Benthic Total Maximum Daily Load (TMDL) Action Plan

Stormwater Management / MS4 Permit Compliance

City of Fairfax
10455 Armstrong Street
Fairfax, VA 22030-3630

Version 02/2025

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Report Certification

As required by the MS4 General Permit, Part IV. K. 4.

"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."

Name: Satoshi Eto

Signature: 

Digitally signed by Satoshi Eto
Date: 2025.02.06 13:30:59 -05'00'

Title: Public Works Program Manager

Date:

Acronyms

Acronym	Meaning
Ac.	Acre
BMP	Best Management Practice
CBPA	Chesapeake Bay Preservation Act
City	City of Fairfax, Virginia
CWA	Federal Clean Water Act
DEQ	Virginia Department of Environmental Quality
EPA	Environmental Protection Agency
FY	Fiscal Year
HP-SWPPP	High Priority Stormwater Pollution Prevention Plan
HUC	Hydrologic Unit Code
LA	Load Allocation
Lat.	Latitude
Lbs.	Pounds
Long.	Longitude
MCM	Minimum Control Measure
MOS	Margin of Safety
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
MS4 General Permit	VPDES General Permit for Discharges of Stormwater from Small MS4s
NVSWCD	Northern Virginia Soil and Water Conservation District
SOP	Standard Operating Procedure
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
VCAP	Virginia Conservation Assistance Program
VDOT	Virginia Department of Transportation
VESMP	Virginia Erosion and Stormwater Management Program
VPDES	Virginia Pollutant Discharge Elimination System
WLA	Wasteload Allocation
Yr.	Year

1.0 Introduction

The City of Fairfax (City) is an independent 6.24 square mile city of approximately 24,000 residents in the heart of Northern Virginia (Figure 1). It includes neighborhoods in four Potomac River tributary watersheds:

- Accotink Creek (Virginia Hydrologic Unit Code (HUC) PL30)
- Difficult Run (HUC PL22)
- Lower Bull Run (HUC PL46)
- Pohick Creek (HUC PL29) (Figure 2).

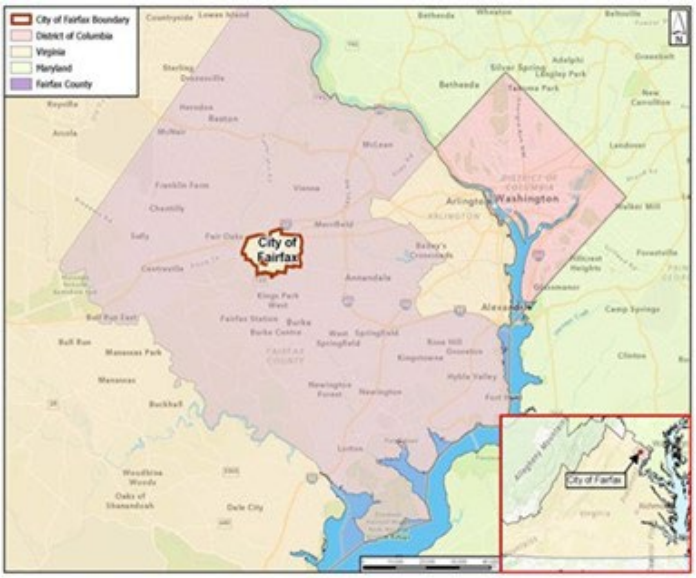


Figure 1. The City of Fairfax, located in Northern Virginia, is surrounded by Fairfax County

The City operates a small municipal separate storm sewer system (MS4) that collects stormwater from both private stormwater infrastructure and other MS4s, including Fairfax County and the Virginia Department of Transportation (VDOT).

Discharges from the MS4 are authorized under the Virginia Pollutant Discharge Elimination System (VPDES) program. As such, the City applied for and has maintained coverage for MS4 discharges under the appropriate VPDES General Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit) since the initial MS4 General Permit was approved by the State Water Control Board in 2003.

2.0 City of Fairfax Stormwater Pollutant Reduction Efforts

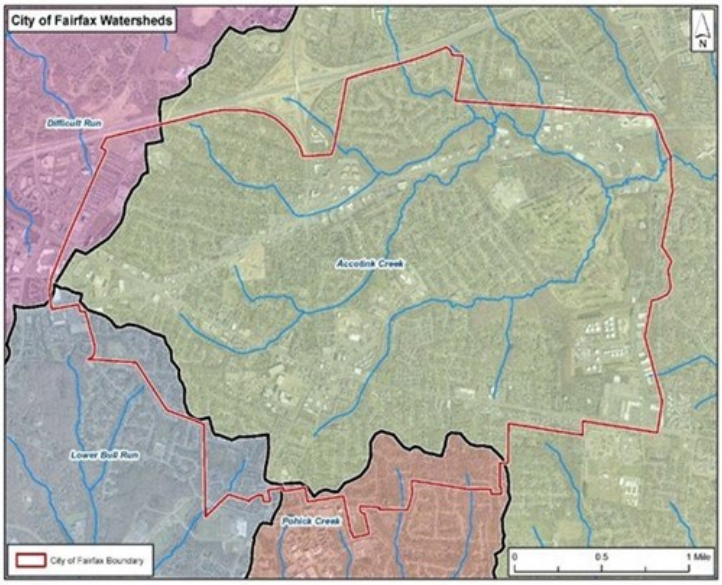


Figure 2. The City of Fairfax intersects four 6th Order Hydrologic Unit Codes in the Potomac River watershed

The City has developed an MS4 Program Plan to document its strategies and implementation schedules for addressing the MS4 General Permit conditions. The MS4 Program Plan includes best management practices (BMPs) for each of the permit's six minimum control measures (MCMs) (Table 1). These BMPs have varying impacts on reducing individual pollutants of concern found in Total Maximum Daily Loads (TMDLs) based on the BMP, the pollutant of concern, and the City's BMP implementation strategy. The MS4 General Permit contains additional information regarding the implementation and schedule of these BMPs.

