roadways and sidewalks during wintery conditions. All winter salt products are stored inside or in tanks and have no exposure to stormwater. Using deicing agents containing urea or other forms of nitrogen or phosphorus are prohibited on Center per LPR 8500.1.

Underground Storage Tanks (USTs) and Above-Ground Storage Tanks (ASTs)

NASA LaRC has six (6) active USTs on Center. All USTs at LaRC are equipped with electronic leak-detection systems. In addition, product inventory records are maintained by operating personnel at each facility where USTs are located. Facilities maintenance support contractors visually inspect the ASTs each time they are filled with product. In addition, documented AST inspections are performed in accordance with Virginia AST and EPA SPCC regulations. Records of AST inspections are kept in the EMO files.



Application, Storage, Transport and Disposal of Pesticides, Herbicides, and Fertilizers

LaRC's policy regarding the use of pesticides, herbicides, and fertilizers is to follow Integrated Pest Management (IPM) practices whenever possible and to use the absolute minimum amount of pesticides, herbicides, and fertilizers on Center as necessary. LaRC has no applicable lands where nutrients are applied to a contiguous area of more than 1 acre.

Fertilizers

Much of the Center's land and foliage is allowed to grow naturally, without any fertilizer. Grass clippings are returned to the lawn to restore important nutrients and avoid the need for fertilizers. In general, LaRC does not routinely apply fertilizers and they are only used when planting new trees, shrubs, and grass areas (post disturbance, etc.) to help establish the new vegetation. Once established, vegetation is not fertilized unless the health of the vegetation (spot treatments) requires it.

Pesticides

Of the Center's 764 acres of land, less than one-twentieth of one percent is treated with pesticides. These treatments are on an as needed basis and applications are limited to minimal quantities. The grounds maintenance contractor manages the pesticide program at NASA LaRC. Pesticides include insecticides, herbicides, rodenticides, termiticides, and avicides. The contractor uses only EPA approved/registered pesticides upon approval and issuance of a NASA safety permit for the use of potentially hazardous materials. The pesticides are mixed, stored, and applied according to their current Federal use restrictions. As required by law, records of restricted use pesticides are maintained by the contractor. IPM practices are used by the contractor wherever possible and application is performed or supervised by state-certified applicators and/or registered technicians. Chemical spraying is performed only on still days and is delayed when unfavorable weather or other conditions exist which would unduly increase the hazard to personnel or the environment.

General pest control at LaRC is performed by way of service request and involves the mitigation of cockroaches, water bugs, ants, rodents, fleas, mites, spiders, wasps, and other Arthropoda. Wood destroying pest control, animal and bird control, and ornamental and turf pest control are other operations performed by the contractor on an as needed basis. The contractor also performs scheduled and preventative maintenance pesticide applications in food processing areas, such as the cafeteria area of Building 2102, which is treated on a twice-monthly preventative maintenance schedule.

Herbicides

Herbicide application provides non-crop control of emerged annual and perennial weeds with glyphosate used exclusively. Herbicides are not applied to large grassy areas; these areas are allowed to grow naturally and only receive routine mowing. Herbicides are typically only used to treat area fence lines, right of ways, outdoor electrical substations, and large gravel fenced enclosures. Application rates are based on product label recommendations. Between 800 and 1000 gallons of diluted herbicides are applied annually at NASA LaRC.

Storage of Pesticides, Herbicides, and Fertilizers

All products are stored in Building 1285 (Landscape Maintenance and Storage Facility) and have no exposure to stormwater. There are also no floor drains and the building has the necessary equipment to clean up any spills. All products are stored in elevated locked cabinets at Building 1285 to minimize flooding-related issues. All products are tracked in LaRC's Chemical Management Tracking System (CMTS) which is updated by the Facility Coordinator when products are purchased, used, transferred, or disposed of. The system also houses an SDS for each product so that LaRC has accurate data on all products currently stored on Center.



Disposal

The Grounds Maintenance contract is written with specific language requiring the proper disposal of these products. All products are disposed of in accordance with product labels and state regulations.

High Priority Facilities Analysis- Part I E 6 c

NASA LaRC has assessed all facilities on Center for their potential to discharge pollutants. In general, LaRC has a low risk for facilities discharging pollutants due to various procedures in place and LaRC's practice of material storage with no exposure to stormwater. Additionally, many facilities addressed in the MS4 permit are already covered under LaRC's VPDES Permit #VA0024741 or LaRC's General VPDES Permit for Vehicle Wash Facilities #VAG750198. Facilities covered under a separate VPDES permit shall adhere to the conditions established in that permit and are excluded from this requirement. LaRC only identified the composting facility/area as a high priority facility.

Grounds Maintenance Yard/Composting Facility – The Center operates an informal composting area and landscape material storage area in the fields near Building 1285. This area is primarily used for composting leaves and other landscaping debris (gumballs, small branches, mulch, etc.). The area selected is surrounded by grass and has no storm inlets or ditches nearby. The potential for any stormwater runoff is limited; however, this area could be improved. This operation poses the greatest risk (not covered by another DEQ permit) for organics and sediment discharge in stormwater runoff. Additionally, LaRC is interested in expanding its composting operation, so the risk to the MS4 could be expanded. Barrier walls were installed in 2017 to create a designated, contained area for landscaping debris stockpiles. This BMP will further reduce the potential for organics or sediment from discharging from the site to the storm sewer system.

LaRC has developed and implemented a specific stormwater pollution prevention plan (SWPPP) for this high-priority facility. Inspections are conducted and documented two times a year (March and September). The SWPPP is kept at the facility and utilized as part of staff training.

A copy of the SWPPP can be found in Appendix F.

No later than June 30 of each year, LaRC will review other areas on Center for which a SWPPP has not been developed to determine if the facility has a high potential to discharge pollutants as described in Part I E 6 c. If the facility is determined to be a high-priority facility with a high potential to discharge pollutants, LaRC will develop a SWPPP meeting the requirements of Part I E 6 d no later than December 31 that same year.

Nutrients and Turf Management – Part I E 6 p (3)

LaRC will continue to strictly limit the use of nutrients and fertilizer application on pervious turf areas. LaRC's policy regarding the use of pesticides, herbicides and fertilizers is to follow Integrated Pest Management (IPM) practices whenever possible and to use the absolute minimum amount of pesticides, herbicides, and fertilizers on Center as necessary. If nutrients are being applied to achieve final stabilization of a land disturbance project, application shall follow the manufacturer's recommendations. LaRC has no applicable lands where nutrients are applied to a contiguous area of more than 1 acre. The total acreage of lands where turf and landscape nutrient management plans apply is zero. The acreage of lands upon which turf and landscape nutrient management plans have been implemented is zero.

Mechanisms for Contractor Compliance - Part I E 6 p (4)

LaRC requires all contractors engaging in activities with the potential to discharge pollutants to use appropriate control measures to minimize the discharge of pollutants to the MS4. LaRC accomplishes this



through language in procedural documents, including the Environmental and Energy Program Manual (LPR 8500.1) and LaRC’s DEQ-approved Annual Standards and Specifications. The Center also utilizes a robust training plan that includes targeted training for contractors completing maintenance and construction tasks. Finally, LaRC relies on the Langley Form 461 (LF461), the “Environmental Project Planning Form.” All proposed facility and infrastructure projects and all research and development projects conducted on LaRC’s property or funded with government dollars must be reviewed for potential environmental impacts. Through this electronic form, EMO is able to review a project and provide feedback or requirements to reduce negative environmental impacts, including illicit discharges to the MS4.

Annual Training Plan - Part I E 6 1

NASA LaRC has developed an annual training plan including a schedule of training events that ensures implementation of the training requirements as follows:

Training Requirements	Selected Audience	Training Program(s) and Frequency
(1) Field personnel receive training in the recognition and reporting of illicit discharges no less than once per 24 months	Facility Environmental Coordinators (FECs)	Annual FEC Training – 3 classes
	Environmental Management Office (EMO) employees, Jacobs (primary Center contractor) Personnel, and any interested LaRC personnel	Illicit Discharge Specific Stormwater Management Training – 1 class
	Personnel who handle waste on Center.	LaRC Annual Waste Management/ Spill Response Training – 4 classes
(2) Employees performing road, street, and parking lot maintenance receive training in pollution prevention and good housekeeping associated with those activities no less than once per 24 months	Grounds Maintenance Contractor	Grounds Specific Stormwater Management Training – 1 class
	Jacobs (primary Center contractor) Personnel	Maintenance Specific Stormwater Management Training – 1 class
(3) Employees working in and around maintenance, public works, or recreational facilities receive training in good housekeeping and pollution prevention practices associated with those facilities no less than once per 24 months	Facility Environmental Coordinators	Annual FEC Training – 3 classes
	Jacobs (primary Center contractor) Personnel	Maintenance Specific Stormwater Management Training – 1 class
	Grounds Maintenance Contractor	Grounds Specific Stormwater Management Training – 1 class



(4) Employees and contractors hired by the permittee who apply pesticides and herbicides are trained or certified in accordance with the Virginia Pesticide Control Act	Grounds Maintenance Contractor	LaRC’s Grounds Contract requires that the contractor have properly trained and certified personnel to work on Center.
(5) Employees and contractors serving as plan reviewers, inspectors, program administrators, and construction site operators obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations; Employees; and (6) contractors implementing the stormwater program obtain the appropriate certifications as required under the Virginia Stormwater Management Act and its attendant regulations	Environmental Management Office (EMO)	LaRC’s VSMP Specifications and Standards are written to ensure LaRC has properly certified personnel for both SWM and ESC. Please see Section 2.0 of Appendix D for more specific information on current staff and their certifications.
(7) Employees whose duties include emergency response have been trained in spill response	All applicable Center Personnel	LaRC Annual Waste Management/ Spill Response Training – 4 classes
	Emergency responders such as firefighters and law-enforcement officers	Emergency responders receive training on the handling of spill releases as part of a larger emergency response training.

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.

Annual Reporting - Measurable Goals - Part I E 6 q

LaRC will include the following information in each annual report:

- (1) A summary of any daily operation procedures developed or modified in accordance with Part I E 6 a during the reporting period;
- (2) A summary of any new SWPPPs developed in accordance with part I E 6 c during the reporting period;
- (3) A summary of any SWPPPs modified in accordance with Part I E 6 f during the reporting period;
- (4) A summary of any new turf and landscape nutrient management plans developed that includes:
 - a. Location and the total acreage of each land area; and
 - b. The date of the approved nutrient management plan; and
- (5) A list of the training events conducted in accordance with part I E 6 m, including the following information:



- a. The date of the training event;
- b. The number of employees who attended the training event; and
- c. The objective of the training event.



Chesapeake Bay TMDL Special Conditions – Part II A

The Special Condition for the Chesapeake Bay TMDL within the General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (VAR04), requires NASA LaRC to develop a Chesapeake Bay TMDL Action Plan (“Action Plan”) and submit it to the DEQ. LaRC has developed an Action Plan for Phase II to satisfy the Special Condition requirement.

This Phase II Action Plan provides a review of the current MS4 program, demonstrates LaRC’s ability to ensure compliance with the Special Condition, and includes the means and methods LaRC will use to meet an additional 35.0% of the Level 2 (L2) scoping run reduction for existing development during the second permit cycle. In combination with the 5.0% reduction of L2 that has already achieved, this will result in a total reduction of 40% of L2 at the end of this permit cycle. 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’s Phase II Action Plan was submitted to DEQ with the registration statement as required. Please see Appendix E for a copy of the Phase II Action Plan which addresses the requirements for Part II A.

For each reporting period, LaRC will include in the annual report items identified in Part II A 13.

Local TMDL Special Condition – Part II B

NASA LaRC has been allocated a waste load reduction for the Back River TMDL, which was approved by the Environmental Protection Agency on February 9, 2018. In compliance with Part II B 1 b, NASA LaRC will develop and initiate implementation of an action plan to meet conditions of the Part II B 3 and B4 of the General Permit, no later than 30 months after the permit effective date. The action plan will be maintained and implemented by EMO, and a copy will be available upon request once complete.

Note: Part II B 5 and B6 are not applicable to NASA at this time.

In compliance with Part II B 3, LaRC’s Action Plan for the Back River TMDL will include the following:

- a. The TMDL project name;
- b. The EPA approval date of the TMDL;
- c. The wasteload allocated to NASA LaRC, and the corresponding percent reduction, if applicable;
- d. Identification of the significant sources of the pollutants of concern discharging to LaRC’s MS4 and are not covered under a separate VPDES permit. For the purposes of this requirement, a significant source of pollutants means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL;
- e. The BMPs designed to reduce the pollutants of concern in accordance with parts II B 4;
- f. Any calculations required in accordance with part II B 4;
- g. An outreach strategy to enhance the public’s education on methods to eliminate and reduce discharges of the pollutants; and
- h. A schedule of anticipated actions planned for implementation during this permit term.

For each reporting period, LaRC will include in the annual report a summary of actions conducted to implement each local TMDL action plan.



Signed Certification Statement in accordance with 9 VAC 25-890-40

"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 gathered and evaluated 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."

Acting for

Kristen Poultney, Environmental Branch Head

Date

Note: The Center Director has authorized the position of Environmental Branch Head and Acting Environmental Branch to have signatory authority for all MS4 related submittals (excluding the registration statement). This was done in a letter dated December 19, 2019.



Documents Incorporated by Reference

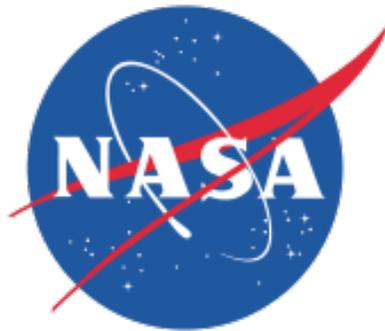
- A. NASA LaRC Illicit Discharge Detection and Elimination (IDDE) Handbook
- B. NASA LaRC Green Infrastructure Maintenance Handbook (Please contact EMO for the most current version).
- C. LaRC Environmental Specifications Section 01 35 40.00 41, 10/2019
- D. NASA LaRC Annual Standards and Specifications for ESC and SWM, 2020; and DEQ Approval Letter, 05/28/2020
- E. NASA LaRC DEQ TMDL Action Plan Phase II
- F. High-Priority Facility SWPPP, 08/2017 (This is a “living document” – please contact EMO for the most recent version)



Appendix A: NASA LaRC's IDDE Handbook

NASA Langley Research Center

Illicit Discharge Detection and Elimination (IDDE) Handbook



**Developed by the NASA LaRC Standard Practice and Environmental Engineering
Branch for compliance with MS4 Permit Minimum Control Measure Three**

Section 1 - Introduction

This handbook has been prepared to ensure compliance with the Department of Environmental Quality's *General Permit for Discharges under the Virginia Stormwater Management Program and the Virginia Stormwater Management Act* (General Permit #VAR040092). Specifically, this handbook covers the requirements listed in General Permit Section II 3 *Illicit Discharge Detection and Elimination*.

The Center's Illicit Discharge Detection and Elimination (IDDE) program is managed by the Standard Practice and Environmental Engineering Branch (SPEEB). For any questions regarding the MS4 program or illicit discharges please contact:

Peter Van Dyke
Water Program Manager
757-864-7517
Peter.vandyke@nasa.gov

Jazmin Argarin
Environmental Specialist
757-864-7031
jazmin.m.argarin@nasa.gov

Section 2 - IDDE Policy

LaRC has worked diligently to develop an effective illicit discharge detection and elimination program. This version of the Program Plan continues to support and build upon previous efforts taken to build this program over the last decade. This manual provides written procedures to detect, identify, and address unauthorized nonstormwater discharges, including illegal dumping, to the small MS4 as required in General Permit No. VAR040092, Section II 3 C.

Illicit discharges are prohibited via Langley Procedural Requirements (LPR) 8500.1, also known as the "Environmental and Energy Program Manual." These policies are made available to Center personnel through the Langley Management System (LMS), the Environmental web site, and are also included in various Environmental Training sessions. LPR policies are LaRC's most effective legal mechanism as the Center does not have municipal ordinances. The following statement the Center's policy in LPR 8500.1 Section 5.2.3.1:

"5.2.3.1 The "Illicit Discharge Detection and Elimination" minimum control measure of the State's General MS4 Permit requires the Center to effectively prohibit non-stormwater discharges into the storm sewer system and implement appropriate enforcement procedures and actions. LaRC defines an illicit discharge as any discharge to the MS4 that is not composed entirely of stormwater, except for discharges allowed under the Center's VPDES permit, a discharge approved by DEQ in writing as a de minimis discharge that does not contain a significant amount of pollutants, waters used for firefighting operations/line flushing, and A/C condensate. Illicit discharges are not allowed on the Center and are subject to an array of enforcement actions."

Section 3 - What does an Illicit Discharge look like?

Illicit discharges can come in and from a seemingly endless amount of places and take many forms. There are three primary classifications of illicit discharge as defined by the EPA:

Continuous	Discharges occur most or all of the time, are usually easier to detect, and typically produce the greatest pollutant load.
Intermittent	Discharges occur over a shorter period of time (e.g., a few hours per day or a few days per year). Because they are infrequent, intermittent discharges are hard to detect, but can still represent a serious water quality problem, depending on their flow type.
Transitory	These discharges are extremely hard to detect with routine monitoring, but under the right conditions, can exert severe water quality problems on downstream receiving waters. These discharges occur rarely, usually in response to a singular event such as an industrial spill, ruptured tank, sewer break, transport accident or illegal dumping episode.

Illicit discharges can be from:

- Disposal of vehicle maintenance fluids into a storm drain;
- Hosing or washing loading areas in the vicinity of storm drain inlets;
- Leaking dumpsters flowing into a storm drain inlet;
- Old and damaged sanitary sewer line leaking fluids into a cracked or damaged storm sewer line;
- Illegal dumping;
- Allowing unauthorized wash water with soaps or detergents into a storm drain inlet;
- Washing silt, sediment, concrete, cement or gravel into a storm drain;
- Dewatering of trenches or excavations for utility maintenance or construction; and/or
- A measurable flow during dry weather that contains pollutants or pathogens.

Dry weather discharges are composed of one or more possible flow types:

- Sewage flows produced from sewer pipes;
- Washwater flows are generated from a wide variety of activities and operations;
- Liquid wastes refer to a wide variety of flows, such as oil, paint, and process water that enter the storm drain system;
- Tap water flows are derived from leaks and losses that occur during the distribution of drinking water in the water supply system; and
- Groundwater and spring water flows occur when the local water table rises above the bottom elevation of the storm drain and enters through cracks or joints.

Illicit connections can also be considered illicit discharges. Essentially, an illicit connection is any man-made conveyance that is connected to a MS4 without a permit,

excluding roof drains and other similar type connections. Examples of illicit connections include, but are not limited to, the following:

- Sanitary sewer piping that is connected directly from a building to the stormwater system;
- A sink plumbed to storm;
- A basement or shop floor drain that is connected to the stormwater system; or
- A cross connection between the municipal sanitary sewer and the stormwater system.

Examples of Potential Illicit Discharges



Section 4 - Investigation Procedures

Illicit discharges and connections can be identified in a variety of ways. Notifications can be made through employee, construction site operators, inspectors, or other routine environmental site activities. By far the most common way to pinpoint illicit discharges is a dry weather field screening program. LaRC's Water Management Team relies on the following investigative techniques:

- Dry Weather Screening
- Multi-media Facility Audits
- Facility Environmental Coordinator Reports (based on training)
- Center Personnel Reports
- Drive-by inspections

Priority schedule for investigations:

1	16 Outfalls and nearby conveyances
2	40 Facility Audits and infrastructure, including dumpsters, around facilities
3	Investigations based from reports, FECs, and drive-by observations

Multimedia Facility Audits

SPEEB performs at least forty (40) facility audits each year. These are multi-media audits including water quality auditing. Auditors are environmental professionals trained to inquire and inspect for illicit discharges. High priority and risky facilities (based on past experience and records) remain in the audit queue annually. Other less risky facilities are rotated on an annual basis. The schedule has been prioritized. All records for this program are available with SPEEB.

Facility Environmental Coordinator (FEC) Reporting

Every facility on LaRC has an assigned FEC. FEC are trained annually by SPEEB to ensure environmental compliance, including identification and elimination of illicit discharges. FECs serve as the “eyes and ears” on Center. All training records are kept on file with SPEEB.

Incident Reporting

The Environmental and Energy Program Manual (LPR 8500.1) also provides information on applicable regulatory requirements and procedures related to spill control at LaRC. The Center’s Hazardous Materials Spill Contingency Plan, Oil Discharge Contingency Plan, and Oil Spill Prevention Control and Countermeasure (SPCC) Plan have been combined into one document called the NASA LaRC Integrated Spill Contingency Plan (ISCP). The plan is available in the LaRC LMS as LPR 8715.12. Any LaRC personnel or on-site contractors who discover a release of material shall respond by calling the LaRC Emergency Dispatcher at 911 (from land line phone on Center). Alternate phone numbers for the Emergency Dispatcher are: 757-864-2222 (Cell Phone) or 757-864-5500 (Business Number). The LaRC Emergency Dispatcher will initiate spill response with the LaRC Fire Department. Center employees can also call the Environmental staff at 757-864-3500 for concerns over potential illicit discharges. In addition, MS4 Program Staff and contact information are identified above in Section 1 – Introduction.

Employee Illicit Discharge Reporting

All LaRC employees are encouraged to report illicit discharges and illegal dumping activities. Periodically, SPEEB runs @LaRC articles about the IDDE and how to report it. Also, many of

Environmental training programs detail IDDE and the importance of employee reporting. Employees can report illicit discharges or illegal dumping activities to NASA SPEEB (specifically the Water Program Manager) by phone, email, or via the SPEEB website reporting link.

The IDDE reporting website can be found here:

<https://environmental.larc.nasa.gov/water/idde/>

Outfall Screening

LaRC has sixteen (16) outfalls. A prioritized schedule for field screening is not needed given the small number of total outfalls. As there are fewer than 50 outfalls in the MS4, all outfalls are inspected at least annually as required in MS4 Permit Section II B 3 c. (1)(b). MS4 Program staff inspect and screen outfalls on a much more frequent basis, usually weekly and/or in response to site specific concerns where a discharge from construction or other operations is believed to have occurred. LaRC's individual VPDES permit requires quarterly documented outfall inspections.

Dry Weather Field Screening Methodologies

The following methodology will be used to determine the source of all illicit discharges. NASA Langley's outfall network consists largely of smaller diameter outfalls and a simple drainage network that is well mapped, suspected illicit discharges will be investigated using the EPA method of following up the network or the "Up the Trunk" approach, where field crews start with the manhole closest to the outfall, and progressively move up the network, inspecting manholes until indicators reveal that the discharge is no longer present. The goal is to isolate the discharge between two storm drain manholes.

Only trained inspectors should perform IDDE field screening activities. All field investigations should be fully documented. The following general information and documentation applies to this methodology:

- The Dry weather field screening shall be conducted using the Dry Weather Outfall Inspection and Illicit Discharge Detection and Elimination Report form. This form can be found in Appendix A of this document.
- Inspectors shall pull rain fall data on the time of the last rain and the amount of the last rain from <http://w1.weather.gov/obhistory/KLFI.html> or <https://www.wunderground.com/weather/us/va/hampton/23681> Langley Air Force Base has a station associated with this site.
- Inspectors shall pull site descriptions and information on the drainage system (topography, drainage flow, conveyance type) from LaRC's GIS database. <https://gis-portal.ndc.nasa.gov/arcgis/home/webmap/viewer.html?webmap=be39d32f2db84c03a4df4ba57c2966c7>

Response Timeframes and Methodology for Source Identification

Generally, a response to an illicit discharge concern is a top priority. In the event, of actual environmental harm stop work or operation orders may be issued to halt the damage and allow for investigation. The timeframe for correction is dependent on the issue. Historically, hard to correct illicit discharges (illegal processes, sewage cross connect, etc,) at LaRC have not been found. The majority of illicit discharges identified and eliminated have been human error issues, leaking equipment, or poor planning. All things that can be corrected immediately or in short order.

The following timeframes apply to any investigations to identify and locate the source of any observed continuous or intermittent nonstormwater discharges: (i) illicit discharges suspected of being sanitary sewage or significantly contaminated must be investigated first and (ii) investigations of illicit discharges suspected of being less hazardous to human health and safety such as noncontact cooling water or wash water may be delayed until after all suspected sanitary sewage or significantly contaminated discharges have been investigated, eliminated, or identified. Discharges authorized under a separate VPDES or state permit require no further action.

If an illicit discharge is found, but within six months of the beginning of the investigation neither the source nor the same nonstormwater discharge has been identified, then LaRC will document such in accordance with Section II B 3 f. If the observed discharge is intermittent, LaRC will document that a minimum of three separate investigations were made in an attempt to observe the discharge when it was flowing. If these attempts are unsuccessful, LaRC will document such in accordance with Section II B 3 f. All documentation will kept in the MS4 files with SPEEB.

Mechanisms for Source Elimination

MS4 program staff is located in NASA Langley's Standard Practice and Environmental Engineering Branch, which is organized under the Center Operations Directorate (COD). COD is the directorate responsible for center operations including maintenance of stormwater and wastewater infrastructure. SPEEB works closely with other Branches within COD to ensure environmental compliance at the Center. LaRC's Environmental Policies are documented in LPR 8500.1, Environmental and Energy Program Manual and specifically addresses illicit discharges as prohibited as indicated above in "Section 2 - IDDE Policy." This policy document, as well as specific contract language, serves as the Center's legal authority to eliminate identified sources of illicit discharges. In addition, all of the areas within the NASA Langley MS4 boundaries are owned by and under the control of NASA.

NASA SPEEB can advocate for funding, if needed, based on IDDE policies, the MS4 Permit, and general compliance. Should an illicit discharge need funding to be eliminated, SPEEB will lead the effort to obtain funding. If an illicit discharge is found within a specific project or organization, SPEEB may require that organization to eliminate the illicit discharge at their expense.

The Center also has two contracts in place to help eliminate illicit discharges. The Grounds Management Contract is a vehicle that can be used to eliminate illicit discharges, especially any related to trash, debris, and sediment. The Center Maintenance contract is a vehicle that can be used to eliminate improper equipment discharges, cross connections, improperly plumbing, drips/leaks/spills, etc. This contract has a short and urgent crew that can be tasked with this type of work.

Methodology for Follow-Up Investigation and Tracking

A similar methodology to source identification will be used as a follow-up investigation to verify the elimination of illicit discharges. Again, NASA Langley's outfall network consists largely of smaller diameter outfalls and a simple drainage network that is well mapped. Once sources of illicit discharge have been addressed, field crews will re-visit the isolation point between the two manholes from the source identification and re-assess the upstream manhole to verify elimination of the suspected source. In addition, to ensure the source has been correctly identified and eliminated, field crews will again assess the individual drainage network from the outfall up stream of the network. If an illicit discharge was more equipment or plumbing based, SPEEB will revisit the site and ensure the plumbing was corrected, cross connection eliminated, leak stopped, etc.

Public Notification and Participation

MS4 staff will investigate any complaints received from employees or contractors on Center and conduct follow-up inspections where necessary to ensure corrective measures have been implemented by the responsible party. Neighboring areas outside the MS4 would also be notified in the event that an illicit discharged is suspected of being hazardous to human health and safety.

All LaRC employees are encouraged to report illicit discharges. Periodically, SPEEB runs @LaRC articles about the IDDE and how to report it. Also, many of Environmental training programs detail IDDE and the importance of employee reporting. Employees can report illicit discharges or illegal dumping activities to NASA SPEEB (specifically the Water Program Manager) by phone, email, or via the SPEEB website reporting link.

Annual reports for the MS4 permit are posted on a website accessible to all Center employees. As indicated above, any reports of illicit discharge investigation will be included in this reporting package and therefore will be viewable by the public.

Record Keeping

NASA SPEEB will track (1) dates that an illicit discharge was observed and/or reported, (2) the results of the investigation, (3) any follow-up to the investigation, (4) resolution to the investigation, and (5) the date that the investigation was closed. Records will be kept of these inspection forms as well as any correspondence from reporting as well as work orders, or other records of corrective actions as appropriate. These documents will be kept on the

Center's Environmental Management Branch (Standard Practice and Environmental Engineering Branch server). In the event of an illicit discharge investigation, a report will be filed to indicate the observation dates (along with the field forms), the results of the investigation, follow-up actions, resolution of the investigation as well as the date the investigation was closed. This report will become part of the permit record and will be included in annual reporting for the MS4.

Section 1: Background

Outfall ID:	Receiving Water: Tides Mill Creek
Date:	Time:
Temperature:	Inspector(s):
Previous 48 hour rain event?	Photos Taken (Y/N):
Notes:	

Section 2: Outfall Description

Type	Material	Shape	Submerged	
Storm Sewer (Closed Pipe)	<input type="checkbox"/> RCP <input type="checkbox"/> Steel <input type="checkbox"/> PVC <input type="checkbox"/> HDPE <input type="checkbox"/> Clay <input type="checkbox"/> Other: _____	<input type="checkbox"/> Circular <input type="checkbox"/> Elliptical <input type="checkbox"/> Box <input type="checkbox"/> Other:	<input type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Triple <input type="checkbox"/> Other:	<i>In water:</i> <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully <i>With Sediment:</i> <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
Open Drainage (Swale/ditch)	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen/Grass <input type="checkbox"/> Riprap <input type="checkbox"/> Other: Ditch	<input type="checkbox"/> Trapezoidal <input type="checkbox"/> Parabolic <input type="checkbox"/> Other:	<i>In water:</i> <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully	

Section 3: Physical Indicators

Indicator	Yes	Description	Comments
Outfall Damage	<input type="checkbox"/>	<input type="checkbox"/> Spalling, cracking or chipping <input type="checkbox"/> Corrosion <input type="checkbox"/> Other:	
Deposits/Stains	<input type="checkbox"/>	<input type="checkbox"/> Oily <input type="checkbox"/> Flow Line <input type="checkbox"/> Paint <input type="checkbox"/> Other:	
Abnormal Vegetation	<input type="checkbox"/>	<input type="checkbox"/> Excessive <input type="checkbox"/> Inhibited	
Poor Water Quality	<input type="checkbox"/>	<input type="checkbox"/> Odors <input type="checkbox"/> Colors <input type="checkbox"/> Floatables <input type="checkbox"/> Oil Sheen	

		<input type="checkbox"/> Suds <input type="checkbox"/> Excessive Algae <input type="checkbox"/> Other:	
Pipe Algae Growth	<input type="checkbox"/>	<input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green <input type="checkbox"/> Other:	
Do physical indicators suggest an illicit discharge is present?			

Section 4: Flow Information

Flow Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes, complete Section 5
Flow Description	<input type="checkbox"/> Dry <input type="checkbox"/> Trickle <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
Comments:	

Section 5: Illicit Discharge Check for Flowing Outfalls

Indicator	Check if Present	Description	Relative Severity Index (1-3)		
Odor	<input type="checkbox"/>	<input type="checkbox"/> Sewage <input type="checkbox"/> Rancid/sour <input type="checkbox"/> Sulfide <input type="checkbox"/> Petroleum <input type="checkbox"/> Laundry <input type="checkbox"/> Other:	<input type="checkbox"/> 1 - Faint	<input type="checkbox"/> 2 - Easily Detected	<input type="checkbox"/> 3- Noticeable from a far
Color	<input type="checkbox"/>	<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Gray <input type="checkbox"/> Yellow <input type="checkbox"/> Green <input type="checkbox"/> Orange/red <input type="checkbox"/> Other:	<input type="checkbox"/> 1 - Faint colors	<input type="checkbox"/> 2 – Clearly visible	<input type="checkbox"/> 3- Visible in outfall flow
Turbidity	<input type="checkbox"/>	See severity	<input type="checkbox"/> 1 – Slight	<input type="checkbox"/> 2 – Cloudy	<input type="checkbox"/> 3- Opaque
Floatables (not trash)	<input type="checkbox"/>	<input type="checkbox"/> Sewage <input type="checkbox"/> Suds/foam <input type="checkbox"/> Sulfide <input type="checkbox"/> Oil sheen <input type="checkbox"/> Grease <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Few/slight; Source not obvious	<input type="checkbox"/> 2 – Some; Indications of Source	<input type="checkbox"/> 3- Some; Source clear

Section 6: ID Determination and Outfall Inspection Summary

Do physical indicators (flowing) suggest an illicit discharge is present?