Table 1. BMPs Implemented by the City of Fairfax to Meet the MS4 General Permit MCMs

BMP	BMP Title
MCM #1 - Public Education and Outreach	
BMP 1A	Public Education and Outreach Program
MCM #2 - Public Involvement and Participation	
BMP 2A	Public Involvement Procedures
BMP 2B	Stormwater and Floodplain Management Webpage
BMP 2C	Stormwater Public Participation Initiative
MCM #3 - Illicit Discharge Detection and Elimination	
BMP 3A	Geographic Information System Mapping
BMP 3B	MS4 Outfall Data Management Tracking
BMP 3C	Downstream MS4 Interconnection – Operator Notification
BMP 3D	Prohibition of MS4 Illicit Discharges
BMP 3E	Illicit Discharge Detection and Elimination
BMP 3F	Dry Weather Screening
MCM #4 - Construction Site Stormwater Runoff and Erosion and Sediment Control	
BMP 4A	DEQ – Authorized Virginia Erosion and Stormwater Management Program (VESMP)
MCM #5 - Post-Construction Stormwater Management (SWM) for New Development and Development on Prior Developed Lands	
BMP 5A	DEQ-Authorized VESMP
BMP 5B	City-Owned/Operated SWM Facility Inspections
BMP 5C	City-Owned/Operated SWM Facility Maintenance
BMP 5D	Private SWM Facility Inspection and Long-Term Compliance
MCM #6 - Pollution Prevention and Good Housekeeping for Facilities Owned or Operated by the Permittee within the MS4 Service Area	
BMP 6A	Pollution Prevention and Good Housekeeping Standard Operating Procedures
BMP 6B	High Priority City Facility Evaluations
BMP 6C	HP-SWPPP for the City Property Yard
BMP 6D	Turf and Landscape Nutrient Management Plans
BMP 6E	Contractor Management and Oversight
BMP 6F	Stormwater Management Training

Additionally, the City of Fairfax is a Tidewater, Virginia, locality, as defined by the Chesapeake Bay Preservation Act (CBPA). Resource Protection Areas (RPAs) have been established along sensitive water resources throughout the City. RPAs provide buffers between development and receiving waters to further reduce pollutants from anthropogenic sources entering impaired watersheds. Additional information regarding the City's CBPA Program and riparian buffers is available at: https://www.fairfaxva.gov/government/public-works/stormwater-and-floodplain-management/chesapeake-bay-ordinance.

Many of the City's local streams are impaired by sediment. Therefore, many strategies outlined in Section 2.0 of the City's MS4 Program Plan already address sediment reduction. Pollutant reduction strategies implemented in the City's Chesapeake Bay TMDL Action Plan also reduce sediment discharges and play a significant role in local TMDL Action Plan implementation. The City's Public Works Department

provides street sweeping and storm drain cleaning services. The City has developed and is considering the following draft Standard Operating Procedures (SOPs) as additional means of calculating currently achieved, but not credited, sediment load reductions:

- *City of Fairfax Storm Drain Cleaning*, aimed at calculating the pollutant load reductions associated with City storm drain cleaning and street sweeping.
- *Calculating VSMP Pollutant Reductions Creditable to Chesapeake Bay Existing Source Load Reductions*, which calculates pollutant load reductions associated with the implementation of stormwater management as part of redevelopment projects within the City.

These services are currently not included in this TMDL Action Plan as they are undergoing review. If the City determines that documenting the actual pollutant load removal rates from these activities will benefit it sufficiently, it will integrate them into the Benthic TMDL Action Plan.

3.0 City of Fairfax TMDLs

The current MS4 General Permit, effective November 1, 2023, includes updated compliance requirements for MS4 operators that discharge to surface waters for which a Total Maximum Daily Load (TMDL) study has been approved by the Environmental Protection Agency (EPA). TMDLs are developed for surface waters that are "impaired" (i.e., do not meet their designated uses under the federal Clean Water Act (CWA) and State Water Control Law). TMDLs identify the cause and source of surface water impairment and calculate the maximum loading rates of the identified pollutant of concern that can be discharged into the impaired waterbody while meeting its designated uses.

TMDL = Wasteload Allocation (WLA) + Load Allocation (LA) + Margin of Safety (MOS)	
where	
WLA	The amount of the total pollutant load that can be discharged to the receiving water from VPDES-regulated point sources, such as the discharges from the City's MS4.
LA	The amount of the total pollutant load that can be discharged to the receiving water from unregulated non-point sources.
MOS	Provides a margin of safety in the TMDL.

The MS4 General Permit conditions require the City to develop and implement TMDL Action Plans for waterbodies when EPA-approved TMDLs allocate a wasteload to the MS4. These TMDL Action Plans are implemented in multiple phases over more than one MS4 General Permit cycle using an adaptive iterative approach to achieve adequate progress to reduce discharge of the pollutant identified in the TMDL through implementation of BMPs in a manner consistent with the assumptions and requirements of the TMDL and compliant with the MS4 General Permit. Part II.B. of the current MS4 General Permit requires that the City evaluates the progress demonstrated through its existing TMDL Action Plans and update them to continue progression towards meeting the WLAs and implement the requirements of the MS4 General Permit for local TMDLs associated with:

- Bacteria
- Sediment
- Chloride

The Virginia DEQ has developed, and the EPA has approved eight TMDLs for local waterbodies that receive discharges from the City's MS4 (Figure 3).

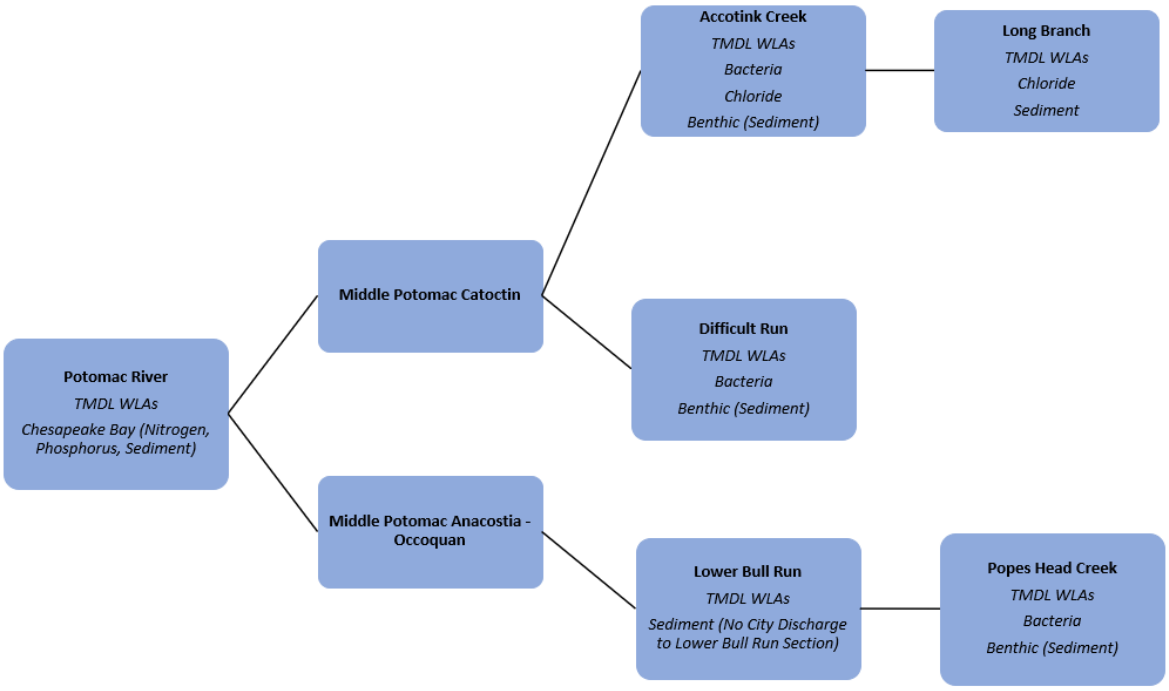


Figure 3. Waterbodies with TMDL Wasteloads or Pollutant Reductions Allocated to City of Fairfax MS4 Discharges