Any follow-up needed?

Other Comments:

Section 7: Inspector Signature

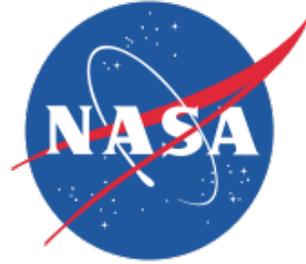
Name	Signature	Date



Appendix B: NASA LaRC's Green Infrastructure Maintenance Handbook

Please contact EMO for the most current version.

NASA Langley Research Center



Green Infrastructure Maintenance Guide



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Introduction and Intent

Green infrastructure can be a cost-effective, resilient approach to meeting compliance requirements and creating sustainable facilities. In fact, green infrastructure is no longer an optional design technique, it is a requirement. Green infrastructure systems are supported by NASA, an element of the Center Operations Directorate (COD) Environmental and Energy Design Standard (LaRC-FES-ENVENE), and required to meet Virginia's rigorous water quality and quantity regulations on new construction. These are engineered systems, and maintenance is essential to their long-term success. Proper maintenance over the life of these systems can avoid catastrophic system failures and help limit expensive repairs. This document is not an introduction to green infrastructure concepts or a design tool. The purpose of this handbook is to provide guidance on maintenance associated with practices used at Langley Research Center.

Summary of Best Management Practices Covered

There are many common green infrastructure techniques and systems available for use in the Hampton Roads area. These include both proprietary (commercial off the shelf systems) and non-proprietary systems. Please see LaRC-FES-ENVENE for a full list of approved practices for use at Langley Research Center (LaRC). The practices covered in this handbook are practices are in use or likely to be used at LarC. These include:

- Bio-retention Systems (large scale, urban/small scale, rain gardens, etc.)
- Grass Channels
- Infiltration practices
- Permeable Pavers
- Rooftop Disconnection
- Vegetated Roofs
- Tree Box Filters
- Reinforced Turf Systems

Three (3) common practices in Virginia that are not approved for use at LaRC include: (1) Wet Swale; (2) Extended Detention Pond; and (3) Wet Pond. These will not be covered in this document.

Green Infrastructure Map

To help facilitate maintenance planning, the stormwater system map can be used to view locations of practices, utility information, drainage boundaries and more. [Click here to visit the map.](#)

Bio-retention Systems



Table 1: Current Listing of Bio-retention Systems on Center

BMP Name	Location	Install Year	Underdrain	Notes
BR_2101_01	2101	2011	No	Heavily vegetated.
BR_2101_02	2101	2011	No	Heavily vegetated
BR_1229	1229C	2011	No	Rain garden style.
BR_2102_01	2102	2014	Yes	Large unit, mulch bottom.
BR_2102_02	2102	2014	Yes	Smaller unit.
BS_2102_P	2102	2014	Yes	Two parking lot bio-swales.
BS_1212_P	1212	2014	Yes	Six parking lot bio-swales.
BR_2103_01	2103	2018	Yes	Largest unit. Includes a clay liner.
BR_2103_02	2103	2018	Yes	Between 2103 and 1230
BR_2103_03	2103	2018	Yes	Parking lot unit.
UB_2104_01	2104	2019	Yes	Concrete vault style with overflow
UB_2104_02	2104	2019	Yes	Concrete vault style with overflow
UB_2104_03	2104	2019	Yes	Concrete vault style with overflow
UB_2104_04	2104	2019	Yes	Concrete vault style with overflow
UB_2104_05	2104	2019	Yes	Concrete vault style with overflow

BMP Name	Location	Install Year	Underdrain	Notes
UB_2104_06	2104	2019	Yes	Concrete vault style with overflow
UB_2104_07	2104	2019	Yes	Concrete vault style with overflow
UB_2104_08	2104	2019	Yes	Concrete vault style with overflow

BR = Bio-retention, BS= Bioswale, UB= Urban Bio-retention

Routine Maintenance

Maintenance of bio-retention units must be integrated into a landscape maintenance contract. These systems require routine and ongoing maintenance. The contract should contain specifics on unique bio-retention landscaping needs, such as maintaining elevation differences needed for ponding, proper mulching, sediment and trash removal, and limited use of fertilizers and pesticides. Depending on the scale of bio-retention, the landscaping template chosen, and the type of surface cover.

Routine maintenance tasks and their required frequency is provided in the table below. Each BMP is slightly different and individual maintenance tasks may vary at each location.

Table 2: Typical Bio-retention Maintenance

Maintenance Tasks	Frequency	Owner
Annual inspection	Annually	SPEEB
Mowing of grass filter strips and bio-retention turf cover	At least 4 times a year	Grounds
Spot weeding, erosion repair, trash removal, and mulch raking	Twice during growing season	Grounds
Add reinforcement planting to maintain desired the vegetation density	As needed	Grounds
Remove invasive plants	As needed	Grounds
Remove leaves from basin bottom	3 times annually. October, November and January	Grounds
Stabilize the contributing drainage area to prevent erosion	As needed	Grounds
Prune trees and shrubs	Species dependent; usually once in Spring, Summer and Fall. Refer to the landscape plan.	Grounds
Remove sediment in pre-treatment cells and inflow points	Once every 2 to 3 years	Grounds

Maintenance Tasks	Frequency	Owner
Supplement mulch to maintain a 3 inch layer	Twice a year – October and May	Grounds
Remove and replace the mulch layer	Every 3 years	Grounds

Non-routine Maintenance

The most common non-routine maintenance problem involves standing water. If water remains on the surface **for more than 48 hours** after a storm, adjustments to the grading and/or underdrain repairs may be needed. There are several steps that can be used to rehabilitate the filter.

Step 1: Open the underdrain observation well or cleanout and pour in water to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see if there is standing water all the way down through the soil. If there is standing water on top, but not in the underdrain, then there is a clogged soil layer. If the underdrain and stand pipe indicates standing water, then the underdrain must be clogged and will need to be snaked.

Step 2: Remove accumulated sediment and till 2 to 3 inches of sand into the upper 8 to 12 inches of soil.

Step 3: Install sand wicks from 3 inches below the surface to the underdrain layer. Sand wicks can be installed by excavating or augering down to the gravel storage zone to create vertical columns which are then filled with a clean open-graded coarse sand material (coarse sand mix similar to the gradation used for the soil media). A sufficient number of wick drains of sufficient dimension should be installed to meet the design dewatering time for the facility.

Step 4: This is a last resort. Remove and replace some or all of the soil media.

Grass Channels



Table 3: Current Listing of Grass Channel Systems on Center

BMP Name	Location	Install Year	Underdrain	Notes
GC_2103_01	2103	2018	No	System is compost amended.
GC_2103_02	2103	2018	No	System is compost amended.

*GC = Grass Channel

Routine Maintenance

Once established, grass channels have minimal maintenance needs outside of a spring clean-up, regular mowing, and repair of check dams. The goal is to maintain the hydraulic efficiency of the channel, the shape, and a dense, healthy grass cover.

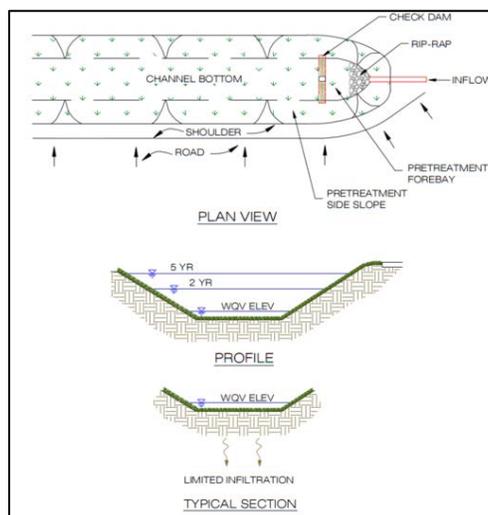


Table 4: Typical Grass Channel Maintenance

Maintenance Activity	Frequency	Owner
Inspect of the system including upstream and downstream of check dams	Annual	SPEEB
Examine channel bottom for evidence of erosion, braiding, excessive ponding or dead grass.	Annual	SPEEB
Check inflow points for clogging and remove any sediment.	Annual	SPEEB
Inspect side slopes and grass filter strips for evidence of any rill or gully erosion and repair.	Annual	SPEEB
Look for any bare soil or sediment sources in the contributing drainage area and stabilize immediately.	Periodic	SPEEB
Add reinforcement fescue/Bermuda mix to maintain 90% turf cover.	Fall	Grounds
Remove any accumulated sediment deposits behind check dams and remove and trash or blockages at weep holes.	Twice a year	Grounds
Remove leaves from ditch bottom	4 times annually	Grounds

Non-routine Maintenance

Soil compost amendments are typically added to grass channels. There are no major on-going maintenance needs associated with soil compost amendments, although NASA should de-thatch the turf every few years to increase permeability.

Permeable Pavers



Table 5: Current Listing of Permeable Paver Systems on Center

BMP Name	Location	Install Year	Notes
PP_2101	2101	2011	No rock joint material.
PP_2102_01	2102	2014	Joint material is #9 or 1/4"
PP_2102_P	2102	2014	Near steam plant. Joint material is #9 or 1/4"
PP_1212_P	1212	2014	1212 Parking area. Joint material is #9 or 1/4"
PP_2103_P	2103	2018	2103 Parking area. Joint material is #9 or 1/4"

It is difficult to prescribe the specific types or frequency of maintenance tasks that are needed to maintain the hydrologic function. Most installations work reasonably well year after year with little or no maintenance as long as they are constructed appropriately. However, the following tasks **must be avoided** on all permeable pavements:

- sanding
- re-sealing
- re-surfacing
- power washing
- storage of snow piles on top of pavers
- storage of mulch or soil materials on top of pavers
- construction staging on unprotected pavement

Routine Maintenance

A preventative maintenance task for large-scale applications involves regenerative air vacuum sweeping on a frequency consistent with the use and loadings encountered in the system. In addition to this sweeping, is a quarterly dry-weather sweeping with a basic sweep track focused on the surface of the units. The contract for sweeping should specify that a vacuum sweeper be used that does not use water spray, since spraying may lead to subsurface clogging. Vacuum settings for interlocking paver applications should be calibrated so **they do not pick or limit the pick-up of** small stones between pavement blocks.

Table 6: Typical Paver Maintenance

Maintenance Activity	Frequency	Owner
Conduct a maintenance inspection	Annually	SPEEB
Remove any soil or sediment deposited on pavement	As needed	Grounds
Replace or repair any necessary pavement surface areas that are degenerating or spalling	As needed	MOB
Regenerative air vacuum sweeping	Annually or when clogged	MOB
Quarterly surface vacuum sweeping to prevent clogging	Quarterly	Grounds
Spot weeding of grass applications. Light use of glyphosate product ok, but preferred to hand pull.	As needed during growing season	Grounds
Replace any necessary joint material	Every two years	MOB

Non-routine Maintenance

Non-routine maintenance usually consists of repairing pavers from sinking, spalling, and cracking. This can occur for many reasons, but damage often occurs from poor installation, parking heavy equipment on the paver system or improper maintenance.

Vegetated Roof



Table 7: Current Listing of Vegetated Roofs on Center

BMP Name	Location	Install Year	Square Footage	Notes
GR_2101	2101	2011	32,000	Seedum plantings.

Routine Maintenance

Maintenance of green roofs is escalated during the initial five-year establishment period. Once plantings have taken hold and spread, the maintenance needs diminish. However, this is very dependent on the quality of the installation and system design. The vegetated roof should only be hand-weeded to remove invasive or volunteer plants, and plants/media should be added to repair bare areas (refer to ASTM E2400). An annual application of slow release fertilizer in the first five years is required. The use of herbicides, insecticides, and fungicides should be avoided, since their presence could hasten degradation of the waterproof membrane.

Table 8: Typical Vegetated Roof Maintenance

Maintenance Activity	Frequency	Owner
Water to promote plant growth and survival.	Twice monthly; June – August	Grounds
Inspect the waterproof membrane for leaking or cracks.	Annually	CMOE
Inspect roof drains, scuppers and gutters immediately adjacent to the growing media to	Annually	SPEEB

Maintenance Activity	Frequency	Owner
ensure they are not overgrown or have organic matter deposits. Remove any accumulated organic matter or debris.		
Inspect the vegetated roof for dead, dying, or invasive vegetation.	Annually	SPEEB
Annual pH test to determine if fertilization is needed.	Annually – April	Grounds
Weeding to remove invasive plants.	Monthly during the growing season	Grounds
Plant replacement vegetation as needed.	Annually	Grounds
Fertilize	Annually	Grounds

Non-routine Maintenance

If a roof leak is suspected, it is advisable to perform an electric leak survey (i.e., Electrical Field Vector Mapping) to pinpoint the exact location, make localized repairs, and then reestablish system components and ground cover.

Tree Box Filters



Table 9: Current Tree Box Filter Systems on Center

BMP Name	Location	Install Year	Underdrain	Notes
TB_01	1189	2015	Yes	Star magnolia tree
TB_02	1189	2015	Yes	Red bud tree
TB_03	1295 Area	2015	Yes	Crepe Myrtle. Along Langley Blvd.
TB_04	1250	2015	Yes	Smoke tree. South Dryden.

Routine Maintenance

Table 10: Typical Tree Box Filter Maintenance

Maintenance Activity	Frequency	Owner
Inspection of tree box and surrounding area	Annually	SPEEB
Plant health check and size check	Annually	SPEEB
Prune trees to encourage proper growth and limit any impacts to walkways or roadways	As needed	Grounds
Removal of debris, trash and mulch	Annually	Grounds
Replace mulch and realign erosion control stones	Annually	Grounds

Non-routine Maintenance

Tree box filters have little non-routine maintenance. However, at some point in time certain tree species will outgrow the box environment. This is estimated to occur around year 10 of the system. At this point, the tree will need excavated, the specialized soil replaced and a tree replanted. Long-term the vault structure could crack. If sediment is entering large cracks into the vault

Reinforced Turf Systems– *Grass Pave or Similar*



Table 11: Current Listing of Reinforced Turf Systems on Center

BMP Name	Location	Install	Fill	Grass Type	Notes
RT_2101	2101		Soil	Bermuda	Primarily in the fire lane near main entrance
RT_Traffic Circle	2103	2018	Sand	Bermuda	Entire traffic circle
RT_2103	2103	2018	Sand	Bermuda/Fescue mix	Spine walkway between 2103 and 1230

*RT = Reinforced Turf Systems

Routine Maintenance

Maintenance of these systems is generally geared towards maintaining grass coverage. Normal turf care procedures should be followed, including de-thatching. However, **DO NOT AERATE**. An aerator will damage the units and aeration is not necessary in a sand root zone.

Table 12: Typical Reinforced Turf Systems Maintenance

Maintenance Activity	Frequency	Owner
Inspection of BMP and area	Annually	SPEEB
Over-seed grass to maintain 95% coverage.	Fall (fescue areas) Summer (Bermuda areas)	Grounds
Fertilize to ensure grass health	Annually, Summer	Grounds

Non-routine Maintenance

When snow removal is required, keep a metal edged plow blade a minimum of $\frac{3}{4}$ inch (17 mm) above the surface during plowing operations to avoid causing damage to the units. Use a plow blade with a flexible rubber edge or with skids on the lower outside corners. Set so the plow blade does not come in contact with the units.

APPENDIX: Manufacturer Information

Filterterra Owner's Manual



filterterra[®]
Bioretention Systems

C NTECH[®]
ENGINEERED SOLUTIONS



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Enclosed

Local Area Filtererra Plant List



Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system’s biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser’s responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices
- Planting of the system’s vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.



Minimum Requirements

The minimum requirements for Filterra Activation are as follows:

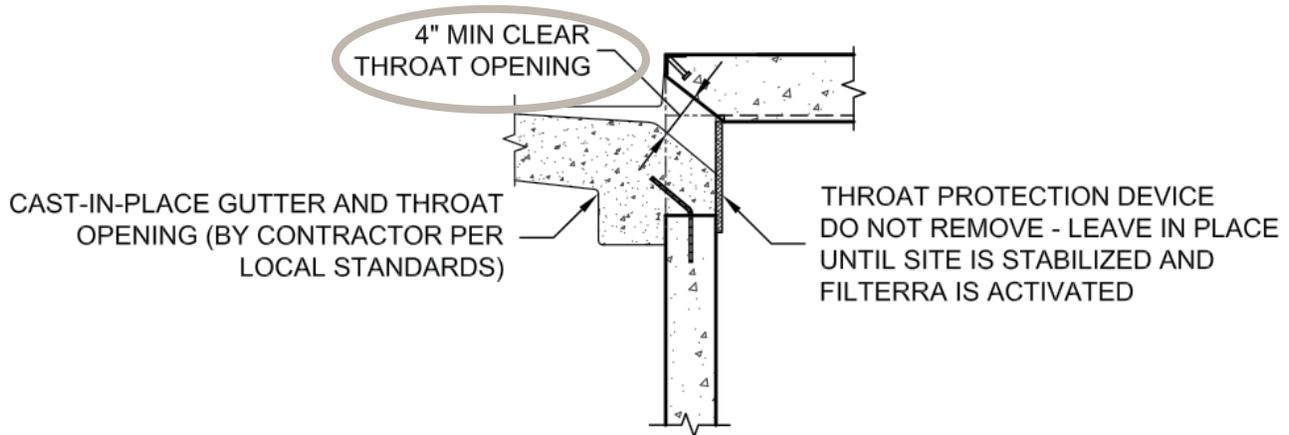
1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.



3. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of \$500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List has been enclosed with this packet highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

The “Planting Requirements for Filterra Systems” document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system’s warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.



Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.



Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft ²)	Volume at 3" (ft ³)	# of 2 ft ³ Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.



1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes		no
Damage to Box Structure	yes		no
Damage to Grate	yes		no
Is Bypass Clear	yes		no

If yes answered to any of these observations, record with close-up photograph (numbered).



2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes		no
Cups/ Bags	yes		no
Leaves	yes		no
Buckets Removed	_____		



- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____



4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.



5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____	(ft)
Width at Widest Point	_____	(ft)
Health	healthy unhealthy	
Damage to Plant	yes no	
Plant Replaced	yes no	



6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.

Filterra Inspection & Maintenance Log

Filterra System Size/Model: _____ Location: _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	5 – 5 gal Buckets	3"	Lowe's Premium Brown Mulch	4'	Galaxy Magnolia	- Standing water in downstream structure	- Removed blockage in downstream structure

Appendix 1 – Filterra® Activation Checklist



Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				
		<input type="checkbox"/> Yes <input type="checkbox"/> No				

Attach additional sheets as necessary.

NOTE: A charge of \$500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

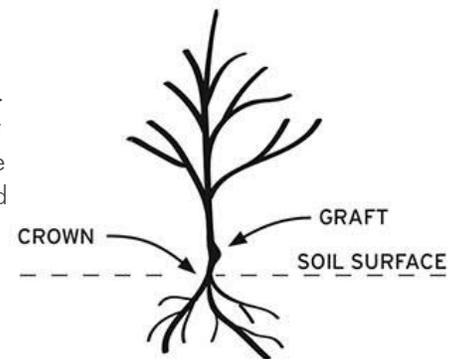
Signature _____

Date _____

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection

- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) will require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts.



Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.





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Filterra[®] Maintenance Steps



1. Inspection of Filterra and surrounding area



2. Removal of tree grate and erosion control stones



3. Removal of debris, trash and mulch



4. Mulch replacement



5. Clean area around Filterra



6. Complete paperwork and record plant height and width

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

Invisible Structures, Inc.
1600 Jackson St., Suite 310
Golden, CO 80401
Toll Free 800-233-1510
Phone 303-233-8383
Fax 303-233-8282
E-Mail sales@invisiblestructures.com
Website www.invisiblestructures.com

April 2015

Grasspave2 Product Specification (CSI Format)

Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) Format, including *MasterFormat* (1995 Edition), *SectionFormat*, and *PageFormat*, contained in the *CSI Manual of Practice*. The section must be carefully reviewed and edited by the Engineer to meet the requirements of the project and local building code. Coordinate with other specification sections and the drawings. Delete all "Specifier Notes" when editing this section.

SECTION 32 12 43 POROUS FLEXIBLE PAVING (Formerly 02795 Porous Paving)

Notes: This section covers Grasspave2 Porous Pavement System from Invisible Structures. The system provides vehicular and heavy load support over grass areas while protecting grass roots from harmful effects of traffic. The major components of the complete system are the Grasspave2 units, an engineered base course, Hydrogrow soil amendment/fertilizer, sand, and grass from seed, hydromulch, or sod. Consult Invisible Structures, Inc. for assistance in editing this section for the specific application.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Porous pavement system.

1.2 RELATED SECTIONS

- A. Section [31 20 00 – Earth Moving] [____ - _____].
- B. Section [33 46 00 – Subdrainage] [____ - _____].
- C. Section [32 10 00 – Bases, Ballasts, and Paving] [____ - _____].

Notes: Edit the following list as required for the project. List other sections with work directly related to the porous pavement system.

- D. Section [32 30 00 - Site Improvements] [____ - _____].
- E. Section [32 90 00 Planting] [____ - _____].
- F. Section [32 92 00 – Manufacturers of Turfs and Grasses] [____ - _____].
- G. Section [32 80 00 – Irrigation or Section 32 84 13 – Drip Irrigation] [____ - _____].

1.3 REFERENCES

- A. ASTM F 1951-08 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.
- B. ASTM D 638-10 Standard Test Method for Tensile Properties of Plastics
- C. ASTM C 33 Standard Specification for Concrete Aggregates
- D. AASHTO M6 Standard Specification for Fine Aggregate for Hydraulic Cement Concrete

1.4 SYSTEM DESCRIPTION

- A. The Grasspave2 porous pavement system provides vehicular and pedestrian load support for grass areas, while protecting grass roots from harmful effects of traffic.
- B. Major Components of the Complete System
 - 1. Grasspave2 units, assembled in rolls.
 - 2. Engineered sand and gravel base course.
 - 3. Hydrogrow soil amendment and fertilizer, supplied with Grasspave2.
 - 4. Sand fill or USGA greens mix.
 - 5. Selected grass from seed, hydroseeding/hydro-mulching, or sod.
 - 6. Selected topsoil (only for seeded installation).
 - 7. Mulch (needed only for seeded or hydroseeded installations).
- C. The Grasspave2 grass paving units, sand, and base course work together to support imposed loading.
- D. The Grasspave2 grass paving units, Hydrogrow, and sand fill contribute to vegetation support.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Shop Drawings: Submit design detail showing proper cross-section.
- C. Samples: Submit manufacturer's sample of Grasspave2 10" x 10" section of Grasspave2 material.
- D. Installation Instructions: Manufacturer's printed installation instructions. Include methods for maintaining installed products.
- E. Certificates:
 - 1. Manufacturer signed certificate stating the product is made in the USA.
 - 2. Submit Material Certificates for base course and sand (or USGA mix) fill materials
 - 3. Product certificates signed by the manufacturer certifying material compliance of polyethylene used to make Grasspave2 units.
 - 4. ISO Certificate certifying manufacturer's quality management system is currently registered to ISO 9001:2008 quality standards.
- F. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
 - 1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
 - 2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
 - 3. Description of Grasspave2 in stormwater design to limit the disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution from stormwater runoff and eliminating contaminants.
 - 4. Designing elements for Grasspave2 to limit the disruption and pollution of natural water flows by managing stormwater runoff.
 - 5. Documenting the use of Grasspave2 to reduce heat islands to minimize the impact on

microclimates and human and wildlife habitats.

- G. Substitutions: No material will be considered as an equivalent to the Grasspave2 unit specified herein unless it meets all areas of this specification without exception. Manufacturers seeking to supply what they represent as equivalent material must submit records, data, independent test results, samples, certifications, and documentation deemed necessary by the Specifier to prove equivalency.
- H. Manufacturer's Material Certification: Product manufacturers shall provide certification of compliance with all applicable testing procedures and related specifications upon written request. Request for certification shall be submitted by the purchasing agency no later than the date of order placement.
- I. Product manufacturers shall also have a minimum of 30 years' experience producing products for porous pavement systems.
- J. Manufacturer Quality Certification: ISO Certification certifying manufacturer's quality management system for its Grasspave2 system is currently registered to ISO 9001:2008 quality standards. Any alternate materials submitted shall provide a certification that their porous pavement system manufacturing process is part of an ISO program and a certification will be required specifically stating that their testing facility is certified and in accordance with ISO.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Protect Grasspave2 units/rolls from damage during delivery and store rolls upright, under tarp, to protect from sunlight, when time for delivery to installation exceeds one week.
- C. Store Hydrogrow in a dark and dry location
- D. Handling: Protect materials during handling and installation to prevent damage

1.7 MAINTENANCE SERVICE

Notes: Once healthy turf has been established, the cell wall structure will have minimal visibility when proper turf maintenance practices are followed.

- A. Installer responsible for maintenance of grass plants – water/irrigation, fertilizing, mowing – for one growing season. DO NOT AERATE. See *Grasspave2 Maintenance Guide* from Invisible Structures
- B. System to be maintained by _____, after one growing season.

1.8 Project Conditions

- A. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not begin installation of porous pavements until all hard surface paving adjacent to porous pavement areas, including concrete walks and asphalt paving, is completed.
- C. Install turf when ambient air temperatures is at least 55 degrees F (13 degrees C).
- D. In cold weather, do not use frozen materials or materials mixed or coated with ice or frost, and do not build on frozen base or wet, saturated or muddy subgrade.
- E. Protect partially completed paving against damage from other construction traffic when work is in progress.
- F. Adequately water sod or grass seed to assure germination of seed and growth of root system.
- G. Grass coverage on the sand-filled Grasspave2 rings must be completed within one week: See *Part 3 Execution*.
- H. DO NOT DRIVE, PARK ON, or use Grasspave2 system for two or three mowing cycles until grass root system has matured (about 3 to 4 weeks for sod or 6 to 8 weeks for seeded areas). Any barricades constructed must still be accessible by emergency and fire equipment during and after installation.

1.9 LIMITED WARRANTY

- A. Invisible Structures, Inc. (ISI) warrants to its purchasers that all products furnished by ISI will be free from defects in material and/or workmanship.
- B. This warranty shall be extended for a period of five (5) years following the date of shipment by ISI.
- C. Providing a written claim is presented to ISI within the warranty period and after inspection by ISI showing the materials have failed under this warranty, all defective materials shall be refurbished under this warranty, at no charge, excluding re-installation costs. This in lieu of all other warranties expressed or implied and is the sole warranty extended by ISI.
- D. Our liability under this warranty is limited to the refurbishing of materials and does not include any responsibility for incidental, consequential, or other damages of any nature.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Invisible Structures, Inc., which is located at: 1600 Jackson St. Suite 310 ; Golden, CO 80401; Toll Free Tel: 800-233-1510; Tel: 303-233-8383; Email: [request info \(sales@invisiblestructures.com\)](mailto:request_info@invisiblestructures.com); Web: www.invisiblestructures.com.
- B. Substitutions: Not permitted.

2.2 GRASSPAVE2

- A. Composition:
 - 1. Manufactured in the USA.
 - 2. High density polyethylene (HDPE): 100 percent recycled materials.
 - 3. Color: black
 - 4. Color Uniformity: Uniform color throughout all units rolls.
 - 5. Carbon Black for ultraviolet light stabilization.
 - 6. Hydrogrow soil amendment and fertilizer, provided by manufacturer with Grasspave2.
- B. Performance Properties:
 - 1. Maximum Loading Capability: 15,940 psi (2.29 million psf, 109,906 kPa) when filled with sand.
 - 2. Wheelchair Access testing for ADA Compliance: Passing ASTM F 1951-08.
 - 3. Wheelchair Access testing for ADA Compliance: Passing Rotational Penetrometer testing.
 - 4. Tensile strength, pull-apart testing: 458 lbf/in from ASTM D638 Modified.
 - 5. System Permeability (Grasspave2, sand, base course): 2.63 to 38.55 inches of water per hour.
 - 6. Effective Imperviousness (E.I.): 10%.
- C. Dimensions (individual units are assembled and distributed into rolls):
 - 1. Roll area: From 108 sq ft (10 sq m) to 538 sq ft (50 sq m), in 108 sq ft (10 sq m) increments
 - 2. Roll Widths: From 3.3 ft (1 m) to 8.2 ft (2.5 m), in 1.6 ft (0.5 m) increments.
 - 3. Roll Lengths: From 32.8 ft (10m) to 65.6 ft (20 m), in 3.3 ft (1 m) increments.
 - 4. Roll Weights: From 41 lbs (19kg) to 205 lbs (93kg), in 41 lbs (19 kg) increments.
 - 5. Unit Nominal Width by Length: 20 inches by 20 inches (0.5 m by 0.5 m) or 40 inches by 40 inches (1 m by 1 m).
 - 6. Nominal Depth: 1 inch (2.5 cm) – for rolls and individual units.
 - 7. Unit Weight: 18 oz (510 g) or 5 lbs. (2.27 kg).
 - 8. Volume Solid: 8 percent.

2.3 SYSTEM MATERIALS

Notes: All measurements are subject to manufacturing tolerances, unless otherwise specified.

- A. Base Course: Sandy gravel material from local sources commonly used for road base construction (recycled materials such as crushed concrete or crushed asphalt are NOT acceptable).
1. Conforming to the following sieve analysis and requirements:
 - a. 100 percent passing sieve size 1 inch (25 mm).
 - b. 90-100 percent passing sieve size 3/4 inch (19 mm).
 - c. 70-80 percent passing sieve size 3/8 inch (9 mm).
 - d. 55-70 percent passing sieve size #4.
 - e. 45-55 percent passing sieve size #10.
 - f. 25-35 percent passing sieve size #40.
 - g. 3-8 percent passing sieve size #200.
 2. Provide a base course material nearly neutral in pH (range from 6.5 to 7.2) to provide adequate root zone development for turf.
 3. Material may be either "pit run" or "crusher run." Avoid using clay based crusher run/pit run. Crusher run material will generally require coarse, well-draining sand conforming to AASHTO M6 or ASTM C 33 to be added to mixture (20 to 30 percent by volume) to ensure long-term porosity.
 4. Alternative materials such as crushed shell, limerock, or crushed lava may be used for base course use, provided they are mixed with sharp sand (20 to 30 percent) to ensure long-term porosity, and are brought to proper compaction. Without added sand, crushed shell and limerock set up like concrete and become impervious.
 5. Alternative size and/or composition of base course materials should be submitted to Invisible Structures, Inc. (Manufacturer) for approval.
- B. Sand Fill for Rings and Spaces Between Rings: Clean sharp sand (washed concrete sand). Choose one of the following:
1. Coarse, well-draining sand, such as washed concrete sand conforming to AASHTO M6 or ASTM C-33.
 2. United States Golf Association (USGA) greens, section - sand mix "The Root Zone Mixture."
- C. Turf Conditioner:
1. Hydrogrow a proprietary soil amendment manufactured by Invisible Structures, Inc. and provided with Grasspave2.
 2. NO SUBSTITUTIONS.