4.0 City of Fairfax Benthic TMDL Action Plan

This TMDL Action Plan documents the City's strategies and efforts for addressing TMDLs developed to address local benthic macroinvertebrate population impairments. Sediment is the pollutant of concern, and an associated wasteload has been allocated to the City's MS4 for the following Benthic TMDLs:

- Sediment TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia
- Benthic TMDL Development for Difficult Run, Virginia
- Benthic TMDL Development for Bull Run, Virginia
- Benthic TMDL Development for Popes Head Creek, Virginia

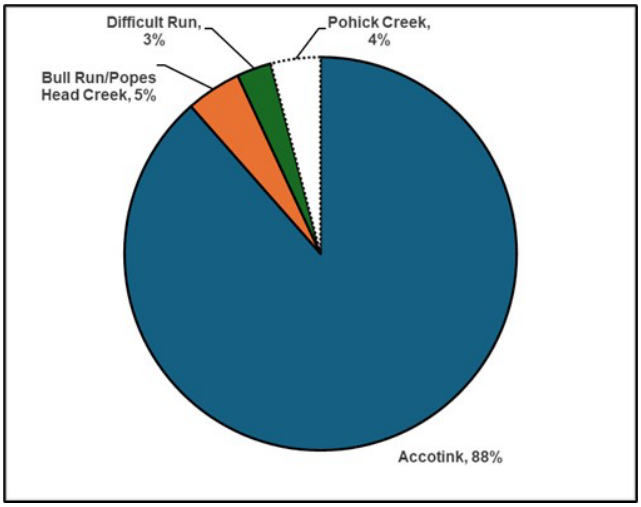


Figure 4. Ninety-six percent (96%) of the City served by the MS4 Discharges to the Impaired Watersheds of Popes Head Creek, Difficult Run, and Accotink Creek

Ninety-six percent (96%) of the City of Fairfax MS4 service area discharges to benthic-impaired surface waters that have an approved TMDL identifying sediment as the pollutant of concern (Figure 4). Although a significant percentage of the City drains to benthic-impaired waters, the City's contribution to these impairments is minor, as the City's drainage areas represent just:

- 19% of the overall Accotink Creek TMDL watershed
- 2% of the overall Popes Head Creek TMDL watershed
- 0.3% of the overall Difficult Run TMDL watershed
- 0.0% of the overall Bull Run TMDL watershed

5.0 Overall Sediment Reduction Strategy

The City will continue to address stormwater quantity and quality to the extent its State-granted authorities allow. The City's legal authorities do not provide carte blanche access to privately owned property to address sediment discharges resulting from in-stream erosion that occurs on-site or from erosion that occurs downstream of the site and outside of the City due to increased stream flow and velocity.

The City will prioritize sediment reduction efforts in the Accotink Creek watershed, which includes the only benthic impaired stream section located within the City's jurisdictional boundaries. The other impaired stream sections for which a benthic TMDL has been approved and the City allocated a WLA are located downstream of the City's boundaries. 88% of the City's MS4 service area discharges into Accotink Creek. The City's ability to provide substantial water quality improvements to the impaired segments of Difficult Run, Bull Run, and Popes Head Creek is hindered as:

- The streams do not flow through the City of Fairfax, and only a minimal portion of the watersheds are in the City.
- The impaired segments are located downstream of the City.
- The TMDLs indicate that a substantial sediment source is in-stream erosion that does not occur in the City.
- Stormwater discharged through the City's MS4 does not enter the impaired section of Bull Run identified in the TMDL.

The City will use the following guidelines to allocate sediment load reductions toward meeting the wasteload allocations:

- 100% of sediment load reductions achieved from strategies aimed at reducing sediment from land-based sources, such as stormwater retrofits and BMP construction, will be applied towards the required land-based sediment load reductions.
- For stream restoration projects in the Accotink Creek watershed, 76% of the total load reduction achieved by the project, which is equivalent to the required TMDL in-stream sediment reduction percentage, will be allocated towards the in-stream reduction requirement. The remaining sediment reduction will be allocated towards the land-based reduction requirements.

5.1 Public Outreach Strategy

The City addresses sediment pollution as part of its public education and outreach, and public participation initiatives. The City has integrated benthic TMDL awareness and sediment pollution prevention/good housekeeping into their staff training and pollution prevention programs implemented under MCMs 4, 5, and 6. The MS4 Program Plan contains additional information specific to these efforts. The City utilizes regulatory sources, general pollutant reduction outreach, and staff training to enhance the public's education on methods to eliminate and reduce sediment discharges. The City's Stormwater and Floodplain Management website provides regulatory information, including descriptions, applications, and other regulatory documents specific to:

- City's Ordinances for Stormwater Management
- Erosion and Sediment Control
- Chesapeake Bay Preservation Act

The City also uses their Stormwater and Floodplain Management website to provide additional information regarding the City's non-regulatory programs for minimizing the sources of sediment, including:

- Webpages specific to the City's Watershed Management Planning and Stream Restoration Frequently Asked Questions
- Webpages specific to how citizens and children can protect water quality

The City provides information and direction through its Environment and Sustainability website to direct property owners to programs designed to actively minimize sources of sediment, including promoting participation in the:

- Virginia Conservation Assistance Program (VCAP)
- Northern Virginia Soil and Water Conservation District (NVSWCD) Regional Rain Barrel workshops
- The City offers reductions in annual Stormwater Utility fees to property owners who participate in these regional programs.

5.2 Sediment TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia

The Accotink Creek Benthic TMDL allocates wasteloads to the City's MS4 in two of the three impaired sections in the Accotink Creek watershed (Table 2). The Upper Accotink Creek (segments VAN-A15R_ACO05A04, VAN-A15R_ACO04A02, VAN-A15R_ACO03A02, and VAN-A15R_ACO02A00) and Long Branch (segment VAN-A15R_LOE01A02). The Upper Accotink Creek impaired section begins at the creek's headwaters in the City and proceeds downstream 11.59 miles to the start of Lake Accotink in Fairfax County(Figure 5). The Long Branch impaired section is in Fairfax County between Guinea Road and the confluence with Accotink Creek and receives City stormwater from 47 acres of the total 2,458-acre Long Branch watershed. Of these 47 acres, 11 acres are public property associated with transportation and State Route 236 and a few segments of secondary residential roads. The remaining 36 acres is comprised of privately owned properties zoned for a mixture of commercial and low- and high-density residential land uses, some of which is not served by the City's MS4.