Notes: Use grass species resistant to wear by traffic generally a Blue/Rye/Fescue mix used for athletic fields in northern climates, and Zoysia, Fescue, or Bermuda types in southern climates. Check with local sod and seed suppliers for preferred mixtures. Dedicated fire lanes can use same grass species used on surrounding turf. Parking applications require greatest wear-resistant species possible, generally available only by seed or hydroseeding/hydro-mulching.

D. Grass – Choose either sod or seed:

1. Sod: [_____]. Use 13 mm (0.5") thick (soil thickness) rolled sod from a reputable local grower. Species should be wear resistant, free from disease, and in excellent condition. Sod shall be grown in sand or sandy loam soils only. Sod grown in soils of clay, silt, or high organic materials such as peat, will not be accepted.
2. Seed: [_____]. Use seed materials, of the preferred species for local environmental and projected traffic conditions, from certified sources. Seed shall be provided in containers clearly labeled to show seed name, lot number, net weight, % weed seed content, and guaranteed % of purity and germination. Pure Live Seed types and amount shall be as shown on plans.
 - a. Mulch – needed only for hydroseeding: Wood or paper cellulose commercial mulch materials compatible with hydroseeding operations. Mulch depth according to mulch

manufacturers' recommendation. DO NOT use mulch of straw, pine needles, etc., because of their low moisture holding capacity.

- b. Topsoil – needed only for seeding, recommended for hydroseeding: Obtain specified topsoil for a light “dusting” (no more than ½” or 13mm) above rings filled with sand for seeding germination.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine subgrade and base course installed conditions. Do not start porous paving installation until unsatisfactory conditions are corrected. Check for improperly compacted trenches, debris, and improper gradients.
- B. For fire lane installations: prior to installing base course for turf paving, obtain approval of local fire authorities of sub-base.
- C. Start of installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Architect for resolution.

3.2 PREPARATION

Notes: Ensure that subbase materials are structurally adequate to receive designed base course, wearing course, and designed loads. Generally, excavation into undisturbed normal strength soils will require no additional modification. Fill soils and otherwise structurally weak soils may require modifications, such as geotextiles, geogrids, and/or compaction (not to exceed 90%). Ensure that grading and soil porosity of the subbase will provide adequate subsurface drainage

A. Subgrade Preparation:

1. Prepare subgrade as specified in Section 32 10 00. Verify subgrade in accordance with porous paving system manufacturer's instructions.
2. Proper subgrade preparation will enable the Grasspave2 rolls/units to connect properly and remain

Notes: For Fire lanes and emergency access, It is recommended that Fire Department inspectors be scheduled to inspect installation of Grasspave2 during preparation of the subbase, installation of the base course, and installation of Grasspave2 units. Most small projects can accommodate these inspections all on the same day. Verify with Fire Department if certificates of inspection are required.

level and stationary after installation.

3. Excavate area allowing for unit thickness, the engineered base depth (where required), and 0.5 inch (1.25 cm) for depth of sod root zone or topsoil germination area (when applicable).
 4. Provide adequate drainage from excavated area if area has potential to collect water, when working with in-place soils that have poor permeability.
 5. Ensure in-place soil is relatively dry and free from standing water.
 6. Uniformly grade base.
 7. Level and clear base of large objects, such as rocks and pieces of wood.
- B. Base Preparation:**
1. Install Base as specified in Section 32 10 00. Verify engineered base (if required) is installed in accordance with porous paving system manufacturer's instructions.
 2. Coordinate base installation and preparation with subdrains specified in Section 33 46 00.
 3. If required, place a geotextile separation layer between the natural ground and the 'engineered base'.
 4. If required, install the specified sub-drain and outlet according to construction drawings.
 5. Coordinate base installation and preparation with irrigation and drip irrigation lines specified in Section 32 80 00 and 32 84 13, respectively.
 6. Place engineered base in lifts not to exceed 6 inches (150 mm), compacting each lift separately to

95 percent Modified Proctor.

7. Leave 1 inch (2.5 cm) of depth below final grade for porous paver unit and sand fill and 0.5 inch (1.25 cm) for depth of sod root zone or topsoil germination area (when applicable).

Notes: Delete requirement for on-site manufacturer's field representative if not required

3.3 ON-SITE MANUFACTURER'S FIELD REPRESENTATIVE

- A. A qualified Manufacturer's field representative shall be available for a pre-construction meeting via phone or in person and will provide installation videos, design details, installation instructions, and the technical specifications.
- B. The time for on-site observation shall be indicated in the Contract Documents and included in the base bid price.

3.4 HYDROGROW INSTALLATION

- A. Spread all Hydrogrow mix provided (spreader rate = 4.53 kg per 100 m² (10 lbs per 1076 ft²) evenly over the surface of the base course with a hand-held, or wheeled, rotary spreader.
- B. The Hydrogrow mix should be placed immediately before installing the Grasspave2.

3.5 GRASSPAVE2 INSTALLATION

- A. Install the Grasspave2 units by placing units with rings facing up, and using snap-fit connectors, pegs and holes, provided to maintain proper spacing and interlock the units. Units can be easily shaped with pruning shears or knife. Units placed on curves, slopes, and high traffic areas shall be anchored to the base course, using 40d common nails with fender washer, as required to secure units in place. Tops of rings shall be between 6 mm to 13 mm (0.25" to 0.5") below the surface of adjacent hard-surface pavements.
- B. Install sand in rings as they are laid in sections by "back-dumping" directly from a dump truck, or from buckets mounted on tractors, which then exit the site by driving over rings already filled with sand. The sand is then spread laterally from the pile using flat bottomed shovels and/or wide "asphalt rakes" to fill the rings. A stiff bristled broom should be used for final "finishing" of the sand. The sand must be "compacted" by using water from hose, irrigation heads, or rainfall, with the finish grade no less than the top of rings and no more than 6 mm (0.25") above top of rings.

3.6 INSTALLATION OF GRASS

- A. Grass coverage on the sand-filled rings must be completed within one week. Sand must be re-installed and leveled and Grasspave2 checked for integrity if rings become exposed due to wind, rain, traffic, or other factors. (Choose one paragraph below to meet grass installation method desired.)

Notes: Choose one paragraph below to match grass installation method

1. Preferred method: Hydroseeding/hydro-mulching - A combination of water, seed and fertilizer are homogeneously mixed in a purpose-built, truck-mounted tank. The seed mixture is sprayed onto the site at rates shown on plans and per hydroseeding manufacturer's recommendations. Coverage must be uniform and complete. Following germination of the seed, areas lacking germination larger than 20 cm x 20 cm (8" x 8") must be reseeded immediately. Seeded areas must be fertilized and kept moist during development of the turf plants.). DO NOT DRIVE ON SYSTEM: Hydroseeded/hydro-mulch areas must be protected from any traffic, other than emergency vehicles, for a period of 6 to 8 weeks, or until the root system has penetrated and established well below the Grasspave2 units.
2. Install thin sod directly over sand filled rings, filled no higher than the top of the rings. Sod strips should be placed with very tight joints. Sodded areas must be fertilized and kept moist during root

establishment (minimum of 3 weeks). DO NOT DRIVE ON SYSTEM: Sodded areas must be protected from any traffic, other than emergency vehicles, for a period of 3 to 4 weeks, or until the root system has penetrated and established well below the Grasspave2 units.

3. Install grass seed at rates per grass type. A light "dusting" of commercial topsoil mix, not to exceed 1/2" (25 mm) will be placed above the rings and seed mix to aid germination rates. Seeded areas must be fertilized and kept moist during development of the turf plants.). DO NOT DRIVE ON SYSTEM: Seeded areas must be protected from any traffic, other than emergency vehicles, for a period of 6 to 8 weeks, or until the root system has penetrated and established well below the Grasspave2 units.
- B. Adequately water sod or grass seed to assure germination of seed and growth of root system.

3.7 PROTECTION

Notes: Choose one paragraph below to match grass installation method.

- A. Seeded areas must be protected from any traffic, other than emergency vehicles, for a period of 4 to 8 weeks, or until the grass is mature to handle traffic.
- B. Sodded areas must be protected from any traffic, other than emergency vehicles, for a period of 3 to 4 weeks, or until the root system has penetrated below the Grasspave2 units.

3.8 FIELD QUALITY CONTROL

- A. Remove and replace segments of Grasspave2 units where three or more adjacent rings are broken or damaged, reinstalling as specified, so no evidence of replacement is apparent.
- B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

3.9 MAINTENANCE

- A. Maintain grass in accordance with manufacturer's instructions and as specified in Section 32 92 00 Manufacturers of Turfs and Grasses.
- B. Lawn Care: Normal turf care procedures should be followed, including de-thatching.
- C. DO NOT AERATE. Aerator will damage the Grasspave2 units. Aeration is not necessary in a sand root zone.
- D. When snow removal is required, keep a metal edged plow blade a minimum of 3/4 inch (17 mm) above the surface during plowing operations to avoid causing damage to the Grasspave2 units, or
 1. Use a plow blade with a flexible rubber edge, or
 2. Use a plow blade with skids on the lower outside corners set so the plow blade does not come in contact with the units.

END OF SECTION



Appendix C: LaRC Environmental Specifications Section 01 35 40.00 41

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NASA LANGLEY ENVIRONMENTAL REQUIREMENTS

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NOTE: This guide specification covers the requirements for section scope.

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NASA LANGLEY ENVIRONMENTAL REQUIREMENTS
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NOTE: Section updated, P. Van Dyke 10-19-19

Section updated, P. Van Dyke 10-25-18

Section updated, P. Van Dyke 10-5-17

NOTE: The requirements defined herein are job related environmental requirements and can be selected by the engineer in accordance with the contract's requirements. Specific deviations, deletions, or modifications of the requirements relative to a given subheading are not permitted without concurrence of the LaRC Environmental Office.

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

The listed versions of the following references were used during the development of this design and are the Government approved versions to be used herein. There may be newer versions of certain references that have been released since the commencement and/or approval of the design effort. However, in order to comply with the Government technical requirements, not all of the latest versions of the listed references were adopted and the versions listed herein shall be utilized.

AMERICAN NURSERY & LANDSCAPE ASSOCIATION (ANLA)

ANSI/ANLA Z60.1 (2014) American Standard for Nursery Stock

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846 (Third Edition; Update IV) Test Methods for Evaluating Solid Waste:

Physical/Chemical Methods

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651 (2014) Standard for Disinfecting Water Mains

LANGLEY RESEARCH CENTER (LaRC)

LPR 8500.1G (September 2019) Environmental and Energy Program Manual

LPR 8715.12 (August 2022) LaRC Integrated Spill Contingency Plan

VSMP Program Summary (2019) VSMP Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

9 VAC 5-40-90 Standard for Fugitive Dust/Emissions

9 VAC 20-60 Title 9, Agency 20, Chapter 60: Hazardous Waste Management Regulations

9 VAC 25-840 Title 9, Agency 25, Chapter 840: Erosion And Sediment Control Regulations

9 VAC 25-870 Title 9, Agency 25, Chapter 870: Virginia Stormwater Management Program (VSMP) Regulation

9 VAC 25-880 General Permit for Discharges of Stormwater from Construction Activities

9 VAC 20-81-660 Soil Contaminated with Petroleum Products

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 112 Oil Pollution Prevention

40 CFR 262 Standards Applicable to Generators of Hazardous Waste

40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 273 Standards For Universal Waste Management

40 CFR 279 Standards for the Management of Used Oil

40 CFR 61 National Emission Standards for Hazardous Air Pollutants

40 CFR 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)	
DEQ-VSWCB-013	(2011) Virginia Erosion and Sediment Control Handbook, Third Edition

1.2 SUBMITTALS

The Contractor shall submit documents to LaRC Environmental as required in the Section(s) of these specifications that are applicable to the project. The following provides a complete list of document submittals included in these specifications with a reference to the applicable Section(s):

SD-01 Preconstruction Submittals

LF 461, Environmental Project Planning Form ; G (Submitted by Program Manager/Project Initiator during the earliest planning stages)

Waste Management Plan; G

Stormwater Pollution Prevention Plan (SWPPP); G

DEQ Construction General Permit Registration Statement; G

DEQ Construction General Permit Coverage Letter; G - Virginia Stormwater Management Program (VSMP) General Permit for Discharges of Stormwater from Construction Activities (obtained prior to any land disturbance)

Emergency Spill Plan; G

Erosion and Sediment Control Plan (ESC Plan); G

Stormwater Management Plan (SWM Plan); G

Disposal of Chlorinated Water Plan; G

SD-02 Shop Drawings

SWM Plan as-builts; G

SD-06 Test Reports

Waste Sampling Analytical Reports; G

Waste Profiles; G

Soil Analytical Results; G

SD-07 Certificates

Hazardous Waste Manifest and LDR; G

Asbestos Manifest; G

Asbestos Return Manifest; G

PCB Manifest; G

Shipping Document; G

SD-11 Closeout Submittals

Notice of Termination Form; G

DEQ Construction General Permit Notice of Termination Letter; G

Project Materials Usage Spreadsheet and SDS's; G

Lead and Chromium Waste Generation Report; G

Construction and Demolition Debris Recycling/Diversion Report; G

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PROJECT REVIEWS AND INSPECTIONS

3.1.1 Environmental Project Planning Form - LF 461

LaRC Environmental requires the completion of a LF 461, Environmental Project Planning Form, for all projects except for those activities listed on the "LF 461 Excluded Activities List". This list is available on the LF461 Homepage. The Project Manager/Project Initiator is responsible for completing and submitting the LF 461 to LaRC Environmental at the earliest planning stages of the project. No on-site work shall begin until there is confirmation that a LF 461 has been submitted and the Program Manager/Project Initiator has received comments and project requirements from LaRC Environmental.

The Project Manager/Project Initiator is responsible for ensuring that the Contractor is provided, in writing, all comments and environmental requirements associated with the LF 461, and any updates, and the Contractor is responsible for complying with such, as well as the requirements included in these specifications.

NOTE: An LF 461 is required for any project or activity requiring a digging permit.

3.1.2 Environmental Inspections, Corrective Action and Enforcement Policy

LaRC Environmental will routinely conduct inspections of project sites on LaRC involving new construction, renovation, repair, demolition and other

infrastructure related activities to ensure compliance with environmental regulations and permits, Waste Management Plans, contract environmental specifications, and other environmental requirements throughout the duration of the project. The "NASA Projects Environmental Field Inspection Form" will be used to document inspections. The Contractor is independently responsible for the knowledge of and compliance with all Federal, State and local environmental laws and regulations.

Upon completion of the inspection, SPEEB Environmental staff will immediately document in the "NASA LaRC-Corrective Action Notice" any observed deficiencies, concerns, corrective actions or non-compliances. This report will be provided by e-mail to the appropriate NASA and Prime Contractor Project Managers and the Contracting Officer. SPEEB will conduct follow-up inspections at least weekly until SPEEB is satisfied the problem is resolved. The Prime Contractor's Project Manager will be responsible for responding to the Corrective Action Notice in writing to SPEEB, with a copy to the Contracting Officer, within seven days from receipt of the Corrective Action Notice explaining what has been done or what will be done to remedy the inspection's findings. In cases of immediate or imminent danger to life or the environment, the responsible Contractor may be required to 'cease and desist' and/or may be subject to other appropriate enforcement actions by LaRC, federal or state authorities.

If findings or deficiencies are not satisfactorily resolved in a timely manner, SPEEB will coordinate with LaRC OP and the Office of Chief Counsel to evaluate what actions are necessary. One or more of the following enforcement actions may be taken:

- 1) SPEEB will notify the Contracting Officer of non-compliance activity and request that the responsible Contractor be informed of the urgency for corrections and consequences if not corrected.
- 2) If repeat findings/deficiencies continue to recur and as a result are recognized as significant risk to LaRC environmental compliance, or damage to the environment is a result, then a contractual action will be taken through the Contracting Officer. Formal contractual actions (as provided in the FAR) can include, but are not limited to, cure notices, formal contract non-conformance notices, stop work orders, withholding of payment, negative evaluation reports in formal systems such as Federal Government's Contractor Performance Assessment Reporting System (CPARS), and/or contract termination.
- 3) A "cease and desist" order may be authorized by SPEEB. The Head of the SPEEB is the delegated cease and desist authority for any operations that, in the professional judgment of the SPEEB Environmental staff, have an immediate and negative impact on the environment or that jeopardize the Center's compliance with permit requirements and applicable environmental regulations.
- 4) Notification of the Contractor's non-compliance activity to Virginia Department of Environmental Quality enforcement officials at the discretion of SPEEB.

Additionally, failure to fully comply with regulatory requirements could result in adverse Federal or State regulatory action and/or criminal prosecution. Citations and fines for violations of environmental laws and regulations are dependent upon the applicable law and the nature of the violation. Legal actions include civil charges with monetary penalties for businesses/organizations for noncompliance and criminal charges

against individuals for willful violations and/or withheld or falsified information. Penalties can range from an injunction to hefty fines to prison time, depending on the nature of the violation.

3.2 AIR QUALITY

3.2.1 Fugitive Dust Emissions

The Contractor shall control fugitive dust emissions in accordance with Virginia Regulation 9 VAC 5-40-90 (Standard for Fugitive Dust/Emissions). The Contractor shall take reasonable precautions to prevent particulate matter from becoming airborne during the project. Examples of such reasonable precautions include:

- o Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land;
- o Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which may create airborne dust; the paving of roadways and the maintaining of them in a clean condition;
- o Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials. Adequate containment methods shall be employed during sandblasting or other similar operations;
- o Open equipment for conveying or transporting materials likely to create objectionable air pollution when airborne shall be covered or treated in an equally effective manner at all times when in motion; and
- o The prompt removal of spilled or tracked dirt or other materials from paved streets and of dried sediments resulting from soil erosion.

3.2.2 Volatile Organic Compounds (VOCs)

The Contractor shall store volatile organic liquids, including fuels and solvents, in closed, labeled containers. Volatile organic liquids shall not be stored with materials that have a high capacity to adsorb VOC emissions or in occupied spaces.

3.2.3 Emergency Generators

Electrical requirements for emergency generators are in the facility electrical specification. Environmental requirements for emergency generators are outlined here. Emergency generators are included in the NASA air permit. Installing, modifying or relocating an emergency generator can affect the air permit with at least six months to be processed by Virginia DEQ.

Emergency generators may operate for unlimited time during an emergency. Virginia DEQ defines emergency as: condition that arises from sudden and reasonably unforeseeable events where the primary energy or power source is disrupted or disconnected due to conditions beyond the control of an owner or operator of a facility including: failure of the electrical grid, on-site disaster or equipment failure, and flood, fire, natural disaster, or severe weather conditions.

Emergency generators may be operated for up to 100 hours per year for generator maintenance and testing. Up to 50 of the 100 hours may be used for non-emergency power generation, such as planned electrical shutdowns. Evaluate the number of hours per year of non-emergency operation needed, to determine whether to install an emergency or non-emergency generator.

3.2.4 Non-Emergency Generators

Non-emergency generators are those units used for peak shaving, distributed generation, or for generating electricity for any reason other than emergency generators use previously explained.

Per NSPS Subpart IIII, if a facility installs a 2011 (and beyond) model year non-emergency compression ignition (CI, or diesel) engine, it must be a Tier 4 engine. Non-emergency engines greater than or equal to 130 kW (175 hp) will need to be added to LaRC's air permit. Air permit modifications can take up to 6 months and no installation can begin until the air permit modification is completed. The Contractor shall notify the Contracting Officer and SPEEB before purchasing any non-emergency generators to ensure the generators engine meets all requirements.

3.2.5 Temporary Portable Power Equipment

Temporary portable diesel powered equipment (e.g., generators, pumps, lamps/lights) present onsite for one year must be added to LaRC's air permit. The Contractor shall notify the Contracting Officer and SPEEB of any such equipment when it is first brought on site. The Contractor is responsible for documenting arrival and departure dates to demonstrate the one year period has not been exceeded.

3.3 WATER QUALITY

3.3.1 Basic Erosion and Sediment Control (ESC)

Regardless of project size or amount of land disturbance, the Contractor is responsible for ensuring that adequate erosion and sediment controls are utilized on site to prevent sediment from leaving the activity at all times. ESC practices selected for use shall be designed, installed and maintained in accordance with the [DEQ-VSWCB-013](#), Virginia Erosion and Sediment Control Handbook, 3rd Edition (as amended).

3.3.2 NASA Stormwater Management Program Authority

NASA LaRC has the necessary authorization from VA DEQ to review and approve stormwater-related Plans in house. NASA is the program authority for Sections 3.3.3, 3.3.4, 3.3.5, and 3.3.6 of this Specification. NASA's Stormwater Management Program, including government oversight procedures, Plan review procedures, enforcement procedures, and Contractor expectations are summarized in a document titled [VSMP Program Summary](#), VSMP Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management. This is a VA DEQ reviewed and approved program summary. A copy of this document can be obtained through the Contracting Officer.

3.3.3 Erosion and Sediment Control Plan (ESC Plan)

Land Disturbing Activities (LDAs) of at least 10,000 square feet or when deemed necessary by LaRC Environmental through the LF 461 process (to a minimum of 2,500 square feet) require the Contractor to develop a site

specific Erosion and Sediment Control Plan that complies with Virginia Erosion and Sediment Control Law and Regulations (9 VAC 25-840) and meets the state's 19 minimum standards outlined in 9 VAC 25-840-40 (as applicable). ESC practices selected for use shall be designed, installed and maintained in accordance with the Virginia Erosion and Sediment Control Handbook, 3rd Edition (as amended). The ESC Plan shall include site plan(s)/detailed maps for the work site that clearly show the siting of the ESC practices and best management practices. The Virginia Uniform Coding System for ESC Practices shall be used on all site plan submittals. The ESC Plan shall include a statement describing the Contractor's maintenance responsibilities required for the ESC controls. The Contractor shall submit the ESC Plan to the Contracting Officer for review and approval.

The Contractor shall have a certified Virginia Responsible Land Disturber (RLD) on staff and associated with any project over 2,500 square feet. A copy of the certification shall be submitted in the ESC Plan.

3.3.3.1 Inlet Protection ESC

The use of cut silt fence sections as inlet protection is prohibited.

3.3.3.2 Dewatering

Unfiltered water with sediment present shall not flow into a drain, inlet or other stormwater system component. Dewatering activities shall use a dewatering bag to filter sediment prior to water discharge. Dewatering should be done to a grassy location away from the storm sewer system, when feasible.

3.3.4 Stormwater Management Plan (SWM Plan)

For LDAs of at least 1 acre or when deemed necessary by LaRC Environmental through the LF 461 process (to a minimum of 2,500 square feet), projects shall comply with VSMP Regulations Part II B - Technical Criteria for Regulated Land-Disturbing Activities (9 VAC 25-870-32 through 9 VAC 25-870-92). A complete SWM Plan must meet the requirements of 9 VAC 25-870-55.

For projects with an approved SWM Plan (completed during a design) it is the construction Contractor's responsibility to implement the Plan and its design features. Any modifications or deviations from the Plan must be approved. A copy of the approved SWM Plan can be obtained through the Contracting Officer if applicable.

For projects that do not have an approved SWM Plan associated with the design (primarily demolition and smaller projects), it is the Contractor's responsibility to develop and implement a SWM Plan.

At the completion of the project, a construction record drawing(s) ("as-built") for permanent stormwater management facilities shall be appropriately sealed and signed by a professional registered in the Commonwealth of Virginia, certifying that the stormwater management facilities have been constructed in accordance with the approved SWM plan as per 9 VAC 25-870-55 D. The Contractor shall submit a SWM Plan as-builts to the Contracting Officer.

3.3.5 Stormwater Pollution Prevention Plan (SWPPP)

For LDAs over 1 acre, a full SWPPP submittal shall be developed in

accordance with 9 VAC 25-870 and 9 VAC 25-880. All SWPPPs must contain the following:

- o Erosion and Sediment Control Plan (See Section 3.3.3);
- o Stormwater Management Plan (See Section 3.3.4);
- o Pollution Prevention (P2) Plan; and
- o Information specifying any additional control measures to meet the requirements of existing Total Maximum Daily Loads (TMDL).

Within the SWPPP the Contractor shall develop a site specific P2 Plan in accordance with 9 VAC 25-870-56. The P2 Plan must identify potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges from the construction site and a description of control measures to minimize pollutants. This Plan shall be included in the Contractor's SWPPP submittal.

The SWPPP must also address all requirements listed in 9 VAC 25-880-70 Part II.

The Contractor shall submit the SWPPP to the Contracting Officer for Government review and approval. If the plan is determined to be inadequate, LaRC Environmental will specify such modifications and/or terms and conditions that will allow approval of the SWPPP plan and notify the Contracting Officer of changes needed. The Plan shall be resubmitted until approval is granted. No LDAs may commence without an approved SWPPP.

3.3.6 Construction General Permit (CGP) Coverage

LDAs greater than or equal to one (1) acre require Construction General Permit coverage under the Virginia Stormwater Management Program (VSMP) General Permit for Discharges of Stormwater from Construction Activities from the Department of Environmental Quality (DEQ). The Virginia Stormwater Management Program Permit Regulations can be found in 9 VAC 25-870 and the General Permit for Discharges of Stormwater from Construction Activities can be found in 9 VAC 25-880.

After SWPPP approval (see Section 3.3.5), the Contractor shall register for CGP coverage from DEQ in accordance with 9 VAC 25-880-50. The Contractor is considered the Permit Operator and is responsible for all CGP fees per 9 VAC 25-870-820.

The Contractor shall submit a copy of the [DEQ Construction General Permit Registration Statement](#) to the Contracting Officer for review and approval prior to submittal to DEQ. LaRC Environmental will ensure correct information is presented on the Contractor's Registration Statement and complete the necessary Annual Standards and Specification (AS&S) Entity Information Sheet to accompany the statement. Upon approval, the Contractor shall submit the DEQ Construction General Permit Registration Statement and applicable fee to DEQ.

The Contractor may begin LDAs once a DEQ Construction General Permit coverage letter has been received. No LDAs shall commence without a NASA-approved SWPPP and DEQ-issued CGP coverage. The Contractor shall submit a copy of the [DEQ Construction General Permit coverage letter](#) to the Contracting Officer once received.

The Contractor shall be responsible for terminating permit coverage in accordance with 9 VAC 25-880-60 once the project site has (1) reached final stabilization verified by the Contracting Officer and (2) Virginia

DEQ has completed a Notice of Termination (NOT) inspection. Final Stabilization is defined in 9 VAC 25-880-1 as soil disturbing activities have been completed and a permanent vegetative cover has been established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive, and will inhibit erosion. The Contractor shall provide the Contracting Officer with a final draft of the [Notice of Termination Form](#) for Government review prior to mailing. Once approved, the form shall be mailed to DEQ Richmond. A copy of the [DEQ Construction General Permit Notice of Termination Letter](#) should be submitted to the Contracting Officer once received.

3.3.7 Prohibited Illicit Discharges

The Contractor shall ensure no illicit discharges occur at the project site. An "illicit discharge" is any non stormwater discharge to the storm drain system, except as expressly allowed by LaRC's VPDES permits, the project-specific VSMP General Permit for Discharges of Stormwater from Construction Activities, and/or a discharge approved in writing by NASA. Water from firefighting, hydrant flushing, and A/C condensate are not considered illicit discharges. Examples of illicit discharges include the following:

- o Dumping of trash or debris
- o Disposing of vehicle/equipment maintenance fluids into a storm sewer system
- o Leaking dumpsters flowing into a storm drain inlet
- o Pouring paints, stains, hazardous materials into a storm drain
- o Cleaning paint brushes/applicators in or near a storm drain
- o Allowing wash waters, including power washing, with soaps, detergents, or paint debris to flow into a storm drain inlet
- o Leaking or washing of silt, sediment, concrete, cement or gravel into a storm drain
- o Allowing uncontrolled release of sediment into a storm drain inlet
- o A measurable flow during dry weather that contains any other pollutants
- o Improper connections or equipment drainage to storm
- o Allowing oily water, discharge from equipment leaks, or any liquid with an observable sheen to enter the storm system, including through basement sumps
- o Concrete washout to ground or storm system
- o Dewatering activities of sediment-laden water
- o Draining chemically-treated water into the storm sewer system

3.3.8 Dumpsters and Construction Site Waste Containers

The Contractor shall ensure that all waste dumpsters/containers on site have a lid or cover. Containers should be closed during all rain events and at the end of each business day.

3.3.9 Deice Agents

The permittee shall not apply any deicing agent containing urea or other forms of nitrogen or phosphorus to parking lots, roadways, and sidewalks, or other paved surfaces.

3.3.10 Mechanical System Draining

The Contractor shall not discharge water generated from draining of

mechanical systems/equipment or flushing of lines without coordination and approval from the Contracting Officer. The Contractor has two options for mechanical system wastewater disposal: (Option 1) sample the water and discharge to the sanitary sewer system upon Hampton Roads Sanitation District (HRSD) approval and/or (Option 2) containerize the wastewater for proper disposal off-site.

Samples required for Option 1:

Metals (Method 200.7)

Total Cadmium
Total Chromium
Total Copper
Total Lead
Total Nickel
Total Zinc

Molybdenum (Method 200.7)

COD (Method HAC8000)

BOD (Method 5210B)

Oil and Grease (1664A)

pH

3.3.11 Draining of Disinfected Water Mains

Potable water lines shall be properly disinfected in accordance with [AWWA C651-05](#). Drainage and discharge of chlorinated water is prohibited without approval and must be done in accordance with all applicable laws and regulations. Chlorinated water (above standard drinking water levels) may not be discharged to the storm sewer system. The Contractor shall develop a [Disposal of Chlorinated Water Plan](#) for Contracting Officer (CO) review and approval. Options for disposal include capturing the water for treatment/neutralization prior to discharge, discharge to HRSD/sanitary sewer (if approved by HRSD through sampling), or capture and disposal off-site

3.4 PROJECT MATERIAL AND CHEMICAL STORAGE, USE, AND REPORTING REQUIREMENTS

3.4.1 Storage Requirements

The Contractor shall ensure that all project materials and chemicals required to perform work are:

- o Stored in an isolated and secure area at the project site to prevent release to the environment.
- o Labeled properly and used according to the manufacturer's guidelines, and that containers are kept closed except for when in use.
- o Removed from NASA LaRC after project completion.

3.4.2 Use and Tracking Requirements

NOTE: The requirements below are primarily targeted to the materials conveyed and used on-site by the Contractors/Subcontractors without access to the LaRC's Chemical Material Tracking System (CMTS).

The Contractor shall track the usage of certain project materials/chemicals brought on the Center. Project materials the Contractor shall track include, but are not limited to:

1. Metals. Metals used in construction, rehab, or other project activities shall be tracked in pounds by alloy such as stainless steel, copper, brass, lead, carbon steel, etc.
2. Asphalt. Paving material shall be tracked in total tons of new asphalt laid and total tons of old asphalt removed. Exception: asphalt material used for or removed from parking lots.
3. Lead-Acid Batteries. The installation, maintenance, or removal of lead-acid batteries shall be tracked by number of batteries installed, maintained, or removed and total weight of each battery type.
4. Paints (all types), which shall be tracked by total amount used.
5. Fuels and Oils. The use of fuels and oils, or their removal from existing equipment, shall be tracked by total amount and type of fuel and oil used or removed. Exception: fuels and oils used in or removed from motor vehicles.
6. Coolants and Refrigerants, which shall be tracked by total amount used. Exception: coolants and refrigerants being tracked in LaRC's electronic Refrigerant Compliance Manager tracking system.
7. Lead-containing products, such as solder, cable sheathings/sleeves, coatings, etc. Products containing lead shall be tracked by total weight of the materials used.
8. Other chemicals and products (solvents, cleaners, lubricants, degreasers, adhesives, acids, aerosols, thinners, strippers, corrosives, etc.), which shall be tracked by type of material and amount used.

Tracking shall not be required if the materials are being used for simple building maintenance and basic administrative, housekeeping, and janitorial services. A pre-prepared Project Materials Usage Spreadsheet will be provided from LaRC Environmental as an option for the Contractor to use for tracking purposes.

3.4.3 Reporting Requirements

The Contractor shall submit the [project materials usage spreadsheet and SDS's](#) to LaRC Environmental upon completion of the project. If the project extends into a new calendar year, the Contractor shall provide the data for all materials used in the preceding year by January 31st of the new calendar year.

3.5 WASTE MANAGEMENT AND DISPOSAL

NOTE: Waste Management Responsibility will be determined early in the planning stages of the project. The Waste Management Requirements (Government responsible) will apply for waste generated by Jacobs personnel during in-house routine maintenance tasks. All other Projects/Tasks (Jacobs or NASA) that generate hazardous waste will be reviewed by LaRC Environmental to determine if the Government or Contractor will be responsible for the disposal of the waste. Information submitted through the LF 461 process for the Project/Task will be used to determine responsibility for waste disposal.

3.5.1 General

Hazardous Waste Management Requirements:

Hazardous waste shall be collected in Satellite Accumulation Area (SAA). SAA's shall be located at or near the point of waste generation and be under the control of the operator of the process generating the waste. Each hazardous waste container located at an SAA shall be marked with the words "Hazardous Waste", identify the type of waste and the hazard of the waste. Each container at an SAA shall be closed at all times (unless adding waste), and shall be maintained in good condition (non-leaking). No more than 55 gallons TOTAL of hazardous waste or 1 quart of acute hazardous waste can be accumulated at an SAA. In addition, the Contractor shall inspect all SAAs on a weekly basis and document the inspection. An example inspection sheet can be obtained from SPEEB. The management and handling of hazardous waste shall be accordance with 40 CFR 262 and State regulations.

Universal Waste Management Requirements:

Universal waste (UW) containers shall be kept closed at all times except when adding or removing waste. All containers containing UW shall be labeled with a universal waste label indicating specific contents and a start date. UW shall be recycled by the Contractor through an EPA approved recycling center. Universal waste includes batteries, devices containing elemental mercury and mercury containing lamps. The Contractor shall inspect the UW areas on a weekly basis and document the inspection. The management and handling of Universal waste shall be in accordance with ALL requirements in 40 CFR 273.

Other waste listed below shall be managed in accordance using the following requirements in the noted sections:

Asbestos - Managed according to section 3.6 titled "ASBESTOS WASTE DISPOSAL REQUIREMENTS".

PCB's - Manage according to Section 3.7 titled "PCB REMOVAL AND DISPOSAL REQUIREMENTS".

Oil (non-transformer) and Oily Debris - Manage according to Section 3.8 titled "FUEL AND OIL MANAGEMENT REQUIREMENTS".

Wastewater - Manage according to Section 3.3 titled "WATER QUALITY" and Section 23 25 00.00 41 CHEMICAL TREATMENT OF WATER FOR MECHANICAL SYSTEMS.

Soil - Manage according to section 3.10.2 titled "SOIL MANAGEMENT AND DISPOSAL".

Construction and Demolition Debris - Manage according to Section 3.9 titled "Construction and Demolition Debris".

3.5.1.1 Waste Management Requirements (Government Responsible)

This section includes the requirements for waste generating projects whereby the Government will be responsible for providing labeled waste containers, analytical testing and the proper disposal of the waste (unless otherwise specified).

The Government requires information on all waste streams that will be generated on the project. Information includes, but is not limited to, description and amount of anticipated hazardous waste, collection and management procedures for hazardous waste and non-hazardous waste and description of materials that can possibly be recycled.

Contractor employees who handle waste on-site shall be thoroughly familiar with LaRC waste handling, packaging, spill response, and other emergency procedures relevant to their responsibilities. Contractor employees performing these duties shall be trained before they begin work. The prime Contractor is responsible to ensure that training is provided and the Government can be contacted for appropriate training materials and copies of the Spill Plan and supporting documents.

The Contractor will be audited by LaRC Environmental to ensure that all applicable waste regulations and proper waste practices are being followed. The Contractor shall take appropriate actions to ensure compliance with all Federal, State and Local regulations. Section 3.1.2 (Inspection, Corrective Action and Enforcement Policy) will be adhered to for non-compliance activities. Disposal of hazardous waste into the storm or sanitary sewer is prohibited at all times.

In the event of a spill, the Contractor shall follow LPR 8715.12, the LaRC Integrated Contingency Spill Plan, and call 911 (using on center phones) or 757-864-2222 and provide the necessary information requested. All possible means to contain and/or prevent entry to storm drains or waterways shall be initiated. The Contractor shall provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled. Spill cleanup resulting from Contractor actions shall be the responsibility of the Contractor.

3.5.1.2 Waste Management Requirements (Contractor Responsible)

This section includes the requirements for waste generating projects whereby the Contractor shall be responsible for disposing of waste generated at the project site.

The Contractor shall provide all labor, equipment, analytical testing,

packaging/containers, materials, labels, placards and all materials, services and transportation necessary to safely store, remove and dispose of all waste in accordance with all Federal, State, and local laws and regulations. Disposal of hazardous waste shall be conducted in accordance with Resource Conservation Recovery Act (RCRA), Federal regulations, and State regulations (9 VAC 20-60). Disposal of hazardous waste into the storm or sanitary sewer is prohibited at all times.

At least ten (10) working days prior to project startup, the Contractor shall submit a [Waste Management Plan](#) (WMP) to LaRC Environmental for review and approval. No work shall begin until the WMP is approved by LaRC Environmental. The WMP shall cover the management of all generated waste anticipated during the project and provide enough detail to describe how the Contractor will manage, store, and dispose of all waste generated at the project site. A WMP template is available for use for the Environmental Office.

At a minimum, the WMP shall specifically address the following:

1. Identification of all hazardous waste, regulated waste, non-hazardous waste, and recyclable/scrap materials/debris that will be generated.
2. For each waste stream that is identified, the WMP shall include:
 - a. Amount/volume (may be estimated).
 - b. The types of DOT-approved shipping containers/packages to be used.
 - c. The means by which all hazardous materials and waste containers will be labeled/marked and stored. See section 3.4.1 (Storage Requirements) for further guidance.
 - d. The management procedures that will be implemented at the project site to ensure compliance with all applicable Federal, State, and local laws and regulations. This includes hazardous waste staging and temporary storage requirements.
 - e. The name and address of the disposal/recycling facility.
3. The name, position and title of the Transportation and Disposal Coordinator (TDC) for the project. The Contractor shall designate a TDC who shall serve as the single point of contact for all waste management matters and be competent and aware of all waste management requirements associated with the project.

The TDC shall have overall responsibility to ensure waste management compliance at the project site including, but not limited to, accurate identification and classification of hazardous waste and hazardous materials; determination of proper shipping names; identification of marking, labeling, packaging and placarding requirements; completion of waste profiles, hazardous waste manifests, asbestos waste shipment records, PCB manifests, bill of lading, exception and discrepancy reports; and all other environmental documentation.

4. The TDC shall be trained to the requirements of RCRA Hazardous Waste Management Training in accordance with [40 CFR 262](#) and [40 CFR 265](#) and DOT Hazmat Employee Training in accordance with [49 CFR 172](#) and [49 CFR 173](#).

5. Contractor employees who will be handling waste on-site shall be thoroughly familiar with LaRC waste handling, packaging and emergency procedures relevant to their responsibilities. Contractor employees performing these duties shall be trained before they begin work.

NOTE: The required training documentation for each individual shall be provided in the WMP. Those individuals without the required training will NOT be allowed to work until proper documentation is provided.

Throughout the duration of the project, the Contractor shall comply with the waste management procedures as specified in the WMP and applicable requirements in Section 01 35 40.00 41 NASA LANGLEY ENVIRONMENTAL REQUIREMENTS. The Contractor will be inspected by LaRC Environmental to ensure that all waste management requirements are being followed at the project site. Section 3.1.2 (Inspection, Corrective Action and Enforcement Policy) shall be adhered to for non-compliance activities.

The Contractor shall ensure that all waste is labeled and packaged in accordance with 49 CFR 172 and 49 CFR 178. The Contractor shall use only DOT-approved drums/shipping containers that are compatible with the waste. Reuse of "Product Drums" is strictly prohibited. The Contractor shall also provide other packaging related materials such as materials used to cushion or fill voids in over packed containers, etc. Sorbent materials shall not be capable of reacting dangerously with, being decomposed by, or being ignited by the hazardous materials being packaged.

The Contractor shall ensure that all hazardous waste containers are managed at the project site in accordance with 40 CFR 262.34(a).

The Contractor shall coordinate any waste sampling activities with LaRC Environmental to ensure proper waste characterization. All test methods shall comply with EPA SW-846, Methods for Evaluating Solid Waste.

At least ten (10) days prior to waste shipment, the Contractor shall submit, to LaRC Environmental, all [waste sampling analytical reports](#) and all [waste profiles](#) for approval.

At least three (3) days prior to waste shipment, the Contractor shall submit, to LaRC Environmental, the [hazardous waste manifest and LDR](#) for approval and signature.

The Contractor shall transport and dispose of all hazardous waste generated at the project site using NASA approved Treatment, Storage and Disposal Facilities (TSDF) (see Attachment 1) as specified in the WMP. If the Contractor wants to use a non-NASA approved TSDF, the Contractor shall submit a NASA TSDF audit package to LaRC Environmental for approval at least thirty (30) days prior to waste shipment. Disposal of hazardous waste at a non-NASA approved TSDF is strictly prohibited.

In the event of a spill, the Contractor shall call 911 (using on-Center, land-line phones) or 757-864-2222 and provide the necessary information requested. All possible means to contain the spill and prevent entry to storm drains or waterways shall be initiated. The Contractor shall provide spill response materials including, but not limited to,

containers, absorbent materials (ex: Oil-Dri, spill mats), shovels, and personal protective equipment. Spill response materials shall be available at all times when hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of material being handled. Spill cleanup resulting from Contractor actions shall be the responsibility of the Contractor.

3.5.2 Lead and Chromium Waste Reporting Requirements

Following completion of the project, the Contractor shall submit a [Lead and Chromium Waste Generation Report](#) to LaRC Environmental that includes the following:

1. The weight of any waste that is contaminated with lead or chromium (e.g., paint debris, sandblast grit, rinse/wash water).
2. Records shall include the amount in pounds of waste generated, the amount of lead and/or chromium in the waste, a copy of the analysis or testing report, the name and complete address of the facility the waste is sent to and what that facility plans to do with the waste (e.g., treatment or disposal).

3.6 ASBESTOS WASTE DISPOSAL REQUIREMENTS

The Contractor shall dispose of asbestos waste in accordance with [40 CFR 61](#) and Chapter 9, Asbestos, in [LPR 8500.1G](#), Environmental and Energy Program Manual. Transportation of asbestos material off-site shall be in accordance with DOT Regulations, [49 CFR 173.1090](#).

Upon request to and approval by LaRC Environmental, the Contractor may use an on-site staging area for the asbestos. The Contractor shall be responsible for transporting the properly packaged asbestos waste to the staging area. Containers in staging area used for AB storage shall be labeled with visible AB warning labels on all sides.

At least two (2) days prior to asbestos waste shipment, the Contractor shall provide LaRC Environmental with the [asbestos manifest](#) for review and signature. The asbestos manifest must include the following information:

1. Generator: Identifies NASA Langley Research Center as owner and waste generator. Address of waste generator shall be:

NASA Langley Research Center
Attn: Dave Steigerwald
Standard Practice and Environmental Engineering Branch
Mail Stop 133
Hampton, VA 23681
Telephone: (757) 864-8058
2. The name and address of the local, State or EPA Regional Office responsible for administering the asbestos NESHAP program. Address of responsible agency shall be:

Department of Labor and Industry, Occupational Health
13 South 13th Street
Richmond, VA 23219
3. The name and telephone number of the contractor responsible for the removal of asbestos at the building site.

4. The approximate quantity in cubic meters and in cubic yards.
5. The name and physical site location of the State-approved landfill disposal site.
6. The name, address, and telephone number of the transporter(s).
7. The date transported.

The Contractor shall be responsible to submit a copy of the [asbestos return manifest](#), signed by the owner or operator of the designated disposal site, to LaRC Environmental within 35 days of the date it was transported off-site. If a copy of the waste shipment record is not received within 45 days, the State or EPA regional office will be contacted in accordance with [40 CFR 61.150\(d\)](#) (4).

3.7 PCB REMOVAL AND DISPOSAL REQUIREMENTS

The Contractor shall perform PCB removal and disposal in accordance with [40 CFR 761](#).

All transformers and electrical equipment that have fluids containing any concentration of PCBs must be drained before being transported off the Center for disposal. Transformer oil shall be sampled in accordance with [40 CFR 279.11](#) used oil specifications requirements and analyzed to acquire PCB ppm content. The Contractor will be responsible for ensuring that the transformer oil is managed and disposed of in accordance with requirements in [40 CFR 761.60](#). The only exception to this is transformers or capacitors that can be contained without modification in a drum or other leak proof container. Request for transporting transformers without removing the fluids are issued only by permission by LaRC Environmental and include special requirements.

Items and fluids that contain 50 ppm PCB or greater are considered as PCB and management shall follow applicable federal regulations.

Items and fluids that contain less than 50 ppm PCB are considered non-PCB and are excluded from federal regulation with the exception of disposal requirements. See section 3.8 titled "Fuel and Oil Containing Equipment/Tanks (Non PCB), of this section for additional requirements.

For PCB removal and disposal projects, the Contractor shall:

- a. At least 10 days prior to project start up, submit an [Emergency Spill Plan](#) to LaRC Environmental. The Plan shall define the procedures and materials that will be used by the Contractor in the event of a spill or leak of any amount of PCBs.
- b. Notify LaRC Environmental prior to draining any equipment to ensure proper accumulation containers are used.
- c. Temporarily store PCB items (e.g., transformers, capacitors), for a period of time, not to exceed 30 days, from the date of removal from service.
 - o Storage shall be coordinated with LaRC Environmental to ensure proper storage practices.

- o A notation shall be attached to the PCB item or PCB container housing which indicates the date of removal from service (considered as the out of service date), its weight, and PCB content.
- d. Package all PCB items for transportation according to applicable DOT regulations (49 CFR).
- e. Perform sampling and analyses of PCB items/oil to determine PCB concentration. Submit analytical reports to LaRC Environmental. Refer to section 3.8.2 for additional requirements.
- f. Provide LaRC Environmental with the name and location of the ultimate disposal facility (only NASA approved facilities may be used for disposal of PCB items).
- g. Ensure all PCB containers are shipped offsite to an approved disposal facility within 270 days of the out of service date on the container.

At least five (5) working days prior to PCB shipment, the Contractor shall submit a completed [PCB manifest](#) to LaRC Environmental for review and signature.

In the event of a spill, immediately call the LaRC Emergency Dispatcher at 911 (from land-line on Center) or at 757-864-2222 (cell phone). Also, notify LaRC Environmental. Perform cleanup as required under [40 CFR 761](#).

All personnel, including supervisors, involved with PCB spill prevention and cleanup shall be trained in accordance with Federal/State regulations [40 CFR 61](#), Subpart G.

No PCB site operations shall be performed if spill materials and qualified personnel defined under the Emergency Spill Plan are not at the site prior to starting any PCB operations.

3.8 FUEL AND OIL MANAGEMENT REQUIREMENTS

3.8.1 Portable/Temporary Fuel Storage Tanks

For projects requiring the use of portable/temporary fuel storage tanks, the Contractor shall ensure that the storage and refilling practices comply with [40 CFR 112](#). It is preferred that fuel storage tanks be of double-walled design. Tanks shall be equipped with a functioning liquid level gauge and with the required normal and emergency vents. If so equipped, the dispenser and dispensing hose shall be in good condition. Drip pans or absorbent pads must be used in fueling areas in the event that there are drips during fueling.

If a double-walled tank is not available, a single-walled tank with a impervious to oil and be constructed so that any discharge will not

the rainwater be drained. The Contractor must keep a log of the draining events that shall have the date, time, a written confirmation of the visual inspection that the water was free from oil including oil sheen, the inspector's name, the inspector's signature, and the confirmation that the drain was closed after draining.

3.8.2 Fuel and Oil Containing Equipment/Tanks (Non PCB)

For projects involving removal and disposal of fuel or oil containing equipment/tanks, the Contractor shall ensure that the equipment is completely drained prior to removal/disposal. The Contractor shall notify LaRC Environmental prior to draining equipment/tanks to ensure proper accumulation containers are used and to verify if the fuel/oil requires any testing. Removed fluids shall be managed in accordance with

Oil containing less than 50 ppm PCB is considered non-PCB and is excluded from federal regulation with the exception of disposal requirements. Oil containing between 2-50 ppm shall be marketed to incinerators or burners defined in 40 CFR 761 or an EPA approved chemical treatment facility. The Contractor shall submit a [shipping document](#) to LaRC Environmental for signature prior to removing the oil from the center.

3.8.3 Oily Debris

Any oily debris generated at the project site shall be accumulated at locations convenient to generation sites and stored in containers labeled as "Non-Hazardous Waste" and the identity of the substance. The Contractor shall be responsible for coordinating accumulation and disposal of oily debris with LaRC Environmental.

3.9 CONSTRUCTION AND DEMOLITION DEBRIS REQUIREMENTS

Construction and demolition debris is any solid waste generated from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure including buildings, utilities, roadways, parking lots, sidewalks and other general infrastructure. Examples include: brick, concrete, and other masonry materials, stone, glass, wall coverings, drywall, framing and finishing lumber/metals, roofing materials, plumbing fixtures (toilets, sinks, water heaters, pipes, heating equipment, furnaces, duct work), electrical wiring and components containing no hazardous fluids or refrigerants, non-asbestos insulation, and wall-to-wall carpeting. Prior to land filling, the Contractor shall be responsible for composite building debris sampling. The Contractor shall ensure that the samples are representative of the building debris. One sample per building shall be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) Metals, using EPA protocol 1311.

3.9.1 Debris/Recycling Management

Prior to project start-up, the Contractor shall submit a WMP that includes identified recyclable materials to LaRC Environmental in accordance with applicable Waste Management Plan requirements sections 3.5.1.1 or 3.5.1.2. The Contractor shall separate recyclable and salvageable materials from non-recyclable materials at the project site. The Contractor shall store, protect, and recycle to the maximum extent possible, but at a minimum, 50 percent of construction and demolition debris generated at the project site. The Contractor shall provide the necessary containers, bins and storage areas to facilitate effective segregation and identification of all waste materials. Recyclable materials shall be handled to prevent

contamination of materials from incompatible products and materials.

3.9.2 Reporting Requirements

The Contractor shall be responsible for tracking the disposition of construction and demolition debris. Tracking shall include total weight of all materials disposed in a landfill and the weight of materials diverted from a landfill. Diversion includes, but is not limited to: incinerated for energy recovery, recycled, composted or reused. Potential materials for recycling and the recycling process shall be identified in the Waste Management Plan provided by the Contractor.

The Contractor shall submit a monthly [construction and demolition debris recycling/diversion report](#) to LaRC Environmental identifying the diversion method and weight of each material within 10 working days after the end of each month. Weight tickets, shipping documents and manifests can be used to confirm diversion/recycling.

3.10 EXCAVATION OPERATIONS

3.10.1 Unexpected Discovery

In the event that excavation activities result in the unexpected discovery of historic artifacts, archaeological resources, petroleum contaminated soil, or hazardous waste, the Contractor shall immediately stop work and notify LaRC Environmental. Work shall not resume until LaRC Environmental provides clearance at the job site.

3.10.2 Soil Management and Disposal

3.10.2.1 Offsite Soil Use

Soil brought in for use shall be managed and sampled in accordance with Section [31 23 00 00 20 EXCAVATION AND FILL](#).

3.10.2.2 Soil Sampling - West Side

The Contractor shall be responsible for sampling excavated soil prior to removal from LaRC property. The soil shall be analyzed for TCLP (metals only), BTEX, TPH (DRO and GRO ranges), TOX and PCB. The Contractor shall be responsible for any additional sampling and analysis that may be required by the disposal facility. The Contractor shall submit [soil analytical results](#) to LaRC Environmental prior to removal from the Center.

Soil sampling done before site work begins is the preferred method as this practice allows the Contractor to remove the soil from the site as it is generated without storing the soil while waiting for sample results.

Testing of soil shall follow Virginia Solid Waste Management Regulations [9 VAC 20-81-660](#).

3.10.2.3 Soil Sampling - East Side

For any excavation work on the East Side (Langley Air Force Base property), the Contractor shall coordinate with and follow the policies and guidance of the LAFB Environmental Office. This section is a summary of the policies and must be verified prior to the project being started. Any soil excavated must be sampled for NASA LaRC parameters from section 3.10.2.1 and for total metals, SVOCs, VOCs, total TCLP. All soil will be

disposed of at an appropriate landfill based on sampling results. No soil will go off-site for re-use, but only to a landfill for disposal.

3.10.2.4 Soil Storage

Upon approval from LaRC Environmental, the Contractor shall be allowed to store soil at the project site or at another approved site pending results of soil analysis or for the purpose of reusing for fill or grading. The Contractor shall secure and control the area to ensure erosion and sediment controls are in place to prevent loose soil from entering the storm sewer. The Contractor shall include the soil storage area inapplicable SWPPP/ESC Plans and perform inspections as required by the Erosion and Sediment Control regulations.

3.10.2.5 Soil Disposal

Soil that reveals levels below the regulatory limits of required tests shall be properly disposed off LaRC property. The Contractor shall not dispose of excess soil on-site unless approved by LaRC Environmental. Soil that is above any regulatory limits shall be disposed at an appropriately permitted landfill and/or an approved treatment facility. The Contractor shall submit the name, address, and permit number of the permitted landfill used for disposal to LaRC Environmental prior to removal of the soil from LaRC. The Contractor shall be responsible for any disposal permits and fees associated with off-site disposal. Disposal of soil shall follow Virginia Solid Waste Management Regulation [9 VAC 20-81-660](#).

3.11 NATURAL RESOURCE MANAGEMENT

3.11.1 General Requirements

The Contractor shall manage and control activities at the project site to minimize interference with and damage to vegetation and wildlife.

The Contractor shall immediately notify the Contracting Officer in the event that it is determined that project activities may adversely impact wildlife (e.g., damage to or removal of nests or other animal dwellings). LaRC Environmental shall be notified of the event.

3.11.2 Tree Protection

The Contractor shall protect trees within their project sites from mechanical or other injury. The Contractor shall install tree protection in accordance with Virginia Erosion and Sediment Control Handbook, [DEQ-VSWCB-013](#). In general, tree protection should be sufficient to eliminate trunk damage, root zone impacts, surface impacts, and limb impacts. Stockpiles or other heavy material storage under the drip line of a tree is prohibited. If tree protection does not extend to the dripline, the Contractor shall be responsible for aeration and fertilization of the tree after construction is complete.

If a tree designated to be protected is damaged or killed during work the Contractor shall coordinate with LaRC Environmental to develop a replacement strategy at the Contractor's expense.

3.11.3 Tree Damage Mitigation

If the roots of a tree are exposed during the course of the work, the

Contractor shall be responsible for ensuring roots are properly cared for to prevent unnecessary drying or damage. Any damaged roots larger than 1 inch in diameter shall be clean cut prior to reburial.

If a tree designated to be protected or not noted for removal on the drawings is damaged or killed during work, the Contractor shall inform and coordinate with LaRC Environmental in developing a replacement strategy at the Contractor's expense in accordance with 3.11.4.

3.11.4 Replacement Tree and Shrub Strategy

For each tree removed, a combination of trees totaling the DBH (diameter at breast height) of the tree removed shall be planted. Location of the replacement and tree/shrub type shall be coordinated with the Contracting Officer and approved by LaRC Environmental. Replacement trees shall be warrantied for a period of one (1) year.

3.11.5 Tree/Vegetation Planting

Prior to installation, the Contractor shall notify the Contracting Officer to allow for inspection of the plant material. To be considered acceptable, plants shall be free of dead or dying branches and branch tips and shall bear foliage of normal density, size, and color. The Contractor shall not install any plant material without notifying the Contracting Officer, obtain a dig permit, and approval by LaRC Environmental.

The Contractor shall ensure that plants are selected and planted in accordance with nursery standards, ANSI/ANLA Z60.1.

Any container-type material, including burlap and wire baskets, is to be completely removed prior to planting. Mulch is to be applied to a depth of 3-4 inches and extending a minimum of 18 inches from the trunk. Mulch shall be pulled 1-2 inches from the trunk. When necessary for stability, trees shall be staked and guyed in at least two directions. Guy wires, with protective tubing, or staking straps may be used.

The Contractor shall guarantee plant material for one year following completion of the project. All plants determined to be dead or in an unacceptable condition during and at the end of the guarantee period shall be replaced by the Contractor at no cost to NASA LaRC. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification. The guarantee of all replacement plants shall extend for an additional period of one year from the date of their acceptance after replacement.

3.11.6 Seeding and Site Stabilization

See Section 32 92 19.00 41 SEEDING for full seeding guidelines.

-- End of Section --



**Appendix D: NASA LaRC's Annual Standards and Specifications for
ESC and SWM; and DEQ Approval Letter**



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219

P.O. Box 1105, Richmond, Virginia 23218

(800) 592-5482

www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director
(804) 698-4000

May 28, 2020

Mr. Peter Van Dyke
Water Program Manager
NASA Langley Research Center
M/S 133
Hampton, VA 23681

Transmitted electronically: peter.vandyke@nasa.gov

Subject: NASA Langley Research Center – Annual Standards and Specifications for Erosion & Sediment Control and Stormwater Management (AS&S for ESC and SWM)

Dear Mr. Van Dyke:

The Virginia Department of Environmental Quality ("DEQ") hereby approves the Annual Standards and Specifications for Erosion & Sediment Control and Stormwater Management for NASA Langley Research Center (NASA LaRC) revision dated "3/20/2020". This coverage is effective from May 28, 2020 to May 27, 2021.

To ensure compliance with approved specifications, the Virginia Erosion and Sediment Control Law and the Virginia Stormwater Management Act, DEQ staff will conduct random site inspections, respond to complaints, and provide on-site technical assistance with specific erosion and sediment control and stormwater management measures and plan implementation.

Please note that your approved Annual Standards and Specifications include the following requirements:

1. Variance, exception, and deviation requests must be submitted separately from this Annual Standards and Specifications submission to DEQ. DEQ may require project-specific plans associated with variance requests to be submitted for review and approval.
2. The following information must be submitted to DEQ for each project at least two weeks in advance of the commencement of regulated land-disturbing activities. Notifications shall be sent by email to: StandardsandSpecs@deq.virginia.gov
 - i: Project name or project number;
 - ii: Project location (including nearest intersection, latitude and longitude, access point);
 - iii: On-site project manager name and contact info;
 - iv: Responsible Land Disturber (RLD) name and contact info;
 - v: Project description;

- vi: Acreage of disturbance for project;
 - vii: Project start and finish date; and
 - viii: Any variances/exceptions/waivers associated with this project.
3. Project tracking of all regulated land disturbing activities (LDA) must be submitted to the DEQ on an annual basis. Project tracking records shall contain the same information as required in the two week e-notifications for each regulated LDA.
 4. Erosion & Sediment Control and Stormwater Management plans must be reviewed by DEQ-Certified Plan Reviewers. NASA LaRC, as the AS&S holder, retains the authority to approve plans and must do so in writing. Should an AS&S holder contract out to a third party to fulfill the Plan Reviewer certification, this certified Plan Reviewer may recommend approval of the plan but final approval must come from the AS&S holder.

To ensure an efficient information exchange and response to inquiries, the DEQ Central Office is your primary point of contact. Central Office staff will coordinate with our Regional Office staff as appropriate.

Please contact Hannah Zegler at 804-698-4206 or hannah.zegler@deq.virginia.gov if you have any questions about this letter.

Thank you very much for your submission and continued efforts to conserve and protect Virginia's precious natural resources.

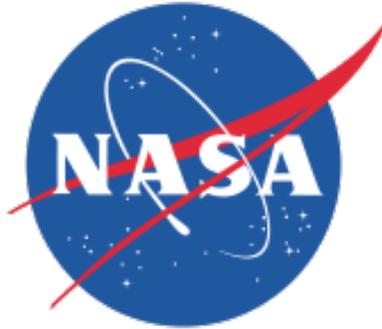
Sincerely,



Erin Ervin Belt, Manager
Office of Stormwater Management

Case Decision Information:

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have thirty days from the date of service (the date you actually received this decision or the date it was mailed to you, whichever occurred first) within which to appeal this decision by filing a notice of appeal in accordance with the Rules of the Supreme Court of Virginia with the Director, Department of Environmental Quality. In the event that this decision is served on you by mail, three days are added to that period.



NASA Langley Research Center

Annual Standards and Specifications:
Erosion and Sediment Control (ESC)

&

Stormwater Management (SWM)

2020

Revision Date 3/20/2020

POC: Peter Van Dyke

(757) 864-7517

peter.vandyke@nasa.gov

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i. Abbreviations and Acronyms

AS&S – Annual Standards and Specifications
BMP - Best Management Practice
Board – State Water Control Board
CATS - Certification Accreditation Tracking System
Center - Langley Research Center
CGP – Construction General Permit (VAR10)
CPAR – Contractor Performance Assessment Reporting System
DEQ - Virginia Department of Environmental Quality
EMS – Environmental Management System
EMO – Environmental Management Office
ESC - Erosion and Sediment Control
LaRC – Langley Research Center
LAPD – Langley Procedural Document
LDA – Land Disturbing Activity
LID – Low Impact Development
LPR – Langley Procedural Requirements
MS4 - Municipal Small Storm Sewer System
NASA - National Aeronautics and Space Administration
NPD – NASA Policy Directive
NPR – NASA Procedural Requirements
SPCC - Spill Prevention Control and Countermeasure
SWM - Stormwater Management
SWPPP - Storm Water Pollution Protection Plan
TMDL – Total Maximum Daily Load
TRO – Tidewater Regional Office (DEQ)
VESCL&R - Virginia Erosion and Sediment Control Law and Regulations
VRRM - Virginia Runoff Reduction Method
VSMP - Virginia Stormwater Management Program
VPDES –Virginia Pollutant Discharge Elimination System
WLA – Waste Load Allocation

1.0 Introduction

The *NASA LaRC Annual Standards and Specifications for ESC and SWM* submittal has been developed to provide detailed information regarding LaRC's compliance with all regulatory requirements. NASA Langley Research Center (LaRC) has incorporated Annual Standards and Specifications for Erosion and Sediment Control (ESC) and Stormwater Management (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 the 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).

NASA LaRC Annual Standards and Specifications for ESC and SWM shall be administered by the NASA LaRC Environmental Management Office (EMO) and shall apply to all design, construction, redevelopment and maintenance activities undertaken at LaRC, either by its internal workforce or contracted to external entities, where such activities are regulated by ESC and SWM regulations and EISA Section 438. These Standards and Specifications lay out the process for a successful and compliant project.

NASA LaRC Annual Standards and Specifications for ESC and SWM are submitted to the DEQ for review and approval on an annual basis or administratively continued as necessary. NASA LaRC shall ensure that project specific plans are developed and implemented in accordance with these Annual Standards and Specifications. This submittal constitutes NASA LaRC's commitment to effective stormwater management.