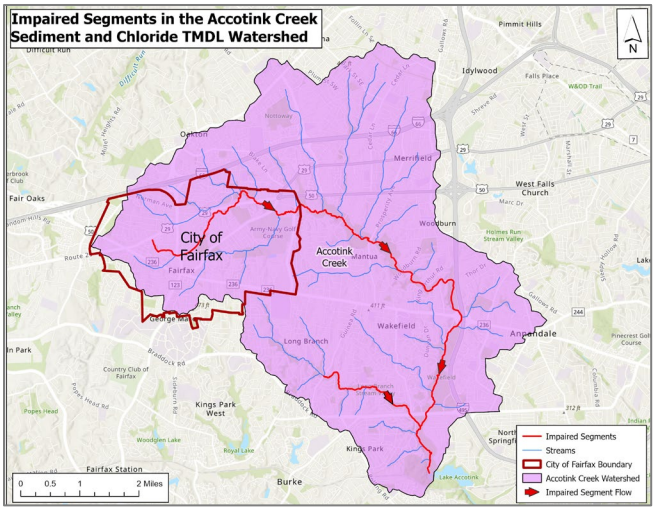


Figure 5. Impaired Sediment in the Accotink Creek Benthic TMDL Watershed

Table 2. Summary of the Sediment TMDL for the Accotink Creek Watershed

MS4 Permit Special Condition Requirement	Individual TMDL
TMDL	Sediment TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia
EPA Approval Date	5/23/2018
Waterbody	Accotink Creek
Pollutant	Sediment
Calculated Baseline Load	Upper Accotink - 2,667 tons/yr.
	Long Branch - 158 tons/yr.
WLA	Upper Accotink - 634 tons/yr.
	Long Branch - 42 tons/yr.
Percent Reduction	Upper Accotink - 76%
	Long Branch - 73%
WLA Type	Aggregate
Additional Aggregated WLA MS4 Operators	VDOT1

[1] The Sediment TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia aggregated wasteload for the City of Fairfax does not delineate the 48.92 acres of unincorporated Fairfax County that are within the City's jurisdictional boundary.

5.2.1 Potential Significant Sources of Sediment

Based on the MS4 General Permit definition of 'significant source of pollutants of concern', the City operates one facility where the stormwater discharge could be considered a potential significant source of sediment in the Upper Accotink Creek watershed:

- City Property Yard, 3410 Pickett Road

The 10-acre Property Yard houses the City's buses, fleet, and maintenance and refuse vehicles, as well as various equipment and chemicals required to conduct the City's public works tasks. These tasks include beautification, stormwater infrastructure maintenance, road maintenance, and snow removal. The Property Yard is a potentially significant contributor to sediment loading due to the various aggregates stored on-site. The Property Yard is also comprised mostly of impervious concrete and asphalt surfaces. The site has a paved swale that runs along the southern and western portions of the site (Figure 6) and outfalls into Accotink Creek. As required by the MS4 General Permit Part I.E.6.i., the City has developed and implemented a high-priority Stormwater Pollution Prevention Plan (HP-SWPPP) for the City Property Yard. Additional information regarding the HP-SWPPP can be found in the City's MS4 Program Plan.

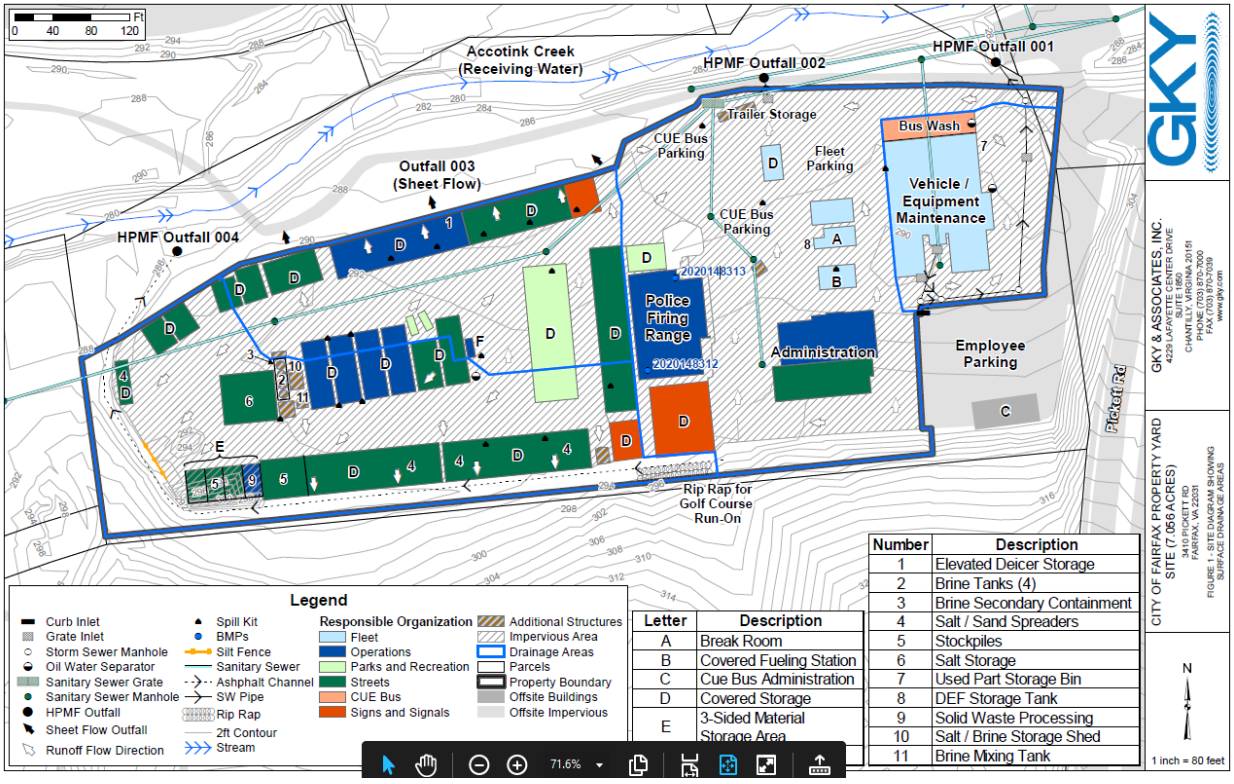


Figure 6. The City's Property Yard, Located in the Accotink Creek Watershed, Meets the MS4 General Permit Definition of a Potential High Source of Sediment

5.2.2 Evaluation of Progress Through October 31, 2023

As of October 31, 2023, the City has completed eight capital improvement projects that have resulted in the annual reduction of 206,282 lbs. (103.1 tons) of sediment discharged into the impaired segments of the Upper Accotink Creek watershed. The projects are:

- Daniels Run Stream Restoration, resulting in a 35,231 lbs./yr. sediment reduction, based on interim sediment reduction rate of 44.88 lbs./linear foot for 785 linear feet of stream restoration.[2] Using the 76% reduction in in-stream pollutant load as the baseline, this results in the mitigation equal to 26,776 lbs./yr. of in-stream sediment and 8,455 lbs./yr. in land-based sediment.
- Tusico Creek Stream Restoration - Phases I & II, resulting in an 84,599 lbs./yr. sediment reduction, based on interim sediment reduction rate of 44.88 lbs./linear foot for 1,885 linear feet of stream restoration. Using the 76% reduction in in-stream pollutant load as the baseline, this results in the mitigation equal to 64,295 lbs./yr. of in-stream sediment and 20,304 lbs./yr. in land-based sediment.
- University Drive Traffic Calming, resulting in a 403 lbs./yr. sediment reduction based on the treatment of 0.43 of impervious cover with a sediment loading rate of 1,171.32 with an urban bioretention facility with 80% effectiveness (0.43 acres x 1,171.32 lbs./ac x 80% effectiveness = 403 lbs. of sediment removed).
- City Pond Retrofit, resulting in a 1,300 lbs./yr. sediment reduction. Calculations are provided in Appendix A.
- Lion Run Outfall and Gully Stabilization, resulting in a 45,077 lbs./yr. sediment reduction. Calculations are provided in Appendix B.
- Pickett Road Outfall and Gully Stabilization, resulting in a 11,571 lbs./yr. sediment reduction. Calculations are provided in Appendix C.
- Shiloh Street Outfall and Gully Stabilization, resulting in a 28,101 lbs./yr. sediment reduction. Calculations are provided in Appendix D.