2.0 NASA LaRC ESC and SWM Personnel

NASA EMO shall be the plan approving authority for land disturbing activities (LDA) at LaRC. The following is a breakdown in responsibilities and titles in regard to *NASA LaRC Annual Standards and Specifications for ESC and SWM*. Responsibilities may be combined in terms of staffing resources only if the person(s) responsible for the task(s) is qualified. Certifications shall be in accordance with the *Virginia Erosion and Sediment Control and Stormwater Management Certification Regulations (9VAC25-850)*;

The following roles and responsibilities are designated to ensure compliance with *NASA LaRC Annual Standards and Specifications for ESC and SWM*:

- 2.1 The SWM/ESC Annual Standards and Specifications Program Administrator (Administrator) shall have overall management and coordination responsibilities for the *NASA LaRC Annual Specifications for ESC and SWM*. This person shall reside within NASA EMO. This person shall be at a minimum a DEQ Dual-Certified Program Administrator.
- 2.2 The SWM/ESC Plan Reviewer (Reviewer) shall be responsible for reviewing plans to ensure compliance with the *NASA LaRC Annual Standards and Specifications for ESC and SWM* and applicable SW/ESC laws and regulations. The Reviewer shall be responsible to review and approve ESC Plans, SWM Plans, P2 Plans, and SWPPPs. This person shall reside within NASA EMO. This person shall be at a minimum a DEQ Dual-Certified Plan Reviewer.
- 2.3 The SWM/ESC Inspector (Inspector) shall have the responsibility for inspecting erosion and sediment control practices to evaluate compliance with the approved Plans and associated laws, regulations, and the *NASA LaRC Annual Standards and Specifications for ESC and SWM*. The Inspector shall be responsible to inspect erosion and sediment control measures to ensure proper installation in accordance with the permitted plan and record the state and effectiveness of such measures in an effort to maximize site erosion and sediment control. They shall also be responsible to inspect the construction and effectiveness of permanent stormwater management controls, verify that all required documents are available on-site for view/review, including but not limited to, land disturbance permit, permitted plans, inspections log, VSMP permits, SWPPP, etc. This person shall reside within NASA EMO. This person shall be at a minimum a DEQ Dual-Certified Inspector.
- 2.4 Personnel certified as a Dual Combined Administrator for ESC and SWM may serve any of the Administrator, Inspector and Plan Reviewer roles for ESC and SWM at NASA LaRC.
- 2.5 The following personnel are currently designated to ensure and verify compliance with ESC and SWM regulations at NASA LaRC:

Dual Combined Administrator(s) Staff:

Peter Van Dyke, Certification #DCA0184 (Expires 4/17/2021)

(757) 864-7517

Peter.vandyke@nasa.gov

Dual Inspector(s) Staff:

Alexandra Salcedo-Bauza, Certification #DIN1117 (Expires 3/22/2022)

(757) 864- 7243

alexandra.salcedo-bauza@nasa.gov

Jazmin Argarin, Certification #DIN0965 (Expires 8/11/2021)
(757) 864-7031
jazmin.m.argarin@nasa.gov

ESC Combined Administrator Staff

Alexandra Salcedo-Bauza, Certification #ESCA0389 (Expires 11/12/2022)
(757) 864- 7243
alexandra.salcedo-bauza@nasa.gov

3.0 LDA Project Requirements and Technical Criteria

3.1 *NASA LaRC Annual Standards and Specifications for ESC and SWM* are composed of general specifications. The following regulations and guidance documents, as amended, have been incorporated by reference into *NASA LaRC Annual Standards and Specifications for ESC and SWM*. All parts of these incorporated regulations apply to LDAs at LaRC.

- Virginia Erosion and Sediment Control Regulations (9 VAC 25-840);
- Virginia Stormwater Management Program Regulations (9 VAC 25-870);
- Virginia Erosion and Sediment Control and Stormwater Management Certification Regulations (9 VAC 25-850);
- Powers and Duties of the State Water Control Board Code of Virginia (§62.1-44.15)
- Virginia Stormwater Management Handbook, 1999, as amended;
- Virginia Erosion and Sediment Control Handbook, 3rd Edition, as amended;
- Technical Bulletins, as amended, on DEQ’s website;
- 40 CFR 450.21;
- Langley Procedural Requirements 8500.1;
- LaRC Master SPEC Section 01 35 40.00 41; and
- Facilities Engineering Standards, Environmental and Energy - LaRC-FES-ENVENE

Compliance with all of the regulations and documents listed above is required.

3.2 In addition to the *NASA LaRC Annual Standards and Specifications for ESC and SWM*, projects shall comply with NASA LaRC Environmental Master Specification Section 01 35 40.00 41 and LaRC-Facility Engineering Standards-Environmental & Energy (LaRC-FES-ENVENE). These documents are incorporated by reference into *NASA LaRC Annual Standards and Specifications for ESC and SWM*. In combination, these documents guide NASA on proper ESC and SWM program implementation. NASA LaRC-FES-ENVENE primarily applies to project design. NASA Section 01 35 40.00 41 primarily applies to construction

3.3 “Land disturbance” or “land-disturbing activity” is defined in Section 14.0. All LDAs on LaRC property shall operate in accordance with the *NASA LaRC Annual Standards and Specifications for ESC & SWM* as applicable. Typical land disturbing projects that will operate under the AS&S include construction, demolition, and large renovation actions. However, only LDAs disturbing more than one acre of land are required to obtain VA DEQ *General VPDES Permit for Discharges of Stormwater from Construction Activities* (CGP/VAR10) coverage from DEQ.

3.4 For LDAs 1 acre or greater, designs shall comply with *VSMP Regulations Part II B – Technical Criteria for Regulated Land-Disturbing Activities* (9 VAC 25-870-62 through 9 VAC 25-870-92).

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- 3.5 For LDAs of at least 10,000 square feet or when deemed necessary by the Administrator (to a minimum of 2,500 square feet), a site specific Erosion and Sediment Control (ESC) Plan that is compliant with the *Virginia Erosion and Sediment Control Regulations* (9 VAC25-840) shall be prepared. This plan must be approved by NASA EMO prior to any land disturbing work commencing or application for CGP coverage (for LDAs over 1 acre). More specific details on ESC plan requirements can be found in Section 4.1.
- 3.6 For LDAs of at least 1 acre or when deemed necessary by the Administrator (to a minimum of 2,500 square feet), a site specific Stormwater Management (SWM) Plan that is compliant with the *Virginia Stormwater Management Program (VSMP) Regulations* (9 VAC25-870) shall be prepared. This plan must be approved by NASA EMO prior to any land disturbing work commencing or application for CGP coverage (for LDAs over 1 acre). Specific details on SWM plan requirements can be found in Section 4.2 and in the NASA Environmental Design Standards.
- 3.7 For LDAs 1 acre or greater, coverage under CGP/VAR10 is required. It is the responsibility of the Contractor to apply for the CGP coverage. The Permit will be issued in the selected contractor's name as the construction operator and they responsible for all permit fees.

The CGP requires the construction site operator to develop and implement a site specific Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must be prepared and approved by NASA prior to submitting a registration statement for permit coverage to DEQ. The SWPPP is to be retained at the construction site along with a copy of the permit and permit coverage letter. The operator has the lead in developing, implementing and maintaining the SWPPP and committing the resources necessary to prevent pollution.

- 3.8 Construction operators (contractor/operator listed on the CGP) conducting ESC and SWPPP inspections must meet the following conditions:
- SWPPP inspections shall be conducted by “qualified personnel”, as required by 9VAC25-870. “Qualified personnel means a person knowledgeable in the principles and practices of erosion and sediment and stormwater management controls who possesses the skills to assess conditions at the construction site for the operator that could impact stormwater quality and quantity and to assess the effectiveness of any sediment and erosion control measures or stormwater management facilities selected to control the quality and quantity of stormwater discharges from the construction activity. The name, phone number, and qualifications of the qualified personnel conducting inspections shall be provided to NASA in the SWPPP submittal.
 - ESC inspections shall be conducted by a certified Responsible Land Disturber (RLD). Prior to engaging in a LDA, the Operator must provide NASA the name of the individual holding a valid RLD Certificate who will be responsible for the land disturbance. This information and a copy of the RLD certificate is also required in the SWPPP submittal.
- 3.9 Only projects located on NASA LaRC property will be covered under the *NASA LaRC Annual Standards and Specifications for ESC and SWM*. NASA LaRC has designated areas on Center for contractor laydown areas and other support activities, and these areas are identified and designated during the project planning process. The contractor would be required to manage these areas in accordance with this Program and 9VAC25-880-30.C (for SWM) and 9VAC25-840-80D (for ESC). Generally, a project cannot use an off-site support area outside of the federal property boundary. Should a project need to utilize an off-property, off-site support area due to a unique requirement, that area shall be approved by the Administrator, any locality program, and be in compliance with 9VAC25-880-30.C (for SWM) and 9VAC25-840-80D (for ESC).

4.0 ESC Plan, SWM Plan, P2 Plan and SWPPP Requirements

The following provides information and requirements on Plan submittals required for compliance with ESC and SWM requirements and regulations.

4.1 Erosion and Sediment Control Plan

4.1.1 An ESC plan consistent with the requirements of the Virginia Erosion and Sediment Control Law and regulations must be designed and implemented during construction activities. The ESC plan must clearly show compliance with the state's 19 minimum standards listed in 9 VAC 25-840-40. The ESC must also provide information on the Operator's RLD. Prior to land disturbance, this plan must be approved by NASA EMO. Please see Section 5.0 for details on the Plan review and approval process.

4.1.2 ESC practices selected for use shall be designed and installed in accordance with the Virginia Erosion and Sediment Control Handbook, 3rd Edition (as amended). Additionally, ESC Technical Bulletin #4 shall be utilized for nutrient management and rates for application. The ESC Plan shall include information describing the maintenance responsibilities of the contractor required for compliance.

4.1.3 An ESC Plan shall adequately cover the following:

- Control of the volume and velocity of stormwater runoff within the site to minimize soil erosion;
- Control of the stormwater discharges, including peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion;
- Minimizes the amount of soil exposed during the construction activity;
- Minimizes the disturbance of steep slopes;
- Minimizes sediment discharges from the site in a manner that addresses (i) the amount, frequency, intensity, and duration of precipitation; (ii) the nature of resulting stormwater runoff; and (iii) soil characteristics, including the range of soil particle sizes present on the site;
- Provides and maintains natural buffers around surface waters, directs stormwater to vegetated areas to increase sediment removal, and maximizes stormwater infiltration, unless infeasible;
- Minimizes soil compaction and, unless infeasible, preserves topsoil;
- Ensures that stabilization of disturbed areas will be initiated immediately whenever any clearing, grading, excavating, or other land-disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 days; and
- Utilizes outlet structures that withdraw stormwater from the surface (i.e., above the permanent pool or wet storage water surface elevation), unless infeasible, when discharging from sediment basins or sediment traps.

4.2 Stormwater Management Plan

4.2.1 A stormwater management plan consistent with the requirements of the Virginia Stormwater Management Act and regulations, in particular *Part II B – Technical Criteria for Regulated Land-Disturbing Activities* (9 VAC 25-870-62 through 9 VAC 25-870-92), must be designed prior to

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construction and implemented during construction. Prior to land disturbance, this Plan must be approved by NASA EMO. Please see Section 5.0 for details on the Plan review and approval process.

A complete SWM Plan shall include the following elements:

- Information on the type of and location of stormwater discharges, information on the features to which stormwater is being discharged including surface waters or karst features if present, and pre-development and post-development drainage areas;
 - Contact information including the name, address, telephone number, and email address of the owner;
 - A narrative that includes a description of current site conditions and final site conditions;
 - A description of the proposed stormwater management facilities and the mechanism through which the facilities will be operated and maintained after construction;
 - Information on the proposed stormwater management facilities, including the type of facilities; location including geographic coordinates; acres treated; and the surface waters into which the facility will discharge;
 - Hydrologic and hydraulic computations, including runoff characteristics;
 - Documentation and calculations verifying compliance with the water quality and quantity requirements (Part II B of the regulations) of these regulations;
 - A map or maps of the site that depicts the topography of the site and includes: (a) All contributing drainage areas; (b) Existing streams, ponds, culverts, ditches, wetlands, other water bodies, and floodplains, (c) Soil types, geologic formations if karst features are present in the area, forest cover, and other vegetative areas; (d) Current land use including existing structures, roads, and locations of known utilities and easements; (e) Sufficient information on adjoining parcels to assess the impacts of stormwater from the site on these parcels; (f) The limits of clearing and grading, and the proposed drainage patterns on the site; (g) Proposed buildings, roads, parking areas, utilities, and stormwater management facilities; and (h) Proposed land use with tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, roads, and easements.
 - Maps will enclose proposed conserved open space with metes and bounds
 - Label any conserved open space as “Runoff Reduction Compliance Forest/Open Space,” with the following note: “The Runoff Reduction Compliance Forest/Open Space area shown here shall be maintained in a forest/open space manner until such time that an amended stormwater management plan is approved”
 - Maps must clearly depict the different type of land cover for site & label sub-areas with the correct acreage.
 - A table listing each land cover type and acreage
 - If an operator intends to meet the requirements established in [9 VAC25-870-63](#) or [9 VAC25-870-66](#) through the use of off-site compliance options, where applicable, then a letter of availability from the off-site provider must be included.
- 4.2.2 Compliance with the water quality design criteria set in 9 VAC 25-870-63 shall be determined by utilizing the Virginia Runoff Reduction Method (VRRM). The BMPs approved in 9 VAC 25-870-65 and listed in the Virginia Stormwater BMP Clearinghouse Website are approved for use as ways to reduce the phosphorus load and runoff volume in accordance with the VRRM.
- 4.2.3 Elements of the SWM Plan that include activities regulated under Chapter 4 (§ [54.1-400](#) et seq.) of Title 54.1 of the Code of Virginia shall be appropriately sealed and signed by a professional

registered in the Commonwealth of Virginia pursuant to Article 1 (§ [54.1-400](#) et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia.

4.3 Pollution Prevention (P2) Plan

- 4.3.1 A P2 Plan that identifies potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges from the construction site and describe control measures that will be used to minimize pollutants in stormwater discharges from the construction site must be developed before land disturbance. This Plan shall be included in the larger SWPPP submittal.
- 4.3.2 At a minimum, the P2 Plan must be designed, installed, implemented, and maintained to: (1) Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge; (2) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater; and (3) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.
- 4.3.3 The P2 plan shall include effective best management practices to prohibit the following discharges in accordance with 40 CFR 450.21(e): (1) Wastewater from washout of concrete, unless managed by an appropriate control; (2) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials; (3) Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and (4) Soaps or solvents used in vehicle and equipment washing.
- 4.3.4 Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls. LPR 8500.1 and Master SPEC Section 01 35 40.00 provide additional detail on prohibited illicit discharges.

4.4 Stormwater Pollution Prevention Plan (SWPPP) Requirements

- 4.4.1 All SWPPPs shall be compliant with 9 VAC 25-870-54 and 9 VAC 25-880-70 (as applicable). A SWPPP shall include, but not be limited to, an approved ESC plan, an approved SWM plan, a P2 plan for regulated land-disturbing activities, and a description of any additional control measures necessary to address a TMDL.
- 4.4.2 The SWPPP requirements may be fulfilled by incorporating by reference other plans such as (i) an ESC plan, (ii) an agreement in lieu of a plan as defined in [9 VAC 25-840-10](#), (iii) a SWM plan, (iv) a SPCC plan developed for the site under § 311 of the federal Clean Water Act or (v) BMP programs otherwise required for the facility provided that the incorporated plan meets or exceeds the SWPPP requirements.
- 4.4.3 All plans incorporated by reference into the SWPPP become enforceable by NASA LaRC and DEQ. If a plan incorporated by reference does not contain all of the required elements of the SWPPP of Section II D, the operator must develop the missing elements and include them in the required SWPPP.
- 4.4.4 If a specific Waste Load Allocation (WLA) for a pollutant has been established in an approved TMDL and is assigned to stormwater discharges from a construction activity, additional control

measures must be identified and implemented by the operator so that discharges are consistent with the assumptions and requirements of the WLA.

- 4.4.5 The SWPPP must address the following requirements (if not addressed in the ESC Plan):
- Control stormwater volume and velocity within the site to minimize soil erosion;
 - Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion;
 - Minimize the amount of soil exposed during construction activity;
 - Minimize the disturbance of steep slopes;
 - Minimize sediment discharges from the site;
 - Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible;
 - Minimize soil compaction and, unless infeasible, preserve topsoil;
 - Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site, or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days.
- 4.4.6 The SWPPP shall be amended whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to state waters and that has not been previously addressed in the SWPPP.
- 4.4.7 The SWPPP must be maintained at a central location onsite. If an onsite location is unavailable, notice of the SWPPP's location must be posted near the main entrance at the construction site.

5.0 NASA Administration and Implementation: Project Approval Process

The following section outlines the process for a compliant project at LaRC and the administrative process used by NASA. This section details how LaRC manages a project from cradle to grave in regards to ESC and SWM.

5.1 Langley Form (LF) 416 – Environmental Review

- 5.1.1 Any land disturbing work, regardless of size, must be coordinated through EMO and approved by the Administrator. To initiate this process a Langley Form (LF) 461 shall be submitted to EMO at the earliest planning stages by the project requestor. LF461s are submitted online at: <https://gis-dbweb.larc.nasa.gov/gisprod/htmldb/f?p=122:1:2858958604240::NO>

The LF 461 submittal shall provide a basic scope of work, an estimate of the amount of land disturbance, information on potential changes to drainage, and a preliminary site work location map. NASA EMO will provide feedback and guidance on the applicability of the *NASA LaRC Annual Standards and Specifications for SWM and ESC* and other regulations. Guidance will be given on the applicability of Plans, CGP coverage, and project expectations.

5.2 Project Planning and Design

5.2.1 It is the responsibility of NASA EMO to ensure that appropriate requirements including, but not limited to, the *NASA LaRC Annual Standards and Specifications for SWM and ESC*, Environmental Specification Section 01 35 40.00 41, Virginia Regulations, and NASA Environmental Design Standards are implemented into project requirements and ultimately into contract award packages.

5.2.2 To ensure projects are designed in accordance with the aforementioned requirements, EMO shall participate in the NASA Design Review Process as described in Langley Procedural Document (LAPD) 7000.2. This LAPD specifically outlines NASA's various preconstruction design reviews and the entire design process. EMO shall participate and provide ESC and SWM guidance during the following design reviews:

- Functional Requirements Document Development
- Project Requirements Review (PRR)
- Conceptual Design Reviews (CoDR)
- Preliminary Design Reviews (PDR)
- Critical Design Reviews (DCR)
- Design Charrettes
- 35%, 90%, and 100% Design Table Tops
- Integrated Systems Review (ISR)
- Operational Readiness Review (ORR)

5.3 Preconstruction Project Submittals

5.3.1 All required submittals shall be submitted to the Contracting Officer for NASA EMO review and approval prior to any LDAs. Submittals timeframes are project specific. Below are the typical required submittals expected to be completed for each project; however, exact composition of submittals is project specific and guidance will be given during the LF 461 process and built into the project bid package.

- LF 461 Submittal
- ESC Plan
- SWM Plan
- P2 Plan
- SWPPP
- Stamped/Signed (by a licensed Professional) Civil Plans and Profiles
- Copy of Completed VSMP Permit Application and check
- Vicinity Map
- Construction Schematics
- Dig Permit
- Virginia Runoff Reduction Method (VRRM) Analysis
- CGP Registration Statement

Prior to commencement of a LDA, the project must have received approval for all applicable plan(s) from NASA EMO's certified staff.

5.4 Plan Reviews

- 5.4.1 Plan reviews shall be conducted by qualified personnel as detailed in Section 2.1. Plan reviews shall ensure compliance with the *NASA LaRC Annual Specifications for ESC and SWM* and all applicable regulations. Plan reviewers shall use the *ESC and SWM Plan Review Checklists* provided in the Appendix A and B respectively. The Plan Reviewer shall have 15 days to review a submittal and provide written comments.
- 5.4.2 Accepted Plans: Should a Plan be accepted and approved by NASA, approval will be granted in writing by the AS&S DEQ-Certified Program Administrator. Please see Appendix C for a template plan approval letter. Once this letter has been received by the contractor via mail, hand delivery or electronically, the contractor may proceed with obtaining CGP coverage from DEQ (for projects 1 acre or greater) or otherwise begin implementing Plans.

Upon approval, the contractor shall submit (2) unmarked Plan sets. Electronic versions are acceptable. These plan sets are allocated as follows: (1) for NASA EMO records and (2) for the Project Inspector. Additional copies may be requested as needed. The Operator's copy (contractor) is considered the primary and active living document (especially for ESC Plans and SWPPPs) that should be updated throughout the project as needed.

- 5.4.3 Rejected Plans: Should a Plan be rejected for rework, the Plan Reviewer shall state in writing the reason(s) for disapproval of a Plan and specify the modifications, terms, and conditions necessary for Plan approval. The re-submission should address all of the Plan Reviewer's comments. Once resubmitted to NASA EMO, the Plan Reviewer has an additional 15 days to provide approval or additional comments. LDAs may not occur during this time. This process continues until all Plans obtain the necessary approvals.

5.5 CGP Coverage and Termination

- 5.5.1 LDAs over 1 acre require DEQ CGP coverage. More information, including access to the DEQ Registration Statement Form, the CGP (VAR10), and the CGP fee schedule, can be found here:

<http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPPermits/ConstructionGeneralPermit.aspx>

The contractor is responsible for submitting a correct Registration Statement and fee to DEQ Central Office for CGP coverage. NASA EMO must review the form(s) prior to submittal. NASA EMO will complete the DEQ AS&S Entity (Appendix I) form that will be sent along with registration statement to certify the project.

- 5.5.3 NASA EMO will notify the DEQ of any changes that may affect information on the CGP Registration Statement or fee form.
- 5.5.4 Terminating coverage under the CGP may be granted for these reasons:
- Necessary permanent control measures included in the SWPPP for the site are in place and functioning effectively and final stabilization has been achieved on all portions of the site for which the operator is responsible. Long-term responsibility for maintenance of SWM facilities is that of NASA LaRC;

- Another operator has assumed control over all areas of the site that have not been finally stabilized and obtained coverage for the ongoing discharge; or
- Coverage under an alternative VPDES or state permit has been obtained.

5.5.5 When terminating CGP coverage due to site completion and Plan completion, the Contractor is responsible for terminating coverage once NASA EMO and Virginia DEQ TRO verify that the site is considered stabilized and any permanent SWM controls are functioning. Completion of the project is defined as the achievement of final stabilization (established vegetative cover), not completion of construction. Established vegetative cover means that it is uniform, mature enough to survive, and will inhibit erosion. Contractors should request an EMO and DEQ TRO (at DEQ's discretion for attendance) site inspection once the site is considered complete. EMO and DEQ TRO will visit the site and either grant permission for CGP termination or specify what work or conditions are needed prior to termination. The notice of termination should be submitted no later than 30 days from NASA EMO approval.

5.5.6 Virginia's CGP expires every 5 years at the state-level. When this occurs, active project sites are responsible for ensuring permit coverage continues under the new state permit. DEQ will provide correspondence directly to the permit holder (contractor) with necessary steps to complete this action. Typically, the contractor is responsible for reapplying for permit coverage by submitting a new registration statement no later than 90 days prior to permit expiration. The registration statement should be reviewed and approved by EMO prior to submittal to DEQ.

5.6 Post-construction Submittals

5.6.1 The CGP termination form shall be submitted to the DEQ. A copy of the Operator's DEQ CGP termination letter shall be submitted to NASA EMO once received. EMO will file the termination letter appropriately into the project file.

5.6.2 A construction record drawing for all permanent stormwater management facilities shall be submitted to the NASA Contracting Officer. The construction record drawing shall be appropriately sealed and signed by a professional registered in the Commonwealth of Virginia, certifying that the stormwater management facilities have been constructed in accordance with the approved SWM Plan. Submittals of stamped construction records drawings to DEQ shall be done by the CGP permit holder only after NASA has approved the submittal. NASA may also submit the construction record drawing package to DEQ if appropriate.

6.0 NASA Administration and Implementation: Inspections

6.1 NASA ESC and SWM Periodic/Oversight Inspections

6.1.1 NASA EMO by means of these Standards and Specifications and as the MS4 Operator, inspects LDAs during construction and post-construction. NASA Inspectors shall be qualified and DEQ-certified personnel. Please refer to Section 2 for more information. The NASA Inspectors ensure:

- Adequate installation of ESC measures and ground stabilization;
- Compliance with the 19 Minimum Standards (9 VAC 25-840-40);
- Implementation and compliance with any approved ESC Plan and SWPPP;
- Implementation and compliance with any approved SWM plan;
- Implementation and compliance with any approved P2 Plan;

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- Development and implementation of any additional control measures necessary to address a TMDL; and
 - Installation and construction of SWM facilities.
- 6.1.2 NASA's DEQ-certified inspectors shall inspect LDAs for compliance with ESC Plans and these Annual Standards and Specifications. These are considered ESC periodic inspections and NASA inspectors shall inspect as follows:
- Provide for an inspection during or immediately following initial installation of erosion and sediment controls,
 - at least once in every two-week period,
 - within 48 hours following any runoff producing storm event, and
 - at the completion of the project prior to the release of any performance bonds.
- 6.1.3 NASA's DEQ-certified inspectors shall inspect LDAs for compliance with SWM Plans and with these Annual Standards and Specifications. These are considered SWM periodic inspections. NASA (i) shall provide for periodic inspections of the installation of stormwater management measures, (ii) may require monitoring and reports from the person responsible for meeting the permit conditions to ensure compliance with the permit and to determine whether the measures required in the permit provide effective stormwater management, and (iii) shall conduct such investigations and perform such other actions as are necessary to carry out the provisions of NASA's AS&S program.
- 6.1.4 The DEQ Certified Inspector(s) are responsible for ensuring that the construction and installation of all structural and non-structural controls are in accordance with the project's ESC and SWM plans and intention. All erosion and sediment control structures and systems are to be inspected. Maintenance and repairs shall be documented and delivered to the appropriate parties to ensure continued performance of their intended function.
- In summary, NASA shall inspect any LDA during construction for:
- Compliance with the approved erosion and sediment control plan;
 - Compliance with the approved stormwater management plan;
 - Development, updating, and implementation of a pollution prevention plan; and
 - Development and implementation of any additional control measures necessary to address a TMDL.
- 6.1.5 For NASA ESC and SWM Inspections, the *ESC and SWM Inspection Report form*, provided in Appendix D, shall be used on each site inspection visit. All measures shown or discussed in the ESC and SWPPP shall be inspected. Additionally, NASA will periodically inspect the installation of any stormwater management measures. A copy of the Inspection Report will be provided to the NASA Project Manager and the Prime Contractor and archived by NASA EMO.
- 6.1.6 Inspection reports conducted by NASA EMO as well as compliance logs and responses may be required to be submitted to the DEQ.
- 6.1.7 Should DEQ (including regional offices) request NASA LaRC to provide weekly e-reporting, reports will include:
- Inspection reports;

- Pictures;
- Complaint logs and complaint responses; and
- Other compliance documents.

6.2 Contractor (“Operator”) CGP Required Inspections

6.2.1 The CGP requires inspections for compliance with the Permit and approved SWPPP to ensure that ESC controls are in place and functioning. Inspections mandated by the CGP are to be performed and recorded by the Permit Operator (“the contractor”).

6.2.2 Permit Operator inspections shall be done in accordance with the CGP and the CGP inspection schedule.

6.2.3 Each inspection report shall include the following items:

- The date and time of the inspection and when applicable, the date and rainfall amount of the last measurable storm event;
- Summarized findings of the inspection;
- The location(s) of prohibited discharges;
- The location(s) of control measures that require maintenance;
- The location(s) of control measures that failed to operate as designed or proved inadequate or inappropriate for a particular location;
- The location(s) where any evidence identified under CGP Part II G 3 a (6) exists;
- The location(s) where any additional control measure is needed that did not exist at the time of inspection;
- A list of corrective actions required (including any changes to the SWPPP that are necessary) as a result of the inspection or to maintain permit compliance;
- Documentation of any corrective actions required from a previous inspection that have not been implemented; and

The date and signature of the qualified personnel and the operator or its duly authorized representative.

6.2.5 For sites with CGP coverage, specific Contractor inspections requirements can be found in the CGP (VAR 10) Part II G.

6.2.6 During SWPPP review and approval, NASA will verify that a quality inspection form and tracking system will be utilized.

7.0 NASA Administration and Implementation: Violations, Corrective Actions, and Enforcement

7.1 Inspections are done in accordance with Section 6.0 of this document. Should an inspector find a violation, the Project Manager, Contracting Officer, and contractor are notified immediately via email and/or phone. Violations will be documented and delivered to the Project Manager and Permit Operator with a copy of the corresponding *ESC and SWM Inspection form* and *Corrective Action Notice*. Any violation reported will include photographs, descriptions, and necessary corrective actions (including timelines for correction).

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The Operator shall implement any corrective action(s) identified as a result of an inspection as soon as practicable but no later than seven days after discovery. A longer corrective action timeframe must be approved by NASA EMO. If approval of a corrective action by NASA EMO is necessary, additional control measures shall be implemented to minimize pollutants in stormwater discharges until such approvals can be obtained.

7.2 Potential ESC and SWM violations include, but are not limited to:

- No CGP coverage for sites over 1 acre;
- No SWPPP; Incomplete SWPPP; and/or SWPPP not available for review;
- No approved ESC plan;
- Failure to install stormwater BMPs or erosion and sediment controls in accordance with approved Plans;
- Stormwater BMPs or erosion and sediment controls improperly installed or maintained;
- Slow contractor response to NASA ESC and SWM findings;
- Operational deficiencies;
- Failure to conduct required inspections;
- Incomplete, improper, or missed inspections and/or records.

7.3 For minor deficiencies with no environmental impacts the contractor may remedy the violation immediately or within 72 hours and avoid a formal *Corrective Action Notice* being issued. However, an inspection report with photos documenting the deficiency will still be issued to the contractor and placed in the project record folder. The contractor shall respond by email within 72 hours with proof of the repair(s) made.

Examples of minor deficiencies include, but are not limited to:

- Inlet protection needing maintenance/cleanout, but the BMP is still functioning;
- Silt fence sagging, but BMP is still functioning;
- CGP Coverage letter not posted at project site.

If the minor deficiency is not remedied in the allotted time, a formal *Corrective Action Notice* will be issued to the Contractor. Under no circumstance should a corrective action take more than 7 days. If rain is expected and a potential discharge may occur, corrective action needs to be taken immediately.

7.4 For deficiencies that have the potential for environmental harm a formal *Corrective Action Notice* will be issued with the corresponding inspection report. Examples of these deficiencies include, but are not limited to:

- Silt fence not installed in accordance with an approved Plan;
- Improper dewatering devices;
- Unprotected inlets or inadequate controls;
- SWPPP paperwork deficiencies;
- Lack of inspection records.

7.5 If a deficiency damaging the environment occurs (ex. illicit discharge of sediment laden water) or minor deficiencies continue to reoccur, then a formal contractual action will be taken through the Contracting Officer. Formal contractual actions (as provided in the FAR) can include, but are not

limited to, cure notices, formal contract non-conformance notices, stop work orders, withholding of payment, negative evaluation reports in formal systems such as Federal Government's Contractor Performance Assessment Reporting System (CPARS) and/or contract termination.