The City has also continued street sweeping and storm drain cleaning initiatives in both the Upper Accotink Creek and Long Branch watersheds to further reduce land-based sediment discharges from public infrastructure. Sediment reductions associated with these programs are not numerically quantified.

5.2.3 BMPs Anticipated to be Implemented during the 2023 MS4 General Permit Cycle to Reduce Sediment

The City anticipates the completion of ten additional capital improvement projects in the Upper Accotink Creek watershed through FY28 (Table 3). This includes nine stormwater retrofit projects and one stream restoration project. These projects will result in an additional annual reduction of 291,297 lbs. (145.6 tons) of sediment. The City utilized the TMDL percent reduction of 76% as the baseline for determining the sediment reduction assigned to the in-stream portion of the WLA. Table 4 provides the City's preliminary schedule for completion of these projects.

[2] Sediment load reductions calculated using the interim rate were calculated by multiplying the linear footage associated with the restoration activity by 44.88 lbs. per linear foot.

Table 3. Sediment Reducing Projects in the Upper Accotink Creek Watershed with Anticipated Completion Dates Prior to October 31, 2028

Project	Location		Reductions					
			Total Sediment		Assigned to In-Stream		Assigned to Land Based	
	Lat.	Long.	lbs./ yr.	tons/ yr.	lbs./ yr.	tons/ yr.	lbs./ yr.	tons/ yr.
Stafford Drive Stream Restoration	38.865	-77.292	49,357	24.68	37,512	18.8	11,846	5.92
Stafford Drive Outfall Restoration #1	38.864	-77.294	7,507	3.75	-	-	7,507	3.75
Stafford Drive Outfall Restoration #2	38.863	-77.294	21,629	10.81	-	-	21,629	10.81
Ashby Pond Wet Pond Enhancement	38.848	-77.286	47,663	23.83	-	-	47,663	23.83
Van Dyck Park Land Cover Conversion	38.855	-77.299	TBD	TBD	-	-	TBD	TBD
Van Dyck Park Outfall and Gully Stabilization (Outfall #4)	38.855	-77.299	150,864	75.43	-	-	150,864	75.43
Traveler Street Outfall and Gully Stabilization #1	38.860	-77.293	10,040	5.02	-	-	10,040	5.02
Traveler Street Outfall and Gully Stabilization #2	38.868	-77.293	4,237	2.12	-	-	4,237	2.12
Mathy Park BMP Retrofit	38.840	-77.315	391	0.20	-	-	391	0.20
Lion Run (Fairfax High School Pond) BMP Retrofit	38.863	-77.289	2,936	1.47	-	-	2,936	1.47
Total Sediment Reductions Anticipated			294,624	147.31	37,512	18.8	257,113	128.56

Table 4. Anticipated Completion Dates for Sediment Reduction Projects Identified in Table 3.

Project	Estimated Schedule of Completion				
	FY24	FY25	FY26	FY27	FY28
Stafford Drive Stream Restoration			✓		
Stafford Drive Outfalls #1 & #2 Restoration			✓		
Ashby Pond Wet Pond Enhancement			✓		
Van Dyck Park Land Cover Conversion			✓		
Van Dyck Park Outfall and Gully Stabilization (Outfall #4)				✓	
Traveler Street Outfalls #1 & #2 and Gully Stabilization				✓	
Mathy Park BMP Retrofit				✓	
Lion Run (Fairfax High School Pond) BMP Retrofit				✓	

Calculations for each of the anticipated projects are provided as follows:

- Stafford Drive Stream and Outfall Restoration – Appendix E
- Ashby Pond Wet Pond Enhancement– Appendix F
- Van Dyck Park Land Cover Conversion– To be determined upon final design.
- Van Dyck Park Outfall and Gully Stabilization – Appendix G
- Traveler Street Outfalls #1 & #2 and Gully Stabilization – Appendix H
- Mathy Park BMP Retrofit– Appendix I
- Lion Run (Fairfax High School Pond) BMP Retrofit – Appendix J

5.2.4 Progress Evaluation

Upon completion of the anticipated projects in Table 4, a total of 18 capital improvement projects in the Upper Accotink Creek watershed will have resulted in the reduction of 500,906 lbs. of sediment annually, including 372,314 lbs. attributed towards land-based source reductions (Table 5).

Table 5. Progress Evaluation Associated With the City's Efforts in Meeting the Aggregated WLA for Sediment in the Upper Accotink Watershed

Pollutant Load Description	Upper Accotink Creek Sediment					
	In-Stream		Land Based		Total	
	lbs./yr. (tons/yr.)	% of Reductions Met Towards WLA	lbs./yr. (tons/yr.)	% of Reductions Met Towards WLA	lbs./yr. (tons/yr.)	% of Reductions Met Towards WLA
Reductions Necessary to Meet Aggregated WLA[3]	2,391,766 (1,195.88)	--	1,662,074 (831)	--	4,053,840 (2,026.9)	--
Reductions Achieved through October 31, 2023	91,071 (45.54)	3.81%	115,211 (57.60)	6.93%	206,282 (103.1)	5.09%
Anticipated Reductions by October 31, 2028	37,512 (18.76)	1.57%	257,113 (128.56)	15.47%	294,624 (147.31)	7.27%
Cumulative Anticipated Reductions by October 31, 2028	128,583 (64.29)	5.38%	372,314 (186.16)	22.40%	500,906 (250.45)	12.36%

[3] Allocated to all MS4 operators in the Accotink Creek watershed

5.3 Benthic TMDL Development for Difficult Run, Virginia

The Benthic TMDL Development for Difficult Run, Virginia, dated April 2008, addresses a benthic impairment in Segment ID: VAN-A11R-01 in the lower segment of the Difficult Run watershed (Table 6). The impaired segment begins at Difficult Run's confluence with Captain Hickory Run in Fairfax County and extends 2.93 miles downstream to the Potomac River (Figure 7). The TMDL-modeled MS4 WLA requires a 64.8% reduction of in-stream erosion and a 35.2% reduction of the land-based sources of sediment (Table 7). Based on current land uses, lack of SWM infrastructure, and small watershed contribution, the City has expanded its ability to further reduce the sediment load attributed to it by the Difficult Run TMDL.