- 7.6 At the discretion of NASA and in coordination with DEQ, the CGP may be suspended and/or revoked; at which time all LDAs must cease until the violation(s) of the plan or permit has ceased, corrective action completed, and any related environmental or property damages abated. Alternatively, NASA also has the option to contract with a 3rd party to install and maintain the ESC and SWM measures in accordance with the approved plan(s), complete any necessary corrective actions, and abate any related damages. Once the site is stabilized to the satisfaction of the NASA EMO, site work may resume.
- 7.7 DEQ has over-sight of the following in relation to SWM:
- Enforcement shall be administered by the Department and the Board where applicable in accordance with provisions of §62.1-44.15:27.F.
 - The Department shall perform random site inspections or inspections in response to a complaint to assure compliance with article §62.1-44.15:31.C, the Erosion and Sediment Control Law, and regulations adopted thereunder.
 - The Department shall assess an administrative charge to cover the costs of services rendered associated with its responsibilities pursuant to §62.1-44.15:31.
- 7.8 The DEQ has over-sight of the following in relation to ESC:
- The Department and the Board, where applicable, shall provide project oversight and enforcement of the VESCP as necessary and comprehensive program compliance review and evaluation. The Department may take enforcement actions in accordance with the provisions of §62.1-44.15:54.E and §62.1-44.15:56.G.
 - The Board shall have the authority to enforce approved specifications and charge fees equal to the lower of (i) \$1,000 or (ii) an amount sufficient to cover the costs associated with standard and specification review and approval, project inspections, and compliance.

8.0 NASA Administration and Implementation: Changes to Approved Plans

- 8.1 NASA EMO may require that an approved plan be changed in the following cases:
- Where inspection has revealed the plan is inadequate to satisfy applicable regulations; or
 - Where the person responsible for carrying out the approved Plan(s) finds that such Plan(s) is no longer effective due to field conditions and/or changes to the overall project scope. In such case, an amended plan must be promptly proposed.
- 8.2 Revisions to an approved ESC and/or SWM plan must be submitted in writing to NASA EMO. Revisions shall not be considered approved until written notice is provided. All revisions must be clearly marked in red. Redlines must be signed off by a DEQ-certified inspector. Revisions must comply with the *NASA LaRC Annual Standards and Specifications for ESC and SWM*. Exceptions may be allowed in the event of an emergency. All changes to the Plans shall be documented on the Plans and recorded in the SWPPP. If such modifications require submittal to the ESC/SWM plan reviewer they will be reviewed and re-approved in 15 business days.

- 8.3 The Contractor is responsible for the performance of the ESC measures. If the designated ESC measures prove to be inadequate, the Contractor is responsible to reassess, design, and submit a plan amendment at no cost to the NASA LaRC.

9.0 NASA Administration and Implementation: Variances and Non-VESCH Control Measures

- 9.1 DEQ Central Office (CO) may waive or modify any of the requirements that are deemed inappropriate or too restrictive for site conditions, by granting a variance. A variance may be granted under these conditions:

- At the time of plan submission, an operator may request a variance. The operator shall explain the reasons for requesting variances to NASA. This request must include a detailed description of the alternative SWM/ESC practice and justification that the practice meets the intent of the state's 19 Minimum Standard for which the variance is sought. NASA will coordinate the request with DEQ CO. Only DEQ CO may approve a variance. Specific variances which are approved by DEQ CO shall be documented in the Plan(s).
- During construction, the person responsible for implementing the approved plan may request a variance in writing from NASA EMO. NASA will coordinate the request with DEQ CO and respond in writing either approving or disapproving such a request. If NASA EMO/DEQ CO does not approve a variance within 10 days of receipt of the request, the request shall be considered disapproved. Following disapproval, the operator may resubmit a variance request with additional documentation.

NASA and DEQ CO shall consider variance requests judiciously, keeping in mind both the need of the applicant to maximize cost effectiveness and the need to protect off-site properties and resources from damage.

- 9.2 Variance requests will be considered freestanding of this AS&S submission and on an individual project-specific basis. The following information shall be included for each variance request:

- Introduction
- Project Description
- Minimum Standards Variance Requests
- Existing Conditions and Adjacent Areas
- Soil Characterization
- Critical and Sensitive Areas (Karst, wetland, etc...)
- Mitigation
 - i. ESC Measures
 - ii. Permanent Stabilization
 - iii. Vegetative Restoration
 - iv. Maintenance
 - v. Critical and Sensitive Areas
- Self-Inspection, Reporting, and DEQ-Certified Personnel

- 9.3 Variances to regulations must ensure off-site properties and resources are protected from damage. Economic hardship is not sufficient reason to request a variance.

- 9.4 All approved variances shall be listed in the General Notes section of the SWM and ESC plans for land disturbing activities and included in the narrative.
- 9.5 NASA LaRC has included as part of the Annual Standards and Specifications for ESC and SWM, certain preapproved ESC measures/controls that are not included in the VESCH. These measures may be included as part of the project construction plans, provided the plans contain a detail sheet, inspection instructions, installation instructions, and maintenance instructions. Non-VESCH control measures approved for use at LaRC.

Geotextile/Dewatering Bags

- Contractors may utilize geotextile bags for dewatering in lieu of dewatering practices illustrated in DS (Std. 3.26 Dewatering Structure). A variety of geotextile dewatering bag products are available on the market. The contractor shall specify which dewatering bag product will be used, and follow specific manufacturer guidelines. Design criteria, specifications, limitations, and maintenance information for a commonly used manufacturer can be found at: <https://acfenvironmental.com/products/perimeter-and-sediment-control/sediment-control/dewatering-bags/>.

GrateGator Drop Inlet Filters or equivalent

- Contractors may utilize GrateGator drop inlet filters or equivalent for storm drain inlet protection only in instances where practices illustrated in IP (Std. 3.07 Storm Drain Inlet Protection) are not appropriate. A variety of filters are available depending on the application; the contractor shall specify which type of filter will be used, and follow specific manufacturer guidelines. Design criteria, specifications, limitations, and maintenance information for a commonly used manufacturer can be found at: <https://acfenvironmental.com/products/inlet-protection/drop-inlets/grate-gator/>

Curb Inlet Filters

- Contractors may utilize non-VESCH curb inlet filters for curb inlet protection only in instances where practices illustrated in IP (Std. 3.07 Storm Drain Inlet Protection) are not appropriate. A variety of curb inlet products are available on the market; the contractor shall specify which type of filter will be used, and follow specific manufacturer guidelines. Design criteria, specifications, limitations, and maintenance information for a commonly used manufacturer can be found at: <https://acfenvironmental.com/product/type/inlet-protection/curb-inlets/>

ESC measures/controls not specifically included as part of the approved ESC Plan shall not be used on the project unless the ESC Plan is amended to include the specific ESC measure/control. Non-VESCH control measures and best management practices (BMP) have been included in the Annual Standards and Specifications but their use may be further reviewed and approved by DEQ on a project specific basis. Should non-VESCH control measures fail to effectively control soil erosion, sediment deposition, and non-agricultural runoff, then VESCH control measures shall be utilized.

10.0 Long-term Management of Stormwater Management Control Devices

This section discusses NASA's provisions for the long-term responsibility and maintenance of SWM control devices and other facilities specified to manage the quantity and quality of runoff, including an inspection and maintenance schedule ensure the long-term success of SWM facilities.

- 10.1 The following post-construction BMP information shall be printed on the SWM plan:
- a. A description of recommended maintenance
 - b. A recommended maintenance schedule
- 10.2 Post-construction BMP maintenance information shall be in accordance with and follow the most stringent of the Virginia BMP clearinghouse, the Virginia SWM handbook, manufacturer's specification and/or the NASA LaRC MS4 permit. The Virginia Stormwater BMP Clearinghouse can be accessed at <http://www.vwrrc.vt.edu/swc/>.
- 10.3 Post-construction inspections shall be made in accordance with the manufacturer's and/or engineer's recommendation, the provisions of these Standards and Specifications, in accordance with the approved SWM Plan, and in accordance with NASA's MS4 Program Plan.

At a minimum, NASA EMO shall inspect all SWM facilities at least annually. This is in accordance with requirements of NASA LaRC's MS4 permit. Long-term maintenance of all SWM facilities in the responsibility of NASA.

- 10.4 Inspections shall include a Plan review prior to site visit, a field visit with photographs, and a completed SWM Facility inspection report form. Inspectors will look for proper drainage and erosion issues (such as scouring, rill erosion, etc.).

A copy of the form used for SWM Periodic inspections can be found in Appendix D.
A copy of the SWM Facility post construction inspection report form can be found in Appendix E.

- 10.5 Once inspection has been completed, NASA EMO will compile the report and any issues that need attention. The inspection report and a summary of the issues will be forwarded to the appropriate entity (such as COD, Grounds Maintenance, Facility Coordinator, etc.) for corrective action(s). For significant corrections (non-routine), NASA EMO may have to advocate for funding to address the issue properly. Documentation on all corrective actions will be kept on file with NASA EMO.

11.0 Land Disturbing Activities and Project Tracking/Records

- 11.1 NASA EMO tracks all regulated (and non-regulated) LDAs. A copy of the historical and active regulated site-tracking log can be found in Appendix G. A "live" version of this log is kept with NASA EMO and updated as needed. A project tracking update will be submitted biannually to DEQ at StandardsandSpecs@deq.virginia.gov. Projects are also tracked in the LF 461 environmental tracking system. Each project has an associated unique LF 461 number and file that is updated and maintained throughout the project.
- 11.2 A formal project tracking update will be submitted annually, on July 1st, to DEQ. This will be submitted electronically to StandardsandSpecs@deq.virginia.gov. Information required to be included within this report shall include:

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1. Project name or project number (any associated CGP permit #)
 2. Project location (including nearest intersection, latitude and longitude, access point)
 3. On-site project manager name and contact info
 4. Responsible Land Disturber (RLD) name and contact info
 5. Project description
 6. Acreage of disturbance for project
 7. Project start and finish date
 8. Any variances/waivers/deviations/exceptions associated with this project.
- 11.3 A list of regulated land-disturbing activities expected to be under contract at NASA has been submitted in Appendix H. The list includes project description, estimated coverage date, estimated disturbed acreage by watershed, and status/notes. Information on specific land-disturbing activities not included on the list will be provided to DEQ no less than two weeks prior to the start of the activity.
- 11.4 NASA EMO will electronically notify the DEQ two weeks prior to initiating a regulated LDA. Information shall be sent to StandardsandSpecs@deq.virginia.gov. The following information will be included in the electronic notification:
- Project name or project number;
 - Project location (including nearest intersection, latitude and longitude, access point);
 - On-site project manager name and contact information;
 - Responsible Land Disturber (RLD) name and contact information;
 - Project description;
 - Acreage of disturbance for project;
 - Project start date and finish date;
 - Any variances/exemptions/wavers associated with the project; and
 - Any associated CGP permit number.
- 11.5 Project records will be kept in accordance with 9 VAC25-870-126.B. Specifically the AS&S holder shall maintain either on site or in AS&S files:
- Project records, including approved stormwater management plans, will be kept for three years after state permit termination or project completion;
 - Stormwater management facility inspection records will be documented and retained for at least five years from the date of inspection;
 - Construction record drawings will be maintained in perpetuity or until a stormwater management facility is removed;
 - All registration statements submitted in accordance with 9VAC25-870-59 will be documented and retained for at least three years from the date of project completion or state permit termination; and
 - A copy of any approved plan and record of inspection for each land disturbing activity.

12.0 Annual Standards and Specifications Review and Evaluation

- 12.1 NASA shall submit an updated version of the *Standards and Specifications for ESC and SWM* to DEQ annually or request the program to be administratively continued. The timeframe for this submittal will be coordinated with DEQ Richmond on an annual basis.

12.2 DEQ shall review/comment/disapprove/approve *NASA's Annual Standards and Specifications for ESC and SWM*. DEQ's comments shall be binding to NASA and any contractor working at NASA.

13.0 Certification Statement

I certify under penalty of law that all documents and all attachments related to the submission and updating of the NASA Langley Research Center's Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management have been prepared under my direction or supervision in 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 a fine and imprisonment for knowing violations.

Name (printed): Peter Van Dyke

Signature:

14.0 Definitions

"Best management practice" or "BMP" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices, including both structural and nonstructural practices, to prevent or reduce the pollution of surface waters and groundwater systems.

"Board" means the State Water Control Board.

"Certified combined administrator for ESC" means a LaRC employee who holds a certificate of competence from the Board in the combined ESC classifications of program administrator, plan reviewer, and project inspector in the area of ESC.

"Certified combined administrator for SWM" means a LaRC employee who holds a certificate of competence from the board in the combined classifications of program administrator, plan reviewer, and project inspector in the area of SWM.

"Classification" means the four specific certificate of competence classifications within the areas of ESC or SWM that make up activities being performed (program administrator, plan reviewer, project inspector, and combined administrator).

"Clean Water Act" or "CWA" means the federal Clean Water Act (33 USC § 1251 et seq.), formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972, Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, and Public Law 97-117, or any subsequent revisions thereto.

"Combined administrator for ESC" means anyone who is responsible for performing the combined duties of a program administrator, plan reviewer and project inspector to fulfill AS&S certification requirements.

"Combined administrator for SWM" means anyone who is responsible for performing the combined duties of a program administrator, plan reviewer and project inspector to fulfill AS&S certification requirements.

"Construction activity" means any clearing, grading or excavation associated with large construction activity or associated with small construction activity.

"Discharge," when used without qualification, means the discharge of a pollutant.

"Discharge of a pollutant" means:

1. Any addition of any pollutant or combination of pollutants to state waters from any point source; or
2. Any addition of any pollutant or combination of pollutants to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation.

This definition includes additions of pollutants into surface waters from: surface runoff that is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a state, municipality, or other person that do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. This term does not include an addition of pollutants by any indirect discharger.

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"Erosion and Sediment Control Plan" or "plan" means a document containing material for the conservation of soil and water resources of a unit or group of units of land. It may include appropriate maps, an appropriate soil and water plan inventory and management information with needed interpretations, and a record of decisions contributing to conservation treatment. The plan shall contain all major conservation decisions and all information deemed necessary by the plan-approving authority to assure that the entire unit or units of land will be so treated to achieve the conservation objectives.

"Land disturbance" or "land-disturbing activity" means a manmade change to the land surface that potentially changes its runoff characteristics including clearing, grading, or excavation, except that the term shall not include those exemptions specified in § [62.1-44.15:34](#) of the Code of Virginia; and

"Land-disturbing activity" means any man-made change to the land surface that may result in soil erosion from water or wind and the movement of sediments into state waters or onto lands in the Commonwealth, including, but not limited to, clearing, grading, excavating, transporting, and filling of land, except that the term shall not include:

1. Minor land-disturbing activities such as home gardens and individual home landscaping, repairs, and maintenance work;
2. Individual service connections;
3. Installation, maintenance, or repair of any underground public utility lines when such activity occurs on an existing hard surfaced road, street, or sidewalk, provided the land-disturbing activity is confined to the area of the road, street, or sidewalk that is hard surfaced;
4. Septic tank lines or drainage fields unless included in an overall plan for land-disturbing activity relating to construction of the building to be served by the septic tank system;
5. Permitted surface or deep mining operations and projects, or oil and gas operations and projects conducted pursuant to Title 45.1;
6. Tilling, planting, or harvesting of agricultural, horticultural, or forest crops, livestock feedlot operations, or as additionally set forth by the Board in regulation, including engineering operations as follows: construction of terraces, terrace outlets, check dams, desilting basins, dikes, ponds, ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation; however, this exception shall not apply to harvesting of forest crops unless the area on which harvesting occurs is reforested artificially or naturally in accordance with the provisions of Chapter 11 (§ 10.1-1100 et seq.) of Title 10.1 or is converted to bona fide agricultural or improved pasture use as described in subsection B of § 10.1-1163;
7. Repair or rebuilding of the tracks, rights-of-way, bridges, communication facilities, and other related structures and facilities of a railroad company;
8. Agricultural engineering operations, including but not limited to the construction of terraces, terrace outlets, check dams, desilting basins, dikes, ponds not required to comply with the provisions of the Dam Safety Act (§ 10.1-604 et seq.), ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation;
9. Disturbed land areas of less than 10,000 square feet in size or 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations; however, the governing body of the program authority may reduce this exception to a smaller area of disturbed land or qualify the conditions under which this exception shall apply;
10. Installation of fence and sign posts or telephone and electric poles and other kinds of posts or poles;
11. Shoreline erosion control projects on tidal waters when all of the land-disturbing activities are within the regulatory authority of and approved by local wetlands boards, the Marine Resources Commission, or the United States Army Corps of Engineers; however, any associated land that is disturbed outside of this exempted area shall remain subject to this article and the regulations adopted pursuant thereto; and
12. Emergency work to protect life, limb, or property, and emergency repairs; however, if the land-disturbing activity would have required an approved erosion and sediment control plan, if the activity were not an emergency, then the land area disturbed shall be shaped and stabilized in accordance with the requirements of the VESCP authority.

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"Linear development project" means a land-disturbing activity that is linear in nature such as, but not limited to, (i) the construction of electric and telephone utility lines, and natural gas pipelines; (ii) construction of tracks, rights-of-way, bridges, communication facilities and other related structures of a railroad company; (iii) highway construction projects; (iv) construction of stormwater channels and stream restoration activities; and (v) water and sewer lines. Private subdivision roads or streets shall not be considered linear development projects.

"Maximum extent practicable" or "MEP" means the technology-based discharge standard for municipal separate storm sewer systems established by CWA § 402(p). MEP is achieved, in part, by selecting and implementing effective structural and nonstructural best management practices (BMPs) and rejecting ineffective BMPs and replacing them with effective best management practices (BMPs). MEP is an iterative standard, which evolves over time as urban runoff management knowledge increases. As such, the operator's MS4 program must continually be assessed and modified to incorporate improved programs, control measures, BMPs, etc., to attain compliance with water quality standards.

"Municipal separate storm sewer system" or "MS4" means all separate storm sewers that are defined as "large" or "medium" or "small" municipal separate storm sewer systems or designated under [9VAC25-870-380 A 1](#).

"Municipal Separate Storm Sewer System Management Program" or "MS4 Program" means a management program covering the duration of a state permit for a municipal separate storm sewer system that includes a comprehensive planning process that involves public participation and intergovernmental coordination, to reduce the discharge of pollutants to the maximum extent practicable, to protect water quality, and to satisfy the appropriate water quality requirements of the CWA and regulations and the Act and attendant regulations, using management practices, control techniques, and system, design and engineering methods, and such other provisions that are appropriate.

"Operator" means the owner or operator of any facility or activity subject to the Act and this chapter. In the context of stormwater associated with a large or small construction activity, operator means any person associated with a construction project that meets either of the following two criteria: (i) the person has direct operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications or (ii) the person has day-to-day operational control of those activities at a project that are necessary to ensure compliance with a stormwater pollution prevention plan for the site or other state permit or VSMP authority permit conditions (i.e., they are authorized to direct workers at a site to carry out activities required by the stormwater pollution prevention plan or comply with other permit conditions).

"Outfall" means, when used in reference to municipal separate storm sewers, a point source at the point where a municipal separate storm sewer discharges to surface waters and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other surface waters and are used to convey surface waters.

"Postdevelopment" refers to conditions that reasonably may be expected or anticipated to exist after completion of the land development activity on a specific site.

"Predevelopment" refers to the conditions that exist at the time that plans for the land development of a tract of land are submitted to the VSMP authority. Where phased development or plan approval occurs (preliminary grading, demolition of existing structures, roads and utilities, etc.), the existing conditions at the time prior to the first item being submitted shall establish predevelopment conditions.

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"Prior developed lands" means land that has been previously utilized for residential, commercial, industrial, institutional, recreation, transportation or utility facilities or structures, and that will have the impervious areas associated with those uses altered during a land-disturbing activity.

"Runoff coefficient" means the fraction of total rainfall that will appear at a conveyance as runoff.

"Runoff" or "stormwater runoff" means that portion of precipitation that is discharged across the land surface or through conveyances to one or more waterways.

"Runoff characteristics" includes maximum velocity, peak flow rate, volume, and flow duration.

"Runoff volume" means the volume of water that runs off the site from a prescribed design storm.

"Site" means the land or water area where any facility or land-disturbing activity is physically located or conducted, including adjacent land used or preserved in connection with the facility or land-disturbing activity. Areas channelward of mean low water in tidal Virginia shall not be considered part of a site.

"Site hydrology" means the movement of water on, across, through and off the site as determined by parameters including, but not limited to, soil types, soil permeability, vegetative cover, seasonal water tables, slopes, land cover, and impervious cover.

"Stormwater management facility" means a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

"Stormwater management plan" means a document(s) containing material for describing methods for complying with the requirements of the VSMP or this chapter.

"Stormwater Pollution Prevention Plan" or "SWPPP" means a document that is prepared in accordance with good engineering practices and that identifies potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges. A SWPPP required under a VSMP for construction activities shall identify and require the implementation of control measures, and shall include, but not be limited to the inclusion of, or the incorporation by reference of an approved erosion and sediment control plan, an approved stormwater management plan, and a pollution prevention plan.

"Surface waters" means:

1. All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;
2. All interstate waters, including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters: (a) That are or could be used by interstate or foreign travelers for recreational or other purposes; (b) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (c) That are used or could be used for industrial purposes by industries in interstate commerce.
4. All impoundments of waters otherwise defined as surface waters under this definition;
5. Tributaries of waters identified in subdivisions 1 through 4 of this definition;
6. The territorial sea; and

7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in subdivisions 1 through 6 of this definition.

"Total maximum daily load" or "TMDL" means the sum of the individual wasteload allocations for point sources, load allocations (LAs) for nonpoint sources, natural background loading and a margin of safety. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. The TMDL process provides for point versus nonpoint source trade-offs.

"Virginia Pollutant Discharge Elimination System (VPDES) permit" or "VPDES permit" means a document issued by the State Water Control Board pursuant to the State Water Control Law authorizing, under prescribed conditions, the potential or actual discharge of pollutants from a point source to surface waters.

"Virginia Stormwater Management Act" means Article 2.3 (§ [62.1-44.15:24](#) et seq.) of Chapter 3.1 of Title 62.1 of the Code of Virginia.

"Virginia Stormwater BMP Clearinghouse Website" means a website that contains detailed design standards and specifications for control measures that may be used in Virginia to comply with the requirements of the Virginia Stormwater Management Act and associated regulations.

"Virginia Stormwater Management Handbook" means a collection of pertinent information that provides general guidance for compliance with the Act and associated regulations and is developed by the department with advice from a stakeholder advisory committee.

"Virginia Stormwater Management Program" or "VSMP" means a program approved by the board after September 13, 2011, that has been established by a VSMP authority to manage the quality and quantity of runoff resulting from land-disturbing activities and shall include such items as local ordinances, rules, permit requirements, annual standards and specifications, policies and guidelines, technical materials, and requirements for plan review, inspection, enforcement, where authorized in the Act and associated regulations, and evaluation consistent with the requirements of the SWM Act and associated regulations.

APPENDIX A: ESC Plan Review Checklist

ESC PLAN REVIEW CHECKLIST

GENERAL

Plan Submission Date:

Project Name _____

Building Number/Site Address _____

Applicant Name _____

Applicant Address _____ Phone Number _____

Principal Designer _____ Phone Number _____

General Contractor _____ Phone Number _____

_____ Complete set of plans- Include all sheets pertaining to the site grading and stormwater and any activities impacting erosion and sediment control and drainage:

Existing conditions

Demolition

Site grading

Erosion and sediment control

Storm sewer systems

Stormwater management facilities

Utility layout

Landscaping

On-site and off-site borrow and disposal areas that do not have separate approved ESC Plans

_____ Professional's seal - The designer's original seal, signature, and date are present?

_____ Number of plan sets submitted: _____

_____ Variances - Variances requested?

_____ Certified Responsible Land Disturber (RLD) - A certified RLD certificate from the contractor is provided?

NARRATIVE

Please reference plan sheet numbers where the information may be found.

_____ Project description - Briefly describe the nature and purpose of the land-disturbing activity. Provide the area (acres) to be disturbed?

_____ Existing site conditions - A description of the existing topography (% slopes), ground cover, and drainage (on-site and receiving channels).

_____ Adjacent areas - A description of all neighboring areas?

_____ Off-site areas - Describe any off-site land-disturbing activities that may occur (borrow sites, disposal areas, easements, etc.). Identify the Owner of the off-site area. Include a statement that any off-site land-disturbing activity associated with the project must have an approved ESC Plan. Submit documentation of the approved ESC Plan for each of these sites.

_____ Soils - Provide a description of the soils on the site? Show the site location on the Soil Survey, if it is available.

_____ Critical areas - A description of areas on the site that have potentially serious erosion problems or that are sensitive to sediment impacts (e.g., watercourses, wet weather / underground springs, etc.).

_____ Erosion and sediment control measures - A description of the structural and vegetative methods that will be used to control erosion and sedimentation on the site. Controls should satisfy applicable minimum standards and specifications in Chapter 3 of the 1992 *Virginia Erosion and Sediment Control Handbook* (VESCH).

_____ Management strategies / Sequence of construction - Address management strategies, the sequence of construction, and any phasing of installation of ESC measures.

_____ Permanent stabilization - A brief description, including specifications, of how the site will be stabilized after construction is completed.

_____ Maintenance of ESC measures - A schedule of regular inspections, maintenance, and repair of erosion and sediment control structures should be set forth.

- _____ Calculations for temporary erosion and sediment control measures - For each temporary ESC measure, provide the calculations required by the standards and specifications if applicable.
- _____ Stormwater management considerations - Will the development of the site cause an increase in peak runoff rates? Will the increase in runoff cause flooding or channel degradation downstream? Describe the strategy to control stormwater runoff, including during construction.
- _____ Specifications / Detail Drawings for erosion and sediment control measures - For each erosion and sediment control measure employed in the plan, include, at a minimum, the detail from the standard and specification in the VESCH or NASA LaRC.
- _____ Specifications for stormwater and stormwater management structures - Provide specifications for stormwater and stormwater management structures, i.e., pipe materials, pipe bedding, stormwater structures.

SITE PLAN

Please reference plan sheet numbers where the information may be found.

- _____ Vicinity map - A small map locating the site in relation to the surrounding area. Include any landmarks that might assist in locating the site.
- _____ Indicate north - The direction of north in relation to the site.
- _____ Off-site areas - Include any off-site land-disturbing activities (e.g., borrow sites, disposal areas, etc.) not covered by a separate approved ESC Plan.
- _____ Legend - Provide a complete listing of all ESC measures used, including the VESCH uniform code symbol and the standard and specification number. Include any other items necessary to identify pertinent features in the plan.
- _____ Property lines and easements - Show all property and easement lines. For each adjacent property, list the deed book and page number and the property owner's name and address
- _____ Existing vegetation - Show the existing tree lines, grassed areas, or unique vegetation.
- _____ Limits of clearing and grading - Delineate all areas that are to be cleared and graded.
- _____ Protection of areas not being cleared - Fencing or other measures to protect areas that are not to be disturbed on the site.
- _____ Critical areas - Note all critical areas on the plan.
- _____ Existing contours - Show the existing contours of the site.

_____ Final contours and elevations – Show changes to the existing contours, including final drainage patterns.

_____ Site development – Show all improvements such as buildings, parking lots, access roads, utility construction, etc. Show all physical items that could affect or be affected by erosion, sediment, and drainage.

_____ Location of practices - The locations of erosion and sediment control and stormwater management practices used on the site.

_____ Adequate Conveyances – Ensure that stormwater conveyances with adequate capacity and adequate erosion resistance have been provided for all on-site concentrated stormwater runoff. Off-site channels that receive runoff from the site, including those receiving runoff from stormwater management facilities, must be adequate. Increased volumes of sheet flows must be diverted to a stable outlet, adequate channel, pipe or pipe system, or a stormwater management facility.

- Provide exhibits showing the drainage divides, the direction of flow, and the size (acreage) of each of the site drainage areas that discharge runoff off-site, both existing and proposed.
- Provide calculations for pre- and post-development runoff from these drainage areas.
- Ensure that Minimum Standard 19 is satisfied for each off-site receiving channel, including those that receive runoff from stormwater management facilities.
- Provide calculations for the design of each permanent stormwater management facility.
- Ensure that increased volumes of sheet flows are diverted to a stable outlet, to an adequate channel, pipe or pipe system, or to a stormwater management facility.
- Provide adequacy calculations for all on-site stormwater conveyances.

_____ Calculations for permanent stormwater conveyances - For each permanent stormwater conveyance or structure, provide the following design calculations.

_____ Direction of Flow for Conveyances - Indicate the direction of flow for all stormwater conveyances (storm drains, stormwater conveyance channels).

_____ Storm Drain Profiles - Provide profiles of all storm drains except roof drains. If the type of pipe (RCP, CMP, HDPE, etc.) is not called out on the profiles, then the most conservative pipe material that may be specified for the project must be used in the adequacy calculations.

MINIMUM STANDARDS

Yes No NA

- MS-1 Have temporary and permanent stabilization been addressed in the narrative?
- Are practices shown on the plan?
- Temporary and permanent seed specifications?
- Lime and fertilizer?
- Mulching?
- Blankets/Matting?
- Pavement/Construction Road Stabilization?
- MS-2 Has stabilization of soil stockpiles, borrow areas, and disposal areas been addressed in the narrative and on the plan?
- Have sediment trapping measures been provided?
- MS-3 Has the establishment and maintenance of permanent vegetative stabilization been addressed?
- MS-4 Does the plan specifically state that sediment-trapping facilities shall be constructed as a first step in land-disturbing activities?
- MS-5 Does the plan specifically state that stabilization of earthen structures is required immediately after installation? Is this noted for each measure on the plan?
- MS-6 Are sediment traps and sediment basins specified where needed and designed to the standard and specification?
- MS-7 Have the design and temporary/permanent stabilization of cut and fill slopes been adequately addressed? Is Surface Roughening provided for slopes steeper than 3:1?
- MS-8 Have adequate temporary or permanent conveyances (paved flumes, channels, slope drains) been provided for concentrated stormwater runoff on cut and fill slopes?
- MS-9 Has water seeping from a slope face been addressed (e.g., subsurface drains)?
- MS-10 Is adequate inlet protection provided for all operational storm drain and culvert inlets?

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- MS-11 Are adequate outlet protection and/or channel linings provided for all stormwater conveyance channels and receiving channels? Is there a schedule indicating:
 - Dimensions of the outlet protection? Lining? Size of riprap?
 - Cross section and slope of the channels? Type of lining? Size of riprap, if used?
- MS-12 Are in-stream protection measures required so that channel impacts are minimized?
- MS-13 Are temporary stream crossings of non-erodible material required where applicable?
- MS-14 Are all applicable federal, state and local regulations pertaining to working in or crossing live watercourses being followed?
- MS-15 Has immediate restabilization of areas subject to in-stream construction (bed and banks) been adequately addressed?
- MS-16 Have disturbances from underground utility line installations been addressed?
 - No more than 500 linear feet of trench open at one time?
 - Effluent from dewatering filtered or passed through a sediment-trapping device?
 - Proper backfill, compaction, and restabilization?
- MS-17 Is the transport of soil and mud onto public roadways properly controlled? (i.e., Construction Entrances, wash racks, transport of sediment to a trapping facility, cleaning of roadways at the end of each day, no washing before sweeping and shoveling)
- MS-18 Has the removal of temporary practices been addressed?
 - Have the removal of accumulated sediment and the final stabilization of the resulting disturbed areas been addressed?
- MS-19 Are properties and waterways downstream from development adequately protected from sediment deposition, erosion, and damage due to increases in volume, velocity and peak flow rate of stormwater runoff? Have adequate channels been provided on-site?

CHECKLIST PREPARER

I certify that I am a professional in adherence to all minimum standards and requirements pertaining to the practice of that profession in accordance with Chapter 4 (§ 54.1-400 et seq.) of Title 54.1 of the Code of Virginia and attendant regulations. By signing this checklist I am certifying that this document and all attachments are, to the best of my knowledge and belief, true, accurate, and complete.

SIGNATURE _____

PRINTED NAME _____

DATE _____

CERT # _____

APPENDIX B: SWM Plan Review Checklist

SWM PLAN REVIEW CHECKLIST

GENERAL

Plan Submission Date:

Project Name _____

Operator Name _____

Operator Address _____ Phone Number _____

Principal Designer _____ Phone Number _____

General Contractor _____ Phone Number _____

_____ Professional's seal - The designer's original seal, signature, and date are required on the cover sheet of each Narrative and each set of Plan Sheets.

_____ Number of plan sets submitted:

_____ Exceptions - Exceptions requested are governed by Section 9VAC25-870-57 of the *Virginia Stormwater Management Regulations*.

_____ Grandfathering - Attach supporting documentation consistent with the requirements of Section 9VAC25-870-48 of the *Virginia Stormwater Management Regulations*.

_____ Offsite Compliance – Attach letter of availability from the off-site provider as governed by Section 9VAC25-870-55 of the *Virginia Stormwater Management Regulations*.

_____ Demolition Project – Is this a demolition project that is eliminating impervious area and converting to green space (inherently compliant)?

Notes:

SITE PLANS

Please reference the plan sheet numbers where specific information may be found in the blanks below.

- _____ Common address and description of the site.

- _____ A narrative that includes a description of current site conditions and proposed development and final site conditions, including proposed use of environmental site design techniques and practices, stormwater control measures, relevant information pertaining to long-term maintenance of these measures, and a construction schedule.

- _____ Existing and proposed mapping and plans (recommended scale of 1" = 50', or greater detail), which illustrates the following at a minimum:
 - North arrow
 - Legend
 - Vicinity map
 - Existing and proposed topography (minimum of 2-foot contours recommended)
 - Property lines
 - Perennial and intermittent streams
 - Mapping of predominant soils from USDA soils surveys as well as the location of any site-specific test bore hole investigations that may have been conducted and information identifying the hydrologic characteristics and structural properties of soils used in the installation of stormwater management facilities
 - Boundaries of existing predominant vegetation and proposed limits of clearing and grading
 - Location and boundaries of natural feature protection and conservation areas (e.g., wetlands, lakes, ponds, aquifers, public drinking water supplies, etc.) and applicable setbacks (e.g., stream buffers, drinking water well setbacks, septic drainfield setbacks, building setbacks, etc.)
 - Identification of any on-site or adjacent water bodies included on the Virginia 303(d) list of impaired waters
 - Current land use and location of existing and proposed roads, buildings, parking lots and other impervious areas
 - Location and description of any planned demolition of existing structures, roads, etc.

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- Proposed land use(s) with a tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, roads, parking lots, stormwater management facilities, and easements
- Location of existing and proposed utilities [e.g., water (including wells), sewer, gas, electric, telecommunications, cable TV, etc.] and easements
- Earthwork specifications
- Show the BMP name, geographic coordinates and design of both structural and non-structural stormwater control measures, including maintenance access and limits of disturbance
- Storm drainage plans for site areas not draining to any BMP(s)
- Location of existing and proposed conveyance systems, such as storm drains, inlets, catch basins, channels, lateral groundwater movement interceptors (French drains, agric. tile drains, etc.), swales, and areas of overland flow, including grades, dimensions, and direction of flow
- Final drainage patterns and flow paths
- Location of floodplain/floodway limits and relationship of site to upstream and downstream properties and drainage systems
- Location of all contributing drainage areas and points of stormwater discharge, receiving surface waters or karst features into which stormwater discharges, the pre-development and post-development conditions for drainage areas, and the potential impacts of site stormwater on adjoining parcels
- Location and dimensions of proposed channel modifications, such as bridge or culvert crossings
- Final stabilization and landscaping plans

_____ Hydrologic and hydraulic analysis, including the following:

- Site map with locations of design points and drainage areas (size in acres) for runoff calculations
- Identification and calculation of stormwater site design credits, if any apply
- Summary description of the water quantity and water quality compliance strategy.
- VRRM Sheets

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- Time of concentration (and associated flow paths)
- Imperviousness of the entire site and each drainage area
- NRCS runoff curve numbers or volumetric runoff coefficients
- A hydrologic analysis for the existing (pre-development) conditions, including runoff rates, volumes, and velocities, showing the methodologies used and supporting calculations
- A hydrologic analysis for the proposed (post-development) conditions, including runoff rates, volumes, and velocities, showing the methodologies used and supporting calculations
- Hydrologic and hydraulic analysis of the stormwater management system for all applicable design storms
- Pollution load and load reduction requirements and calculations (VRRM Sheets)
- Final good engineering and sizing calculations for stormwater control measures, including contributing drainage areas, storage, and outlet configurations, verifying compliance with the water quality and water quantity requirements of the regulations
- Stage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities
- Final analysis of the potential downstream impacts/effects of the project, where necessary
- Downstream analysis

_____ Representative cross-section and profile drawings and details of stormwater control measures and conveyances which include the following:

- Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.)
- Design water surface elevations
- Structural details of BMP designs, outlet structures, embankments, spillways, grade control structures, conveyance channels, etc.

_____ Applicable construction and material specifications, including references to applicable material and construction standards (ASTM, etc.)

_____ Landscaping plans for stormwater control measures and any site reforestation or revegetation

- _____ Long term operations and maintenance plan/agreement
- _____ Waiver/exception requests
- _____ Applicable supporting documents and studies (e.g., infiltration tests, geotechnical investigations, TMDLs, flood studies, etc.)

CHECKLIST PREPARER

I certify that I am a professional in adherence to all minimum standards and requirements pertaining to the practice of that profession in accordance with Chapter 4 (§ 54.1-400 et seq.) of Title 54.1 of the Code of Virginia and attendant regulations. By signing this checklist I am certifying that this document and all attachments are, to the best of my knowledge and belief, true, accurate, and complete.

SIGNATURE _____

PRINTED NAME _____

DATE _____

CERT # _____

APPENDIX C: ESC/SWM Plan Approval Letter

National Aeronautics and
Space Administration
Langley Research Center
Hampton, VA 23681-2199



{XX/XX/XXX}

Subject: Erosion and Sediment Control (ESC) Plan Approval
Stormwater Management (SWM) Plan Approval

NASA Langley Research Center's certified plan review staff have reviewed {Insert Contractor's Name}'s ESC and SWM Plan submittals dated {Insert Date} for consistency with contract requirements and conformance with all applicable state regulations. The Plans have been deemed approved for project implementation. The project is authorized to obtain VAR10 Construction General Permit (9 VAC 25-880) coverage from the Virginia Department of Environmental Quality (DEQ).

Plan Professional Stamp Date: {Insert Plan Date}
Formal NASA Date of Plan Approval Date: {Insert Date}

Please note that proposed revisions to approved ESC and/or SWM plans must be submitted to NASA's DEQ-certified plan reviewer(s). Additionally, all Plan redlines must be checked and signed off on by a DEQ-certified inspector(s) and if such modifications require submittal to the ESC/SWM plan reviewer they will be reviewed and reapproved by NASA.

For more information about the ESC and SWM Program at NASA Langley please refer to the Annual Standards and Specifications (AS&S) for ESC and SWM. This is NASA's DEQ approved program summary document.

A copy of this letter must be retained in your onsite project files. If you have any questions please contact Peter Van Dyke at 757-864-7517 or peter.vandyke@nasa.gov.

Peter Van Dyke
AS&S DEQ-Certified Program Administrator
Dual Combined Administrator #DCA0184

**APPENDIX D: NASA ESC and SWM Inspection
Report Form (Periodic)**

ESC and SWM Inspection Report (Periodic)

General Information			
Project Name			
Tracking No.		Location	
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Describe present phase of construction			
Type of Inspection: ESC/SWM Compliance			
Inspection Schedule			
<input type="checkbox"/> Upon initial installation of erosion & Sediment Controls <input type="checkbox"/> At least once during every two-week period <input type="checkbox"/> Within 48 hours of any runoff-producing storm event <input type="checkbox"/> Upon completion of the project			
Weather Information			
Has there been a storm event since the last inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount/date:			
Weather at time of this inspection?			
<input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Rain <input type="checkbox"/> Sleet <input type="checkbox"/> Fog <input type="checkbox"/> Snowing <input type="checkbox"/> High Winds <input type="checkbox"/> Other:			
Temperature: _____°F			
<input type="checkbox"/> Records and Field Inspection <input type="checkbox"/> Field Inspection Only			
Maintaining and Updating SWPPP Compliance			
Is the SWPPP retained, along with a copy of state's permit, registration statement, and acknowledgement letter from DEQ, at the construction site or other location easily accessible during normal business hours? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is the following information posted conspicuously near the main entrance of the construction site:			
<ul style="list-style-type: none"> • A copy of the permit coverage letter including the registration number for the construction activity <input type="checkbox"/> Yes <input type="checkbox"/> No • The location of the SWPPP (or internet address for an electronic version) <input type="checkbox"/> Yes <input type="checkbox"/> No • The name and telephone number of a contact person for scheduling SWPPP viewing times? <input type="checkbox"/> Yes <input type="checkbox"/> No 			
Have any design changes to the construction project been needed? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If yes, has the SWPPP been updated and the date of the SWPPP update logged? <input type="checkbox"/> Yes <input type="checkbox"/> No			

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Are dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated recorded in the SWPPP? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Inspection Compliance				
Are weekly and/or post rain site inspections being conducted? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Are the inspections documented? <input type="checkbox"/> Yes <input type="checkbox"/> No Date of last inspection: _____				
Is the documentation available for review at the time of the inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Are pollution prevention controls, BMPs, and measures (identified in the SWPPP) revised as appropriate, but in no case later than 7 days following the inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Condition of Receiving Waters (Outfall Inspection)				
Is a stormwater discharge apparent at the time of the inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Is there evidence that there has been a discharge of polluted runoff (e.g., muddy flows, sediment deposits, etc.) to the receiving water? <input type="checkbox"/> Yes <input type="checkbox"/> No				
Site ESC Compliance				
	BMP/activity	Implemented?	Maint. Req?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas (not actively being worked) properly stabilized?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2	Are natural resource areas (e.g., wetlands, mature trees, etc.) protected with barriers or similar BMPs?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3	Are perimeter controls and sediment barriers adequately installed?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4	Are discharge points and receiving waters free of any sediment deposits?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5	Are storm drain inlets properly protected?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6	Is the construction exit preventing sediment from being tracked into the street?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

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7	Is trash/litter from work areas collected and placed in covered dumpsters?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8	Are washout facilities available, clearly marked, and maintained?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9	Are vehicle/equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11	Are non-stormwater discharges (e.g., dewatering) properly controlled?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Site SWM Compliance			
Has installation of SWM measures initiated? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is documentation (i.e. records/oversight) of SWM construction process appropriate? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Are record drawings appropriately submitted (i.e. sealed and signed)? <input type="checkbox"/> Yes <input type="checkbox"/> No			
	SWM Installation	Maint. Req?	Corrective Action Needed and Notes
1	Is the installation of SWM measures compliant with the approved SWM Plan?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Non-Compliance/Comments

Print name and title: _____

Signature: _____ Date: _____

**APPENDIX E: NASA SWM Inspection Report Form
(Post Construction)**

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Type of Pretreatment: <input type="checkbox"/> None <input type="checkbox"/> Grass Channel <input type="checkbox"/> Riprap Channel or Apron <input type="checkbox"/> Pavers <input type="checkbox"/> Other:			
Is there evidence that the pretreatment isn't functioning as intended?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Are there signs of pretreatment bypass or short-circuiting?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is sediment removal from pretreatment necessary?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
VEGETATION			
What is the approximate percentage of vegetation coverage?	_____ %		
Has the vegetation altered from the original design?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Are weeds or invasive plants present?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Are there areas of bare soil or erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is there any vegetation in poor health?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is vegetation maintenance needed? (Circle one)	Before next rainfall	Within a year or two	
	Before next rainy season	No sign that any is required	
SOIL CONDITIONS			
Was a soil sample taken? List condition of soil; List dominant soil type(s)/any observable layers			
Depth of mulch, if present			
OVERALL PERFORMANCE			
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure
10	9	8	7
6	5	4	3
2			
Positive notes or good design features:			

Poor or problematic design features:

Inspector Signature: _____ Date: _____

**NASA Langley Research Center
Stormwater BMP Inspection Report
Pervious Pavers**

BMP ID:	DATE:	ASSESSED BY:
BMP TYPE : Pervious Pavers		YEAR CONSTRUCTED:
OWNERSHIP: NASA		
Date of Last Inspection:		
Summary of Last Inspection (note items requiring maintenance or follow-up):		
Rain in last 48 hrs? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount (in):		
Contributing Drainage Area(s): ____ Industrial ____ Forested ____ Maintained Grass ____ Urban ____ Other:		
Associated Outfall:		Receiving Water Body:
Primary Outlet Structure: <input type="checkbox"/> N/A (infiltration and/or sheet flow) <input type="checkbox"/> Curb cut <input type="checkbox"/> Underdrain w/ perf. Pipe		
Emergency Spillway Type: <input type="checkbox"/> Channel <input type="checkbox"/> Riser <input type="checkbox"/> Overflow <input type="checkbox"/> Weir <input type="checkbox"/> Other:		
INSPECTION ITEM	Y/N	COMMENTS:
Is there any staining or sediment present? If yes, where? List source, if possible.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there standing water 48 or more hours after a rainfall? If yes, describe water appearance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of clogged areas that require vacuum-sweeping?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there issues with structural integrity? Look for deterioration such as: slumping, cracking, spalling, or broken pavers.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of migration of eroding material into or from the paver area?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is unnecessary vegetation growing between pavers?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are trash, excessive leaves, grass clippings, or other debris present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is anything blocking or clogging inlets or outlets?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any inlet structures in need of maintenance? (Pipe, roof contribution, etc.)	<input type="checkbox"/> Yes <input type="checkbox"/> No	

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Are there any outlet structures in need of maintenance? (Curb cut, pipe, paved flume, etc.)	<input type="checkbox"/> Yes <input type="checkbox"/> No							
If there is an observation well, is water present inside? Describe depth.	<input type="checkbox"/> Yes <input type="checkbox"/> No							
If underdrain is present, is there standing water 48 or more hours after a rainfall?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there evidence of an illicit storm sewer discharge?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
OVERALL PERFORMANCE								
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure noted					
10	9	8	7	6	5	4	3	2
Positive notes or good design features: 								
Poor or problematic design features: 								

Inspector Signature: _____ Date: _____

**NASA Langley Research Center
Stormwater BMP Inspection Report
Rain Gardens (no underdrains)**

BMP ID:	DATE:	ASSESSED BY:
BMP TYPE : Rain Garden		YEAR CONSTRUCTED:
OWNERSHIP: NASA		
Date of Last Inspection:		
Summary of Last Inspection (note items requiring maintenance or follow-up):		
Rain in last 48 hrs? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount (in):		
Contributing Drainage Area(s): ____ Industrial ____ Forested ____ Maintained Grass ____ Urban ____ Other:		
Associated Outfall:		Receiving Water Body:
Primary Outlet Structure: <input type="checkbox"/> N/A (infiltration) <input type="checkbox"/> Pipe <input type="checkbox"/> Open channel <input type="checkbox"/> Curb cut <input type="checkbox"/> Storm Overflow <input type="checkbox"/> Underdrain w/ perf. Pipe		
Emergency Spillway Type: <input type="checkbox"/> Channel <input type="checkbox"/> Riser <input type="checkbox"/> Overflow <input type="checkbox"/> Weir <input type="checkbox"/> Other:		
INSPECTION ITEM	Y/N	COMMENTS:
Is there sediment accumulation? If yes, where? List source, if possible.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are trash, excessive leaves, grass clippings, or other debris present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is anything blocking or clogging inlets or outlets? If yes, describe.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of erosion or channelization?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any inlet structures in need of maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any outlet structures in need of maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there standing water 48 or more hours after a rainfall? If yes, describe water appearance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of an illicit storm sewer discharge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
PRETREATMENT		
Type of Pretreatment: <input type="checkbox"/> None <input type="checkbox"/> Grass Channel <input type="checkbox"/> Riprap Channel or Apron <input type="checkbox"/> Pavers <input type="checkbox"/> Other:		
Is there evidence that the pretreatment isn't functioning as intended?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Are there signs of pretreatment bypass or short-circuiting?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is sediment removal from pretreatment necessary?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
VEGETATION			
Has the vegetation altered from the original design?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Are weeds or invasive plants present?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is there any vegetation that is an inappropriate size and/or density?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Are there areas of bare soil or erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is there any vegetation in poor health?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Is vegetation maintenance needed? (Circle one)	Before next rainfall Before next rainy season	Within a year or two No sign that any is required	
SOIL CONDITIONS			
Was a soil sample taken? List condition of soil; List dominant soil type(s)/any observable layers			
Depth of mulch, if present			
OVERALL PERFORMANCE			
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure
10	9	8	7
6	5	4	3
2			
Positive notes or good design features:			
Poor or problematic design features:			

Inspector Signature: _____ Date: _____

**NASA Langley Research Center
Stormwater BMP Inspection Report
Bioretention Gardens**

BMP ID:	DATE:	ASSESSED BY:
BMP TYPE : Bioretention Garden		YEAR CONSTRUCTED:
OWNERSHIP: NASA		
Date of Last Inspection:		
Summary of Last Inspection (note items requiring maintenance or follow-up):		
Rain in last 48 hrs? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount (in):		
Contributing Drainage Area(s): ____ Industrial ____ Forested ____ Maintained Grass ____ Urban ____ Other:		
Associated Outfall:		Receiving Water Body:
Primary Outlet Structure: <input type="checkbox"/> N/A (infiltration) <input type="checkbox"/> Pipe <input type="checkbox"/> Open channel <input type="checkbox"/> Curb cut <input type="checkbox"/> Storm Overflow <input type="checkbox"/> Underdrain w/ perf. Pipe		
Emergency Spillway Type: <input type="checkbox"/> Channel <input type="checkbox"/> Riser <input type="checkbox"/> Overflow <input type="checkbox"/> Weir <input type="checkbox"/> Other:		
Is BMP part of a treatment train? If yes, list other BMPs upstream and/or downstream:		
INSPECTION ITEM	Y/N	COMMENTS:
Is there sediment accumulation? If yes, where? List source, if possible.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are trash, excessive leaves, grass clippings, or other debris present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of slope walls sliding or eroding?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is anything blocking or clogging inlets or outlets? If yes, describe.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any inlet structures in need of maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any outlet structures in need of maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there standing water 48 or more hours after a rainfall? If yes, describe water appearance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
If there are any observation wells, is water present inside? Describe depth.	<input type="checkbox"/> Yes <input type="checkbox"/> No	

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If underdrains are present, is there standing water 48 or more hours after a rainfall?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there evidence of an illicit storm sewer discharge?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
PRETREATMENT								
Type of Pretreatment: <input type="checkbox"/> None <input type="checkbox"/> Grass Channel <input type="checkbox"/> Riprap Channel or Apron <input type="checkbox"/> Pavers <input type="checkbox"/> Other:								
Is there evidence that the pretreatment isn't functioning as intended?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are there signs of pretreatment bypass or short-circuiting?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is sediment removal from pretreatment necessary?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
VEGETATION								
What is the approximate percentage of vegetation coverage?	_____ %							
Has the vegetation altered from the original design?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are weeds or invasive plants present?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are there areas of bare soil or erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there any vegetation in poor health?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is vegetation maintenance needed? (Circle one)	Before next rainfall Before next rainy season	Within a year or two No sign that any is required						
SOIL CONDITIONS								
Was a soil sample taken? List condition of soil; List dominant soil type(s)/any observable layers								
Depth of mulch, if present								
OVERALL PERFORMANCE								
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure					
10	9	8	7	6	5	4	3	2
Positive notes or good design features:								

Poor or problematic design features:

Inspector Signature: _____ Date: _____

**NASA Langley Research Center
Stormwater BMP Inspection Report
Green Roof**

BMP ID:	DATE:	ASSESSED BY:
BMP TYPE : Green Roof		YEAR CONSTRUCTED:
OWNERSHIP: NASA		
Date of Last Inspection:		
Summary of Last Inspection (note items requiring maintenance or follow-up):		
Rain in last 48 hrs? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount (in):		
Associated Outfall:		Receiving Water Body:
Primary Outlet Structure(s): <input type="checkbox"/> N/A (infiltration) <input type="checkbox"/> Tray System <input type="checkbox"/> Underdrain w/ perf. Pipe		
Is BMP part of a treatment train? If yes, list other BMPs upstream and/or downstream:		
INSPECTION ITEM	Y/N	COMMENTS:
Are trash, excessive leaves, or other debris present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is anything blocking or clogging inlets or outlets? If yes, describe.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any outlet structures in need of maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence that the waterproof membrane is leaking or cracked?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any noticeable odors, water stains, or presence of algae?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there standing water 48 or more hours after a rainfall? If yes, describe water appearance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are roof drains free of blockages, vegetative debris, and sediment?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of an illicit storm sewer discharge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
VEGETATION		
What is the approximate percentage of vegetation coverage?	_____ %	

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Has the vegetation altered from the original design?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are weeds or invasive plants present?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are there areas of bare soil or erosion from wind or water?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there any vegetation in poor health?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is vegetation maintenance needed? (Circle one)	Before next rainfall Before next rainy season	Within a year or two No sign that any is required						
SOIL CONDITIONS								
Was a soil sample taken? List condition of soil; List dominant soil type(s)/any observable layers								
Average depth of gravel, if present								
OVERALL PERFORMANCE								
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure					
10	9	8	7	6	5	4	3	2
Positive notes or good design features: 								
Poor or problematic design features: 								

Inspector Signature: _____ Date: _____

**NASA Langley Research Center
Stormwater BMP Inspection Report
Tree Filter Boxes**

BMP ID:	DATE:	ASSESSED BY:
BMP TYPE : Filterras		YEAR CONSTRUCTED:
OWNERSHIP: NASA		
Date of Last Inspection:		
Summary of Last Inspection (note items requiring maintenance or follow-up):		
Plant type:		
Rain in last 48 hrs? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount (in):		
Contributing Drainage Area(s): _____ Industrial _____ Forested _____ Maintained Grass _____ Urban _____ Other:		
Associated Outfall:		Receiving Water Body:
INSPECTION ITEM	Y/N	COMMENTS:
Is there sediment accumulation? If yes, where? List source, if possible.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are trash, excessive leaves, grass clippings, or other debris present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is anything blocking or clogging the inlet? If yes, describe.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there damage to the box structure?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there damage to the tree grate?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is the bypass / downstream structure clear (if applicable)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there standing water 48 or more hours after a rainfall? If yes, describe water appearance.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of an illicit storm sewer discharge?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
VEGETATION		
Estimated plant height above grate (ft)		
Estimated stem diameter (in)		

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Is the plant in poor health?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are weeds or invasive plants present?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are there obvious areas of bare soil or erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is additional mulch needed?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is vegetation maintenance needed? (Circle one)	Before next rainfall Before next rainy season	Within a year or two No sign that any is required						
Describe maintenance needed:								
OVERALL PERFORMANCE								
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure					
10	9	8	7	6	5	4	3	2
Positive notes or good design features:								
Poor or problematic design features:								

Inspector Signature: _____ Date: _____

**NASA Langley Research Center
Stormwater BMP Inspection Report
Grass Channels (Compost Amended)**

BMP ID:	DATE:	ASSESSED BY:
BMP TYPE : Grass Channel (Compost Amended)		YEAR CONSTRUCTED:
OWNERSHIP: NASA		
Date of Last Inspection:		
Summary of Last Inspection (note items requiring maintenance or follow-up):		
Rain in last 48 hrs? <input type="checkbox"/> Yes <input type="checkbox"/> No Rainfall amount (in):		
Contributing Drainage Area(s): ____ Industrial ____ Forested ____ Maintained Grass ____ Urban ____ Other:		
Associated Outfall:		Receiving Water Body:
Primary Outlet Structure: <input type="checkbox"/> N/A (infiltration) <input type="checkbox"/> Pipe/weep <input type="checkbox"/> Open channel <input type="checkbox"/> Curb cut <input type="checkbox"/> Overflow <input type="checkbox"/> Underdrain w/ perf. Pipe		
Emergency Spillway Type: <input type="checkbox"/> Channel <input type="checkbox"/> Overflow <input type="checkbox"/> Weir <input type="checkbox"/> Other:		
Is BMP part of a treatment train? If yes, list other BMPs upstream and/or downstream:		
INSPECTION ITEM	Y/N	COMMENTS:
Is there sediment accumulation? If yes, where? List source, if possible.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are trash, excessive leaves, grass clippings, or other debris present?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of slope walls sliding or eroding?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence of runoff ponding, creating rills, and/or causing erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is anything blocking or clogging inlets or outlets? If yes, describe.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is there evidence the inlet is not maintaining a calm flow of water entering the channel?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any inlet structures in need of maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are there any outlet structures in need of maintenance? Is weep hole clogged (if applicable)?	<input type="checkbox"/> Yes <input type="checkbox"/> No	

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Is there standing water 48 or more hours after a rainfall? If yes, describe water appearance.	<input type="checkbox"/> Yes <input type="checkbox"/> No							
If underdrains are present, is there standing water 48 or more hours after a rainfall?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Does the stone at check dams need maintenance?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there a large accumulation of sediment or trash/debris behind check dams?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there evidence of an illicit storm sewer discharge?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
VEGETATION								
What is the approximate percentage of grass coverage?	_____%							
Has the vegetation altered from the original design?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are weeds or invasive plants present?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Are there areas of bare soil or erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is there any grass in poor health?	<input type="checkbox"/> Yes <input type="checkbox"/> No							
Is vegetation maintenance needed? (Circle one)	Before next rainfall Before next rainy season	Within a year or two No sign that any is required						
SOIL CONDITIONS								
Was a soil sample taken? List condition of soil; List dominant soil type(s)/any observable layers								
OVERALL PERFORMANCE								
Excellent design and function, no general problems with performance	BMP is well designed, but is undersized or has a few performance problems	BMP is adequately designed, several problems with performance are noted	Poor BMP design, severe performance problems or failure					
10	9	8	7	6	5	4	3	2
Positive notes or good design features:								

Poor or problematic design features:

Inspector Signature: _____ Date: _____

APPENDIX F: Corrective Action Notice

NASA Langley Corrective Action Notice



Project Name:		Permit Number (if applicable):	
Inspector:		Date:	Time:
Stage of Construction			
Pre-Construction <input type="checkbox"/>	Building Construction <input type="checkbox"/>	Construction of SWM Facilities <input type="checkbox"/>	
Clearing/Grubbing <input type="checkbox"/>	Finish Grading <input type="checkbox"/>	Maintenance of SWM Facilities <input type="checkbox"/>	
Rough Grading <input type="checkbox"/>	Final Stabilization <input type="checkbox"/>	Other _____ <input type="checkbox"/>	
Item #	Law/Regulation/Policy	Description/Location of Deficiency, Recommended Actions, Comments	
<p>The corrective action deadline date must be adhered to. If the site stays in non-compliance and/or corrective actions are not completed by the deadline, other enforcement actions will be pursued. If rain is expected and a potential discharge may occur, corrective action needs to be taken immediately. Notify EMO via email (photos, etc.) once correction actions are completed at peter.vandyke@nasa.gov.</p>			
Deadline Date:		NASA Re-Inspection Date:	
Inspector Signature:		Date:	

**APPENDIX G: Historical and Current Regulated
LDAs Tracking Sheet**

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Project Description	Permit Operator	Coverage Date	Permit #	Status
1189/1190/1200	MK Taylor	4/28/2009	DCR-01-09-101658	Closed
Lrg. Road Repave	Asphalt Roads & Materials Co.	6/12/2009	DCR01-09-101919 to VAR10-10-102326	Closed
Building 1 New Town	Whiting Turner	8/5/2009	VAR10-10-103092	Closed
1262 Pad	Riesbeck Contracting		VAR10-10-103279	Closed
B1236 Parking Lot	Hudgins	9/17/2009	VAR10-10-103433	Closed
Big DEMO Project	Bhate Environmental	10/14/2009	VAR10-10-103599	Closed
B1250 Parking Lot	MK Taylor	12/9/2009	VAR10-140-103943	Closed
Tunnel Demo	Charter Environmental	5/5/2010	VAR10-10-104736	Closed
Hydro Impact	J.B. Denny	6/3/2010	VAR10-10-104921	Closed
Milling and Repaving	Asphalt Roads & Materials Co.	5/24/2010	VAR10-10-104890	Closed
009 OWS Work	Northwind	1/6/2011	VAR10-11-100937	Closed
003 OWS Work	Northwind	1/6/2011	VAR10-11-100937	Closed
1212C - Road Regrade	Pembroke	6/10/2011	VAR10-11-101745	Closed
Temp Gravel Lot	MK Taylor	6/28/2011	VAR10-11-101822	Closed
New Phase II Demo	All Phases	10/7/2011	VAR10-12-100545	Closed
1212 C	Riesbeck Contracting	Summer	VAR10-12-103769	Closed
IESB Site	Whiting Turner	6/4/2012	VAR10-12-103624; VAR108257	Closed
Stratton Road	ROME	8/1/2012	VAR10-13-100158	Closed
1195 Steam Line	MK Taylor	5/29/2013	VAR10-13-101677	Closed
Fire Station Upgrade	Heard	8/1/2013	VAR10-14-100253	Closed
1229/LTPT	All Phase	12/9/2013	VAR10C696	Transferred to LAFB /Closed
Steam Line Replacement	MK Taylor	11/8/2013	VAR10C315	Closed
Sanitary Upgrades	Aspen	1/15/2014	VAR10C750	Closed
Potable Water Upgrades	BCI Construction	2/14/2014	VAR10D018	Closed
1213 - 1192 Demo	Street Legal	1/9/2015	VAR10G488	Closed
ALDF Demo	Bhate Environmental	3/18/2015	VAR10G584	Closed
1145, 1231 Demo	Macsons	6/11/2015	VAR10G966	Closed
CRF	Turner Construction	6/16/2015	VAR10G999	Closed
B1275/B1283 Demolition	Heartland Construction	10/28/2016	VAR10J007	Closed
MSL	WM Jordan	2/15/2017 9/17/2019	VAR10J220	Active Site

APPENDIX H: Proposed LDAs Tracking

2020 Proposed Regulated LDAs – NASA Langley Research Center				
Project Description	Permit Operator	Estimated Coverage Date	Estimated Disturbed Area (acres)	Status / Notes
Demolition Projects (multiple). Removal of impervious surface to a grass condition.	TBD	Late FY20 (Summer 2020)	Up to 7 acres total	Depending on how these are procured and rolled together under a contract will dictate the need for CGP coverage. There are multiple facilities scheduled for demolition. If completed separately, this will impact the number of reportable projects.

**VAR10J220 will continue to operate in 2020.*

APPENDIX I: AS&S Entity Information Form

Annual Standards & Specification (AS&S) Entity Information Sheet

1. Annual Standards & Specifications Entity:	
2. AS&S Coverage Verification	
a. Operator:	
b. Project name:	
c. Estimated Area to be Disturbed (acres):	
3. Plan Approval Verification	
a. Erosion & Sediment Control (ESC) Plan:	
i. ESC Plan Reviewer Name and Certification Number:	
ii. ESC Plan Date:	
iii. ESC Plan Approval Date:	
b. Stormwater Management (SWM) Plan:	
i. Technical Criteria Used:	
ii. SWM Plan Reviewer Name and Certification Number:	
iii. SWM Plan Date:	
iv. SWM Plan Approval Date:	
4. Comments:	

Printed Name:	Title:
Signature:	Date:

(Please sign in ink. This must be signed by an employee of the AS&S entity who has oversight of this project and is aware of its coverage under their AS&S.)

(Retain a copy of this form onsite and within project specific AS&S files.)