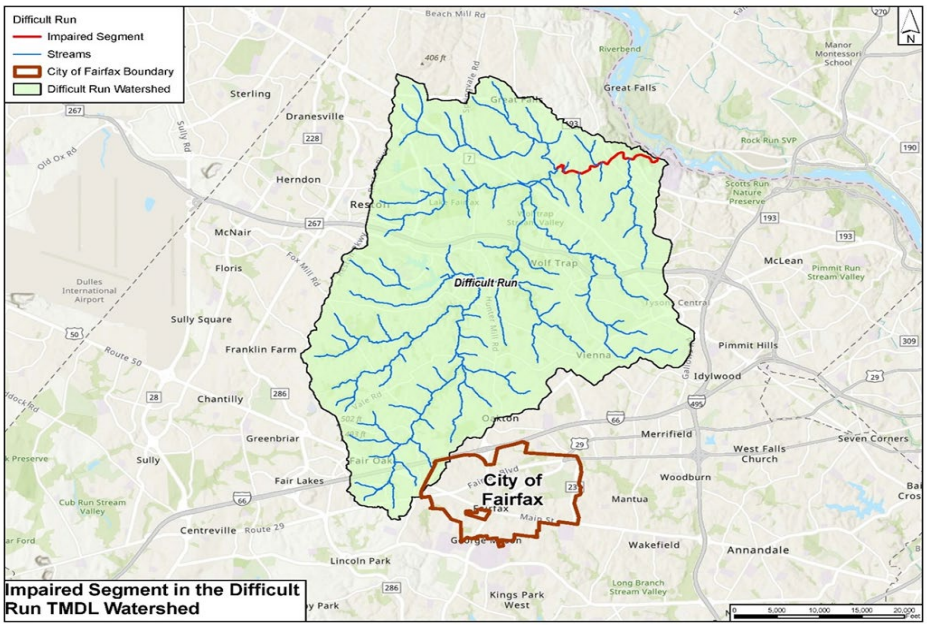


Figure 7. Impaired Segment in the Difficult Run TMDL Watershed

Table 6. Summary of the Benthic TMDL for the Difficult Run Watershed

MS4 Permit Special Condition Requirement	Individual TMDL
TMDL	Benthic TMDL Development for Difficult Run, Virginia
EPA Approval Date	11/7/2008
Waterbody	Difficult Run
Pollutant	Sediment
Calculated Baseline Load	5,316.6 tons/yr. including in-stream erosion
WLA	3,595 tons/yr. including in-stream reduction requirements
Percent Reduction	32%
WLA Type	Aggregate
Additional Aggregated WLA MS4 Operators	Fairfax County (VA0088587)
	Fairfax County Public Schools (VAR040104)
	Town of Vienna (VAR040066)
	VDOT(VAR040062)
	George Washington Memorial Parkway (VAR040111)

Table 7. Difficult Run Watershed Aggregated MS4 Existing Loads, WLA, and Reductions

Source	Existing Load		WLA		Required Reduction, %	Required MS4 Reductions	
	lbs./yr.	tons/yr.	lbs./yr.	tons/yr.		lbs./yr.	tons/yr.
In-Stream Erosion	6,895,800	3,447.90	4,661,800	2,330.90	32%	2,234,000	1,117.00
Land-Based	3,737,400	1,868.70	2,526,600	1,263.30	32%	1,210,800	605.4
Total Allocations	10,633,200	5,316.60	7,188,400	3,594.20	32%	3,444,800	1,722.40

The City has a contributing drainage area of 0.18 square miles (116.1 acres) in the upper reaches of the Difficult Run's 58.22 square mile (37,260 acres) watershed. To better estimate the TMDL's sediment reduction expectations from MS4s in the City, the City applied the City's percentage of the Difficult Run watershed (0.31%) to the overall existing load and WLA. Based on these assumptions, MS4s operating in the City of Fairfax are expected to reduce annual sediment loads by 10,651 lbs./yr., of which 3,744 lbs./yr. originates from land-based sources (Table 8).

Table 8. Difficult Run Watershed Aggregated MS4 Existing Loads, WLA, and Reductions Proportioned for the City Boundaries

Source	City Contributing Load		Portion of WLA Applied to MS4s in the City		Reduction Expectations for MS4s in the City	
	lbs./yr.	tons/yr.	lbs./yr.	tons/yr.	lbs./yr.	tons/yr.
In-Stream Erosion	21,320	10.7	14,413	7.2	6,907	3.5
Land-Based	11,555	5.8	7,812	3.9	3,744	1.9
Total Allocations	32,876	16.4	22,225	11.1	10,651	5.3

5.3.1 Potential Significant Sources of Sediment

According to the City's GIS stormwater infrastructure layers, there are no open stormwater channels or streams both within the City and within the Difficult Run watershed in which the City can reduce in-stream erosion. The City operates three facilities that comprise 39% of the total City's drainage area in the Difficult Run watershed. These City facilities are:

- Kutner Park (3901 Jermantown Road), a 10.5-acre park consisting of 12.5% impervious cover and community gardens, playgrounds, athletic facilities, multipurpose turf fields, trails, and picnic pavilions.
- Kathrine Johnson Middle School (3801 Jermantown Road), an 18.5-acre educational institution for grades 7-8 consisting of 47.9% impervious cover and includes turf soccer fields and a walking track. Stormwater runoff from a total of 5.45-acres (5.03 acres of imperviousness) is collected and detained in an underground detention facility (SWMF0339) to minimize downstream stream channel erosion and protect properties from flooding. The City inspects SWMF0339 annually and conducts the maintenance necessary to ensure continued functional operation.

- Providence Elementary School (3616 Jermantown Road), a 16.2-acre educational institution for grades Pre-K-6 consisting of 36.6% impervious cover and includes athletic fields and playgrounds. Stormwater runoff from a total of 6.32-acres (4.43 acres of imperviousness) is collected and detained in an underground detention facility (SWMF0343) to protect downstream stream channels from eroding and properties from flooding. The City inspects SWMF0343 annually and conducts the maintenance necessary to ensure continued functional operation.

The City implemented underground detention facilities at Katherine Johnson Middle School (SWMF0339) and Providence Elementary School (SWMF0343) prior to the development of the Difficult Run Benthic TMDL. The school properties do not include any practicable locations to implement additional sediment reduction practices.

Based on the MS4 General Permit definition of 'significant source of pollutants of concern', the City does not believe that the sediment load discharged from these facilities would exceed the sediment discharged from any similar institutional facility; thus, the City does not operate facilities that are potentially significant sources of sediment in the Difficult Run watershed.

5.3.2 BMPs Implemented through October 31, 2023 to Reduce Sediment

The City has developed and implemented a nutrient management plan for Kutner Park to maintain healthy turf and minimize sediment discharge from the park. The City's MS4 Program Plan provides additional information regarding the plan.