Instructions for completion:

1. AS&S Entity/Holder Name as it appears on the AS&S Approval Letter
2.a. Operator = Owner, operator, developer, person or general contractor that the AS&S holder is allowing to operate under their DEQ approved AS&S.
2.b. Project Name = Name of the construction activity as it appears on the Registration Statement.
2.c. Estimated Area to Be Disturbed = Provide the estimated area (to the nearest one-hundredth acre) to be disturbed by the construction activity. Include the estimated area of land disturbance that will occur at any off-site support activity to be covered under this general permit.
3.a. Erosion & Sediment Control (ESC) Plans i. = AS&S ESC plans are required to be reviewed and approved by DEQ-Certified ESC Plan Reviewers. Provide the name and certification number of the qualified individual. ii. = Provide the date of the ESC plan. iii. = Provide the date the ESC plan was approved.
3.b. Stormwater Management (SWM) Plans i. = The technical criteria used for this project will be either IIB or IIC per the SWM Regulations; 9VAC25-870. ii. = AS&S SWM plans are required to be reviewed and approved by DEQ-Certified SWM Plan Reviewers. Provide the name and certification number of the qualified individual. iii. = Provide the date of the SWM plan. iv. = Provide the date the SWM plan was approved.
4. Comments = Indicate whether the project package contains any requests (e.g. SWM plan waiver, Decline to Permit, Variance, Exception, Deviation...) DEQ is the VESCP and VSMP Authority for AS&S Entities. Approval for such requests must be issued by DEQ.

(Further questions can be directed to StandardsandSpecs@deq.virginia.gov)

APPENDIX J: AS&S Renewal and Modification Form

Annual Standards & Specification (AS&S) Renewal and Modification Form

(To be submitted to DEQ Central Office)

(Please Type or Clearly Print All Information)

1. AS&S Entity:

Name: _____

Type: State Federal Linear Public Service Authority Wetland/Stream

2. AS&S Approval Letter Addressee:

Name: _____

Title: _____

Mailing address: _____

City: _____ State: _____

Zip: _____ Phone: _____

Email address: _____

3. Indicate the AS&S your entity is renewing:

ESC dated: _____ Approval Date of Existing AS&S: _____

SWM dated: _____ Approval Date of Existing AS&S: _____

4. Indicate if there are any updates to your previously approved AS&S document:

ESC: YES NO **SWM:** YES NO

If there have been any revisions to the previously approved AS&S, submit the revised AS&S document (s) with this form. Revised documents should be 'redlined' or have a reference table showing where revisions are located within the document.

5. Certification: "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."

Printed Name: _____

Title: _____

Signature: _____

Date: _____

(This must be signed by the responsible official representing the AS&S Entity)

Contacts:

1. Main contact (if different from AS&S Approval Letter Addressee)

Name: _____ Title: _____

Email Address: _____

Phone #1: _____ Phone #2: _____

Issues related to: _____

2. Name: _____ Title: _____

Email Address: _____

Phone #1: _____ Phone #2: _____

Issues related to: _____

3. Name: _____ Title: _____

Email Address: _____

Phone #1: _____ Phone #2: _____

Issues related to: _____

4. Name: _____ Title: _____

Email Address: _____

Phone #1: _____ Phone #2: _____

Issues related to: _____

5. Name: _____ Title: _____

Email Address: _____

Phone #1: _____ Phone #2: _____

Issues related to: _____

Instructions for Completing Annual Standards and Specifications (AS&S) Renewal and Modification Form

GENERAL

A. Coverage Under Annual Standards and Specifications.

In accordance with § 62.1-44.15:55, :56 of the Erosion and Sediment Control Law and § 62.1-44.15:31 of the Stormwater Management Act and attendant regulations, Annual Standards and Specifications that describe how land-disturbing activities shall be conducted must be annually resubmitted to DEQ for review and approval. DEQ has created this form to facilitate in the AS&S renewal process for all AS&S Entities.

B. Where to Submit AS&S Renewal Forms

All AS&S Renewal Forms should be submitted either –

Electronically to:

Annual Standards and Specifications Specialist
Hannah.Zegler@deq.virginia.gov

Or hardcopy to:

Department of Environmental Quality
Office of Stormwater Management, 10th Floor
P.O. Box 1105
Richmond, VA 23218

C. Fees

Please note Virginia statute allows the DEQ to assess an administrative charge equal to the lower of (i) \$1,000 or (ii) an amount sufficient to cover the costs of services associated with standard and specification review and approval, project inspections, and compliance.

Once renewed AS&S are approved, the approval letter will be sent to DEQ's Finance Division. Finance will then produce an invoice and contact the AS&S Entity to fulfill the transaction. Approved Renewal Forms will be sent in association with invoices.

LINE-BY-LINE INSTRUCTIONS

Item 1: Annual Standards & Specifications Entity:

Name: Please include the name of the AS&S Entity as it appears on the existing approval letter. If the name of the AS&S Entity has changed, please include the new name with 'formally known as [previously approved name]' listed after it.

Type: There are five types of AS&S Entities. Please indicate the type that your entity falls under. They are as follows:

- a. **State** – Including Departments, Public Institutions of Higher Education (College or University), etc...
- b. **Federal**
- c. **Linear** – Linear projects subject to AS&S include:
 - i. Construction, installation, or maintenance of electric transmission, natural gas, and telephone utility lines and pipelines, and water and sewer lines; and
 - ii. Construction of the tracks, rights-of-way, bridges, communication facilities, and other related structures and facilities of a railroad company.
- d. **Authorities pursuant of § 15.2-5102. (Public Service Authorities)** – § 15.2-5102. One or more localities may create authority.
 - i. The governing body of a locality may by ordinance or resolution, or the governing bodies of two or more localities may by concurrent ordinances or resolutions or by agreement, create a water authority, a sewer authority, a sewage disposal authority, a stormwater control authority, a refuse collection and disposal authority, or any combination or parts thereof. The name of the authority shall contain the word "authority." The authority shall be a public body politic and corporate and a political subdivision of the Commonwealth. The ordinance, resolution or agreement creating the authority shall not be adopted or approved until a public hearing has been held on the question of its adoption or approval, and after approval at a referendum if one has been ordered pursuant to this chapter.
 - ii. Any authority, or any subsidiary thereof, organized pursuant to this section to operate a refuse collection and disposal system that, pursuant to statute, is specifically authorized to include in the system (i) facilities for processing solid waste as a fuel and (ii) facilities for generating steam and electricity for sale, shall not be subject to regulation under the Utilities Facilities Act (§ 56-265.1 et seq.), provided that sales of electricity generated at such facilities are made only to a federal agency whose primary responsibility is national defense and the energy is delivered directly from the generator to the customer's facilities or to a public utility.
- e. **Wetland / Stream** - Any person engaging, in more than one jurisdiction, in the creation and operation of a wetland mitigation or stream restoration bank or banks.

Item 2: AS&S Approval Letter Addressee:

Please include the contact information for whom the AS&S approval letter should be addressed to. This person should be a contact within the actual AS&S entity. No third-party contractors.

Additional contacts may be included on page 2 of this document if there is a different main contact or other individuals in charge of specific functionalities of the AS&S program.

Item 3: Indicate which AS&S your entity is renewing –

Please indicate the date of revision or version noted on the AS&S your entity is renewing.

Please include the approval date on your Entity's existing AS&S approval letter.

Item 4: Indicate if there are any updates to your previously approved AS&S document:

YES – If you have indicated that there have been updates to your AS&S Entity's previously approved AS&S submission. Please include the updated version of your AS&S document alongside this form. Revised AS&S documents should be 'redlined' or have a reference table showing where revisions are located within the document.

NO – If you have indicated that there have been no updates to your AS&S Entity's previously approved AS&S submission you do not need to resubmit these documents.

Please note that DEQ has 60 days in which to comment on or approve AS&S submissions.

Item 5: Certification:

A responsible official representing the AS&S holder is responsible for certifying and signing the AS&S Renewal Form. Responsible officials include:

- i: For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy-making or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for state permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
- ii: For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
- iii: For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.



**Appendix E: DEQ TMDL Action Plan Phase 2 (as submitted to
DEQ)**

CHESAPEAKE BAY TMDL ACTION PLAN

PHASE 2

NASA Langley Research Center

MS4 Permit #VAR040092

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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 second phase of the Action Plan and satisfies the Special Condition requirements covering the period of November 1, 2018 to October 31, 2023. This Action Plan provides a review demonstrates LaRC’s ability to ensure compliance with the Special Condition, and includes the means/methods to meet or exceed the cumulative 40% Level 2 (L2) scoping run reductions for existing development by the end of this permit cycle (2023). 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.

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)** – 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.
- **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. All new construction is required to meet State stormwater design standards.
- **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 40)** – These two 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 41 primarily apply 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.

NASA LaRC is comprised of 764 acres that includes a mix of land use types. An in depth analysis of the size and extent of the regulated MS4 as of June 30, 2009 was developed. LaRC's 764 acreage breakdown is summarized below:

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

The following table showcases the sources loads:

LaRC's Calculation Sheet for Estimating Existing Source Loads for York River Basin				
Sub source	Pollutant	Total Acres	Loading Rate (lbs/acre)	Total Base Load (lbs)
Regulated Urban Impervious	Total Nitrogen (TN)	217.66	7.31	1591
Regulated Urban Pervious		250.77	7.65	1918
Regulated Urban Impervious	Total Phosphorous (TP)	217.66	1.51	329
Regulated Urban Pervious		250.77	0.51	128
Regulated Urban Impervious	Total Suspended Solids (TSS)	217.66	456.68	99401
Regulated Urban Pervious		250.77	72.78	18251

Required TMDL Action Plan Elements (Requirement Part II A. 11)

Part II A. 11 (a) 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 as described in the LaRC Background section above.

Part II A. 11 (b) Load and Cumulative Reduction Calculations

The subsections 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.

Part II A 3: Applicable

The table below shows the required A 3 reductions during the second permit cycle:

Permit Table 3d – Source Loads and Reduction Requirements (York River and Poquoson Coastal Basin)								
		A	B	C	D	E	F	G
Pollutant	Sub source	Loading Rate (lbs/ac/yr)	Existing developed lands as of 6/30/09 served by MS4 within 2010 CUA (acres)	Load (lbs/yr)	% of Ms4 required L2 Load Reduction	% of L2 reductions required by 6/30/2023	40% cumulative reduction required by 6/30/2023 (lbs/yr)	Sum of 40% cumulative reduction (lb/yr)
TN	Regulated Urban Impervious	7.31	217.66	1591	9%	40%	57	103
	Regulated Urban Pervious	7.65	250.77	1918	6%	40%	46	
TP	Regulated Urban Impervious	1.51	217.66	329	16%	40%	21	25

Permit Table 3d – Source Loads and Reduction Requirements (York River and Poquoson Coastal Basin)								
		A	B	C	D	E	F	G
	Regulated Urban Pervious	0.51	250.77	128	7.25%	40%	3.7	
TSS	Regulated Urban Impervious	456.68	217.66	99401	20%	40%	7952	8591
	Regulated Urban Pervious	72.78	250.77	18251	8.75%	40%	639	

Part II A 4: Not applicable

No projects were designed in accordance with 9 VAC 25-870 Part II C; therefore, LaRC has determined that there are no needed offsets for increased loads from new sources that initiated construction between July 1, 2009 and June 30, 2019.

Part II A 5: Not Applicable

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 meet Technical Criteria Part II B design requirements per LaRC's Annuals Standards and Specifications for ESC and SWM. No future projects and zero acreage qualify as grandfathered in accordance with 9 VAC 25-870-48.

Part II A. 11 (c) Total Reductions Achieved as of July 1, 2018

The table below summarizes the total reductions achieved as of July 1, 2018. NASA LaRC achieved significantly more than the required 5% reductions during the first cycle. Please see section Part II A.11 (d) for a listing of BMPs that generated these load reductions.

Sub source	Pollutant	Load (lbs) Reduction Required by end of Permit Cycle 1	Load (lbs) Reduction Achieved by End of Permit Cycle 1
Regulated Urban Impervious	TN	7.2	100
Regulated Urban Pervious		5.8	31
Regulated Urban Impervious	TP	2.6	22
Regulated Urban Pervious		.46	3.1
Regulated Urban Impervious	TSS	994	7557
Regulated Urban Pervious		80	527

Part II A. 11 (d) List of BMPs as of July 1, 2018

Summary Narrative:

Several management practices and retrofit programs were utilized and implemented during the first permit cycle to achieve more than the required 5% reductions for existing sources. No nutrient trading was used. In summary, a total of fifty (50) impervious structures were demolished and returned to a grass condition. While these areas are mowed periodically, they do not receive nutrient applications, allowing them to be classified as a grass condition. The fifty demolished structures equate to a total of 10.7 acres of impervious areas converted to grass. Street sweeping was utilized during all years of permit cycle including all roads and parking surfaces on Center were swept. Additionally, 3.62 acres were converted to a forested condition (0.32 acres converted from impervious to forest; 3.3 acres converted from pervious to forest). Stormwater retrofits were also completed via the installation of four tree-box filters around the Center.

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 Grass	7/1/2009 - 6/30/2010	10.12	0.00	1.95	0.00	718.10	0.00
Land Use Change - Impervious to Grass	7/1/2010 - 6/30/2011	1.82	0.00	0.35	0.00	129.00	0.00
Land Use Change/Pervious to Forest AND Forest	4/30/2011	2.19	0.62	0.48	0.07	239.70	11.56
Land Use Change - Impervious to Grass	7/1/2011 - 6/30/2012	0.61	0.00	0.12	0.00	43.00	0.00
Land Use Change - Impervious to Grass	7/1/2012 - 6/30/2013	3.21	0.00	0.62	0.00	227.90	0.00
Land Use Change - Impervious to Grass	7/1/2013 - 6/30/2014	3.45	0.00	0.67	0.00	245.10	0.00
Land Use Change/Pervious to Forest AND Forest	4/23/2014	0.00	2.71	0.00	0.26	0.00	45.17
Land Use Change - Impervious to Grass	7/1/2014 - 6/30/2015	4.00	0.00	0.77	0.00	283.80	0.00
Tree Box Filter #1	3/1/2015	0.25	0.24	0.22	0.07	31.79	4.54
Tree Box Filter #2	3/1/2015	0.10	0.32	0.05	0.05	12.33	5.90
Tree Box Filter #3	3/1/2015	0.06	0.37	0.02	0.04	6.66	6.91
Tree Box Filter #4	3/1/2015	0.11	0.04	0.07	0.01	13.97	0.74
Land Use Change - Impervious to Grass	7/1/2015 - 6/30/2016	32.00	0.00	6.18	0.00	2270.40	0.00
Land Use Change/Pervious to Forest AND Forest	7/1/2015 - 6/30/2016	0.00	9.06	0.00	0.86	0.00	150.58
Land Use Change - Impervious to Grass	7/1/2016 - 6/30/2017	9.64	0.00	1.86	0.00	683.70	0.00
Land Use Change/Pervious to Forest AND Forest	7/1/2016 - 6/30/2017	0.00	9.06	0.00	0.86	0.00	150.58
Land Use Change/Pervious to Forest AND Forest	7/1/2017 - 6/30/2018	0.00	9.06	0.00	0.86	0.00	150.58
Street Sweeping	Annual	0.00	0.00	2.00	0.00	2652.00	0.00
Catch Basin Cleaning	Annual	32.00		7.10			
Total		99.56	31.48	22.46	3.08	7557.45	526.56

Part II A. 11 (e) Means and Methods: BMP Implementation Plans

This section describes the management practices and retrofit programs that have been or will be implemented between July 1, 2018 and June 30, 2023 to achieve at least an additional 35% reduction for existing sources. In combination with the 5.0% reduction of L2 that has already been achieved, the result will be a 40% total reduction at the end of this permit cycle. No nutrient credit trading is proposed. The information has been broken down and presented by MS4 permit year (July to June timeframes) from 2018 through 2023.

Below is a summary table of all planned BMPs. In addition to these, the annual credit for street sweeping and catch basin cleaning also apply.

Planned to be Implemented	Planned Date of Implementation	TN		TP		TSS	
		Impervious Load Reduced (lbs/yr)	Pervious Load Reduced (lbs/yr)	Impervious Load Reduced (lbs/yr)	Pervious Load Reduced (lbs/yr)	Impervious Load Reduced (lbs/yr)	Pervious Load Reduced (lbs/yr)
Land Use Change - Impervious to Grass	7/1/2018 - 6/30/2019	3.33	0	0.64	0	236.5	0
Land Use Change - Impervious to Grass	7/1/2019 - 6/30/2020	3.7	0	0.71	0	262.3	0
Land Use Change - Impervious to Grass	7/1/2020 - 6/30/2021	8.12		1.57		576.2	
Land Use Change - Impervious to Grass	7/1/2021 - 6/30/2022	30.54	0	5.89	0	2167.2	0
Land Use Change/Pervious to Forest AND Forest Buffer	7/1/2021 - 6/30/2022	0.00	9.06	0.00	0.86	0.00	150.58
Land Use Change/Pervious to Forest AND Forest Buffer	7/1/2022 - 6/30/2023	0	9.06	0	0.86	0	150.58
Total		45.69	18.12	8.81	1.72	3242.2	301.16

Timeframe: July 1, 2018 to June 30, 2019

Project/BMP: Land Use Change - Impervious to Grass Credit

From July 1, 2018 to June 30, 2019, a total of one (1) impervious structure is listed in the Center's Demolition Plan. The plan is to return this area to a grass condition. The structure equates to a total of 0.55 acres of impervious area converted to grass.

Building	Name	Demolish Date	Acres Reduced
1222	REID CONFERENCE CENTER	4/1/2019	0.55
Total			0.55

	Loading Rate for Land Conversion	Loading Equation	Reduction Credit
T N	6.06 lbs/ac/year	0.55 ac * 6.06 TN/ac/yr	3.33 TN/yr
T P	1.17 lbs/ac/year	0.55 ac * 1.17 TP/ac/yr	0.64 TP/yr
TSS	430.00 lbs/ac/year	0.55 ac * 430.00 TSS/ac/yr	236.5 TSS/yr

Project/BMP: Street Sweeping Program – Annual credit

Developed using the qualifying street lanes method to reflect the *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices Final Report*, dated May 19, 2016. LaRC has an established street sweeping program that is accomplished through a grounds maintenance contract. All roads and parking surfaces (102 acres) on Center are swept on a quarterly basis (one pass every twelve weeks). 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

Project/BMP: Storm Drain Cleaning Credit

Loads were developed using the stormdrain cleaning credit method to reflect the *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices Final Report*, dated May 19, 2016. LaRC has an established catch basin cleaning program that is completed through a grounds maintenance contract. All 761 catch basins 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

Timeframe: July 1, 2019 to June 30, 2020

Project/BMP: Land Use Change - Impervious to Grass Credit

From July 1, 2019 to June 30, 2020, a total of two (2) impervious structures are listed in the Center’s Demolition Plan. The plan is to return these areas to a grass condition. The structures equate to a total of 0.61 acres of impervious areas converted to grass.

Building	Name	Estimated Demolish Date	Acres Reduced
1194	FLOYD L. THOMPSON TECHNICAL LIBRARY	11/1/2019	0.53
1194A	TRAINING CLASSROOMS	11/1/2019	0.08
Total			0.61

	Loading Rate for Land Conversion	Loading Equation	Reduction Credit Earned
T N	6.06 lbs/ac/year	.61 ac * 6.06 TN/ac/yr	3.70 TN/yr
T P	1.17 lbs/ac/year	.61 ac * 1.17 TP/ac/yr	.71 TP/yr
T S S	430.00 lbs/ac/year	.61 ac * 430.00 TSS/ac/yr	262.30 TSS/yr

Timeframe: July 1, 2020 to June 30, 2021

Project/BMP: Land Use Change - Impervious to Grass Credit

From July 1, 2019 to June 30, 2020, a total of two (2) impervious structures are listed in the Center's Demolition Plan. The plan is to return these areas to a grass condition. The structures equate to a total of 1.34 acres of impervious areas converted to grass.

Building	Name	Estimated Demolish Date	Acres Reduced
1200	RESEARCH FACILITY	6/30/2021	1.1
1235	RESEARCH COMPLEX	June 2021	.24
Total			1.34

	Loading Rate for Land Conversion	Loading Equation	Reduction Credit Earned
TN	6.06 lbs/ac/year	1.34 ac * 6.06 TN/ac/yr	8.12 TN/yr
TP	1.17 lbs/ac/year	1.34 ac * 1.17 TP/ac/yr	1.57 TP/yr
TSS	430.00 lbs/ac/year	1.34 ac * 430.00 TSS/ac/yr	576.20 TSS/yr

Timeframe: July 1, 2021 to June 30, 2022

Project/BMP: Land Use Change - Impervious to Grass Credit

From July 1, 2021 to June 30, 2022, a total of four (4) impervious structures are listed in the Center's Demolition Plan. The plan is to return these areas to a grass condition. The structures equate to a total of 7.81 acres of impervious areas converted to grass.

Building	Name	Demolish Date	Acres Reduced
1200A	RESEARCH COMPLEX	12/1/2021	0.02
1202	RESEARCH LAB	12/1/2021	3.01
1202A	PEARL YOUNG CONFERENCE CENTER	12/1/2021	0.16
1299	RESEARCH COMPLEX	12/1/2021	0.75
Total			5.04

	Loading Rate for Land Conversion	Loading Equation	Reduction Credit Earned
TN	6.06 lbs/ac/year	5.04 ac * 6.06 TN/ac/yr	30.54 TN/yr
TP	1.17 lbs/ac/year	5.04 ac * 1.17 TP/ac/yr	5.89 TP/yr
TSS	430.00 lbs/ac/year	5.04 ac * 430.00 TSS/ac/yr	2167.20 TSS/yr

Project/BMP: Phase I North 40 Land Conversions (Land Use Change - Pervious to Forest) – Phase 1

LaRC has been converting several areas of its "North 40" that are currently mowed (pervious areas) to forested cover. These areas have no value in being mowed/maintained and would serve better as forested habitat. This is a multi-stage project within the Reforestation Plan to convert 1.0 acres from grass to hardwood forested areas by planting 400 seedlings (per Guidance Document Table V.F.2, a minimum of 400 seedlings per acre reclassify the land as forest land). LaRC works with the Virginia Department of Forestry when evaluating tree costs and species, and ideal planting techniques for scope of work development.

Part 1: Land Use Change Credits – Pervious to Forest

	Loading Rate for Land Conversion (Efficiency)	Loading Equation	Reduction Credit
TN	5.18 lbs/ac/year	1.0 ac * 5.18 TN/ac/yr	5.18 lbs TN/yr
TP	0.40 lbs/ac/year	1.0 ac * 0.40 TP/ac/yr	0.40 lbs TP/yr
TSS	78.30 lbs/ac/year	1.0 ac * 78.30 TSS/ac/yr	78.30 lbs TSS/yr

Part 2: Forest Buffer (Upland Acre treatment ratio of 2:1) Efficiency Credit

1.0 acres * 2 = 2.0 upland acres treated (verified)

Forest Buffer Efficiency	TN	TP	TSS
	25%	50%	50%

	Loading Rate	BMP Efficiency	Adjusted Loading Rate after BMP Install
TN	7.65 lbs/ac	.25	1.94
TP	0.51 lbs/ac	.50	0.23
TSS	72.28 lbs/ac	.50	36.14

	Treatment Acres	Adjusted Loading Rate	Loading Equation	Forest Buffer Reduction Credit
TN	2.0 acres Pervious	1.94	2.0 ac * 1.94 TN/Ac/yr =	3.88 lbs TN/yr
TP	2.0 acres Pervious	.23	2.0 ac * .23 TP/ac/yr =	0.46 lbs TP/yr
TSS	2.0 acres Pervious	36.14	2.0 ac * 36.14 lbs/ac/yr =	72.28 lbs TSS/yr

Timeframe: July 1, 2022 to June 30, 2023

Project/BMP: Phase I North 40 Land Conversions (Land Use Change - Pervious to Forest) – Phase 1

LaRC has been converting several areas of its “North 40” that are currently mowed (pervious areas) to forested cover. These areas have no value in being mowed/maintained and would serve better as forested habitat. This is a multi-stage project within the Reforestation Plan to convert 1.0 acres from grass to hardwood forested areas by planting 400 seedlings (per Guidance Document Table V.F.2, a minimum of 400 seedlings per acre reclassify the land as forest land). LaRC works with the Virginia Department of Forestry when evaluating tree costs and species, and ideal planting techniques for scope of work development.

Part 1: Land Use Change Credits – Pervious to Forest

	Loading Rate for Land Conversion	Loading Equation	Reduction Credit
TN	5.18 lbs/ac/year	1.0 ac * 5.18 TN/ac/yr	5.18 lbs TN/yr
TP	0.40 lbs/ac/year	1.0 ac * 0.40 TP/ac/yr	0.40 lbs TP/yr
TSS	78.30 lbs/ac/year	1.0 ac * 78.30 TSS/ac/yr	78.30 lbs TSS/yr

Part 2: Forest Buffer (Upland Acre treatment ratio of 2:1) Efficiency Credit

1.0 acres * 2 = 2.0 upland acres treated (verified)

Forest Buffer Efficiency	TN	TP	TSS
	25%	50%	50%

	Loading Rate	BMP Efficiency	Adjusted Loading Rate after BMP Install
TN	7.65 lbs/ac	.25	1.94
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TSS	72.28 lbs/ac	.50	36.14
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	Treatment Acres	Adjusted Loading Rate	Loading Equation	Forest Buffer Reduction Credit
TN	2.0 acres Pervious	1.94	2.0 ac * 1.94 TN/Ac/yr =	3.88 lbs TN/yr
TP	2.0 acres Pervious	.23	2.0 ac * .23 TP/ac/yr =	0.46 lbs TP/yr
TSS	2.0 acres Pervious	36.14	2.0 ac * 36.14 lbs/ac/yr =	72.28 lbs TSS/yr

Summary Table Loads Reductions through June 30, 202

Sub source	Pollutant	Total Load Reduction Achieved 2009 through Permit Cycle 1	Load Reductions Planned Permit Cycle 2	Cumulative Load Reductions Planned/Achieved by 6/30/2023	Reduction required by 6/30/2023 (lbs/yr)
Regulated Urban Impervious	TN	100	46	146	57
Regulated Urban Pervious		31	18	49	46
Regulated Urban Impervious	TP	22	8.8	31	21
Regulated Urban Pervious		3.1	1.7	4.8	3.7
Regulated Urban Impervious	TSS	7557	3242	10799	7952
Regulated Urban Pervious		527	301	828	639

Part II A. 11 (f) 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 additional BMPs proposed to meet the reductions not previously approved by the department in the first phase of the Chesapeake Bay TMDL action plan. The opportunity for public comment was provided on 9/2/19, 9/3/2019, 9/4/2019, 9/5/2019, and 9/6/2019 via the communication website for LaRC employees called the @LaRC announcement system. This announcement page is viewable and accessible to all LaRC employees. The announcements for public involvement received 101 clicks. The public was given until 9/23/2019 to respond. No (zero) comments were received. As such no follow-up meetings or forums were needed. No edits were made to the Plan based off of public feedback.

Below is an example announcement:

[Employee Input Needed: LaRC's Chesapeake Bay Action Plan](#)

The Chesapeake Bay Total Maximum Daily Load (TMDL) requires NASA LaRC to develop a **Chesapeake Bay TMDL Action Plan** ("CB Action Plan"). In CB Action Plan - Phase II, LaRC provides an overview of several [management practices](#) and [retrofit programs](#) that are to be implemented from 2018 to 2023 to achieve the reduction of pollutants of concern for the Chesapeake Bay (e.g. sediment and nutrients).

Prior to submitting the CB Action Plan - Phase II, LaRC's Environmental Office is providing the opportunity for public input. You can find more detailed information and read LaRC's Action Plan by [CLICKING HERE](#) (link directs you to our public webpage).

If you have any *feedback* on the management practices that are proposed in the Plan, please email peter.vandyke@nasa.gov or call 4-7517. Any comments or feedback need to be received by 9-23-2019.

Thank you in advance for your ideas and suggestions!

Keywords: [ms4](#), [water](#), [stormwater](#), [quality](#), [input](#), [pollution](#), [deg](#), [program](#), [plan](#), [chesapeake bay action plan](#)

Posted by [Peter Ryan Van Dyke](#) on 9-2-2019 at 12:00 AM.
Edited by [Peter Ryan Van Dyke](#) on 8-27-2019 at 9:28 AM.
Viewed 38 times.

Real and Projected Costs

The following table depicts actual costs for TMDL compliance-related projects that have been implemented since July 1, 2009.

Time Period	Project	Cost (\$)	Notes
July 1, 2009 – June 30, 2010	Demolition – Land Use Conversion of Impervious to Grass (total of 28 facilities)	1,336,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2009 – June 30, 2010	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2010 – June 30, 2011	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	20,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2010 – June 30, 2011	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2011 – June 30, 2012	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	46,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2011 – June 30, 2012	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2012 – June 30, 2013	Demolition – Land Use Conversion of Impervious to Grass (total of 10 facilities)	231,000	This cost includes all demolition costs, contract fees, and site restoration work.

Time Period	Project	Cost (\$)	Notes
July 1, 2012 – June 30, 2013	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2013 – June 30, 2014	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	350,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2013 – June 30, 2014	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2013 – June 30, 2014	Forest Buffer	450	Labor was in-house Environmental staff. Only the costs of the trees.
July 1, 2014 – June 30, 2015	Demolition – Land Use Conversion of Impervious to Grass (total of 1 facility)	400,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2014 – June 30, 2015	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2014 – June 30, 2015	Tree Boxes x 4	180,000	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)	1,005,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2015 – June 30, 2016	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2015 – June 30, 2016	Land Use Conversion of Pervious to Forest	5477.55	1-acre reforestation (hardwood)

Time Period	Project	Cost (\$)	Notes
July 1, 2016 – June 30, 2017	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	580,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2016 – June 30, 2017	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2016 – June 30, 2017	Land Use Conversion of Pervious to Forest	890.25	1-acre reforestation (pines and hardwood)
July 1, 2017 – June 30, 2018	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2017 – June 30, 2018	Land Use Conversion of Pervious to Forest	2362.23	1-acre reforestation (pines and hardwood)
Total cost paid		4,202,180	

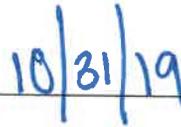
The following table depicts estimated costs for projects that are planned from July 1, 2018 to the close of the MS4 permit cycle 2.

Time Period	Project	Cost	Notes
July 1, 2018 – June 30, 2019	Demolition – Land Use Conversion of Impervious to Grass (total of 1 facility)	372,368	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2018 – June 30, 2019	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2019 – June 30, 2020	Demolition – Land Use Conversion of	500,000	This cost includes all demolition costs,

Time Period	Project	Cost	Notes
	Impervious to Grass (total of 2 facilities)		contract fees, and site restoration work.
July 1, 2019 – June 30, 2020	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2010 – June 30, 2021	Demolition – Land Use Conversion of Impervious to Grass (total of 2 facilities)	500,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2020 – June 30, 2021	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2021 – June 30, 2022	Demolition – Land Use Conversion of Impervious to Grass (total of 4 facilities)	800,000	This cost includes all demolition costs, contract fees, and site restoration work.
July 1, 2021 – June 30, 2022	Land Use Conversion of Pervious to Forest	2,500	1-acre reforestation (hardwood)
July 1, 2021 – June 30, 2022	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
July 1, 2022 – June 30, 2023	Land Use Conversion of Pervious to Forest	2,500	1-acre reforestation (hardwood)
July 1, 2022 – June 30, 2023	Street Sweeping/catch basin cleaning Program	5,000	Annual cost for street sweeping and catch basin cleaning via contract.
Total cost projected =		2,202,368	

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."



Peter Van Dyke, Acting Environmental Branch Head

Date