5.3.3 BMPs Anticipated to be Implemented during the 2023 MS4 General Permit Cycle to Reduce Sediment

As authorized in Part I.C.6. of the MS4 General Permit, the City is negotiating an agreement with Fairfax County in which the County would implement sufficient sediment reduction strategies in the Difficult Run watershed that would also account for the City's required reductions.

5.3.4 Implementation Schedule of Anticipated Actions

The City is currently in negotiations with Fairfax County. The City anticipates a final resolution, including a signed memorandum of understanding (MOU) with the County to be completed and in place prior to FY2028. A copy of the draft City of Fairfax / Fairfax County Memorandum of Understanding – Difficult Run Benthic Local TMDL is provided as Appendix K.

5.3.5 Progress Evaluation

Uncalculated sediment reductions have been achieved through the City's implementation of its VESMP and street sweeping, and storm drain cleaning programs. Stormwater water quantity facilities installed at the public schools assist in controlling the stormwater downstream release rate in compliance with the VESMP regulations and are protective of downstream channels.

5.4 Benthic TMDL Development for Popes Head Creek, Virginia

The Benthic TMDL Development for Popes Head Creek, Virginia, was developed to address benthic impairments existing in Popes Head Creek (Table 9). The impaired segment of Popes Head Creek (Segment ID: VAN-A23R-02) begins southwest of the City at the confluence of Piney Branch and Popes Head Creek and extends 4.9 miles downstream to the confluence with Bull Run (Figure 8). The City's MS4 serves approximately 171.5 acres that drain into the impaired water segment identified in the TMDL. The TMDL identifies in-stream erosion as the predominant source of sediment (90% of the existing sediment load), causing the benthic impairment (Table 10).

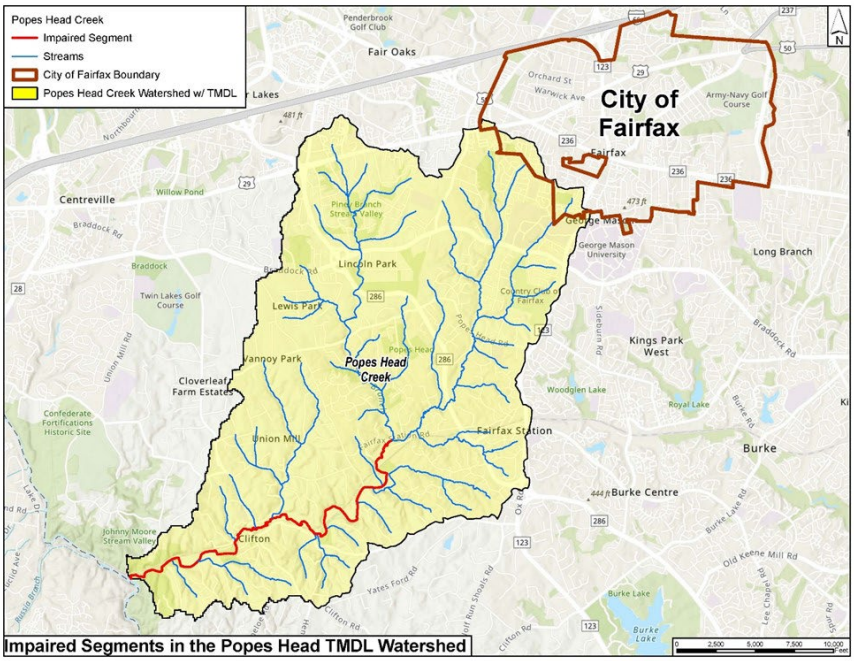


Figure 8. Impaired Segment in the Popes Head Creek TMDL Watershed

Table 9. Summary of the Benthic TMDL for the Popes Head Creek Watershed

MS4 Permit Special Condition Requirement	Individual TMDL
TMDL	Benthic TMDL Development for Popes Head Creek, Virginia
EPA Approval Date	9/26/2006
Waterbody	Popes Head Creek
Pollutant	Sediment
Calculated Baseline Load	31.3 tons/yr., including instream erosion
WLA	22.6 tons/yr., including in-stream reduction requirements
Percent Reduction	27.70%
WLA Type	Aggregate
Additional Aggregated WLA MS4 Operators	VDOT

Table 10. Pope's Head Creek Aggregated Wasteload Allocations for the City of Fairfax

Source	Existing Load		WLA		Required Reduction, %	Required MS4 Reductions	
	lbs./yr.	tons/yr.	lbs./yr.	tons/yr.		lbs./yr.	tons/yr.
In-Stream Erosion	56,200	28.1	27.7%	40,633	20.3	15,567	7.78
Land-Based	6,400	3.2	27.7%	4,627	2.3	1,773	0.89
Total Allocations	62,600	31.3	27.7%	45,260	22.6	17,340	8.67

5.4.1 Potential Significant Sources of Sediment

The City operates three facilities in the Popes Head Creek watershed:

- Providence Park – a 20-acre park consisting of 10.7% impervious cover and includes numerous trails, multi-purpose fields playgrounds, tennis courts, and picnic pavilions. The City has installed five stormwater management facilities in Providence Park
  - One dry detention pond
  - Three underground detention facilities
  - One bioretention facility
- Westmore Park – a 1-acre park consisting of 10.3% impervious cover and includes a basketball court, a picnic pavilion, a tennis court, and a playground.
- Westmore Dog Park – a 10-acre parcel that was the previous location of the City's Westmore Elementary School. The Westmore Elementary School was demolished in 2014, and the City constructed a Dog Park within the school's original footprint. The current impervious footprint is 18.7% of the total property.

Based on the MS4 General Permit definition of 'significant source of pollutants of concern,' the City does not believe that it is responsible for any discharges considered to be potential significant sources of sediment in the Popes Head Run watershed.

5.4.2 BMPs Implemented through October 31, 2023 to Reduce Sediment

Since the approval of the Benthic TMDL Development for Popes Head Creek, Virginia, the City has demolished the Westmore Elementary School and constructed the City's dog park within the school's original footprint. The overall redevelopment of the property resulted in a net reduction of impervious cover (IC) by 1.04 acres, corresponding to an annual reduction in sediment of 1,290 lbs. (Table 11). As part of the redevelopment process, the City also installed a bioretention facility designed to treat both 0.24 acres of previously untreated impervious cover and 0.27 acres of turf, resulting in an additional sediment reduction of 263 lbs./yr. (Table 12).

Table 11. Westmore Land Use Modification Sediment Reduction Calculation

Strategy	Pre-Dev Impervious Cover, ac.	Post-Dev Impervious Cover, ac.	Impervious Cover Reduction, ac.	Land Use Conversion Credit lbs./ac./yr.	Sediment Load Reduction, lbs./yr.
Land Use Conversion (IC to Turf)	3.37	2.33	1.04	1,240	1,290

Table 12. Westmore Redevelopment Sediment Load Reduction Calculation

Strategy	Impervious Urban		Pervious Urban		Total Sediment Load, lbs./yr.	BMP Percent Effectiveness	Total Sediment Removed, lbs.
	Area Treated, ac.	Loading Rate, lbs./ac./yr.	Area Treated, ac.	Loading Rate, lbs./ac./yr.			
Bioretention	0.24	1,172.32	0.27	175.8	329	80%	263

5.4.3 BMPs Anticipated to be Implemented during the 2023 MS4 General Permit Cycle to Reduce Sediment

The City Capital Improvements Program budget has scheduled the completion of the Providence Park Outfall and Gully Stabilization Project in FY27. This restoration project will result in the annual reduction of 36,054 lbs. of sediment into the Popes Head Creek watershed (Table 13).

Table 13. Anticipated Sediment Reduction Projects in the Popes Head Creek

Project	Location		Total Sediment Reduction		Reductions Assigned to Land Based		Reductions Assigned to In-Stream	
	Lat.	Long.	lbs./yr.	tons/yr.	lbs./yr.	tons/yr.	lbs./yr.	tons/yr.
Providence Park Outfall and Gully Stabilization	38.84	-77.315	36,054	16	36,054	16	-	-

The calculations for the Providence Park Outfall Restoration are provided in Appendix L.

5.4.4 Progress Evaluation

The City's pollutant reduction strategies implemented through October 31, 2023, result in sediment reductions equivalent to 87.5% of the land-based sediment reductions and 9% of the total sediment reductions necessary to meet the aggregated WLA for MS4s in the City for Pope's Head Creek watershed (Table 14). Upon completion of the Providence Park Outfall Restoration project, sediment reductions resulting from City sediment reduction strategies will be 2,131% of the necessary reductions from land-based sources and 217% of the total sediment reductions necessary to meet the aggregated WLA for MS4s in the City.

Table 14. Currently Achieved and Anticipated City of Pope's Head Creek Sediment Reductions

Evaluation	Popes Head Creek Sediment					
	In-Stream		Land Based		Total	
	lbs./yr. (tons/yr.)	% Met	lbs./yr. (tons/yr.)	% Met	lbs./yr. (tons/yr.)	% Met
Required Reductions Necessary to Meet Aggregated WLA	15,587 (7.79)	-	1,773 (0.89)	-	17,340 (8.68)	-
City-Achieved Reductions Through October 31, 2023	-	-	1,552 (0.77)	86.9%	1,552 (0.77)	8.9%
City-Anticipated Reductions Through October 31, 2028	-	-	36,054 (18.03)	2,033.8%	36,054 (18.03)	208.0%
Cumulative Reductions Anticipated Through October 31, 2028	-	-	37,606 (18.80)	2,120.7%	37,606 (18.80)	216.8%

5.5 Benthic TMDL Development for Bull Run, Virginia

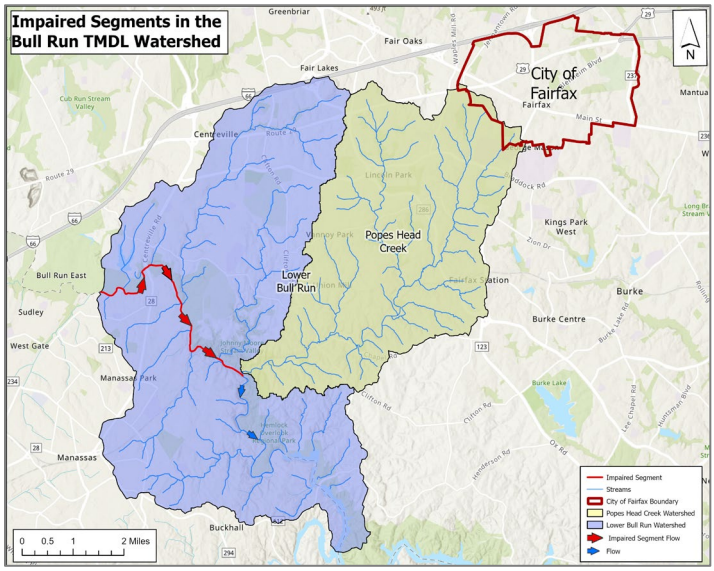


Figure 9. The Impaired Bull Run Segment in Relationship to the City of Fairfax. The City of Fairfax Does Not Discharge into the Impaired Section Identified in the TMDL

The Benthic TMDL Development for Bull Run, Virginia, dated June 2006, was developed to address benthic impairments in the Bull Run watershed (Table 15). "The impaired segment of Bull Run (Segment ID: VAN-A23R-01) is 4.8 miles in length, extending from the confluence of Cub Run with Bull Run and continuing downstream to the confluence of Popes Head Creek with Bull Run (Figure 9)."[4] Discharges from the City's MS4 do not discharge, either directly or indirectly, into the impaired section of Bull Run located between the confluence of Cub Run and the confluence of Popes Head Creek. Discharges from the City's MS4 discharge into Popes Head Creek. The City's MS4 does not discharge into the impaired segment of Bull Run and cannot attribute any of its sediment reductions towards meeting the Benthic TMDL Development for Bull Run, Virginia MS4 WLAs. However, because of the projects completed in the Pope's Head Creek watershed prior to October 31, 2023, the City has reduced the sediment load in the Bull's Run watershed downstream of the impairment by 1,552 lbs./yr. (0.78 tons/yr.). The City anticipates that completion of the Providence Park Outfall Restoration Project in FY27 will further reduce the sediment discharged into the downstream segment of Bull's Run by 26,054 lbs./yr. (13.0 tons/yr.). The City will continue implementing its VESMP and street sweeping and storm drain cleaning programs. However, these programs will not provide benefits to the upstream impaired segment of Bull Run.

Table 15. Summary of the Benthic TMDL for the Bull Run Watershed

MS4 Permit Special Condition Requirement	Individual TMDL
TMDL	Benthic TMDL Development for Bull Run, Virginia
EPA Approval Date	9/26/2006
Waterbody	Bull Run
Pollutant	Sediment
Calculated Baseline Load	67.6 tons/yr. including in-stream erosion
WLA	15.4 tons/yr. including in-stream reduction requirements
Percent Reduction	77.10%
WLA Type	Aggregate
Additional Aggregated WLA MS4 Operators	VDOT(VAR040062)

[4] Benthic TMDL Development for Bull Run Executive Summary, Page E-2.

6.0 Future Reporting Requirements

No later than 36 months of its effective date (i.e., November 1, 2026), the MS4 General Permit requires the City to submit to DEQ an update on the progress toward achieving the local TMDL Action Plan goals and the anticipated end dates by which the City will meet the associated sediment wasteload allocations and may be estimated using a multiple permit cycle iterative approach to meeting the wasteload allocation.

Appendix A. City Hall Pond Retrofit Sediment Reduction Calculations

CONSTRUCTION PLANS
CITY HALL POND RETROFIT

SP-22-00507
PIN #: 57 4 02 013 A
10455 ARMSTRONG STREET
CITY OF FAIRFAX, VIRGINIA 22030

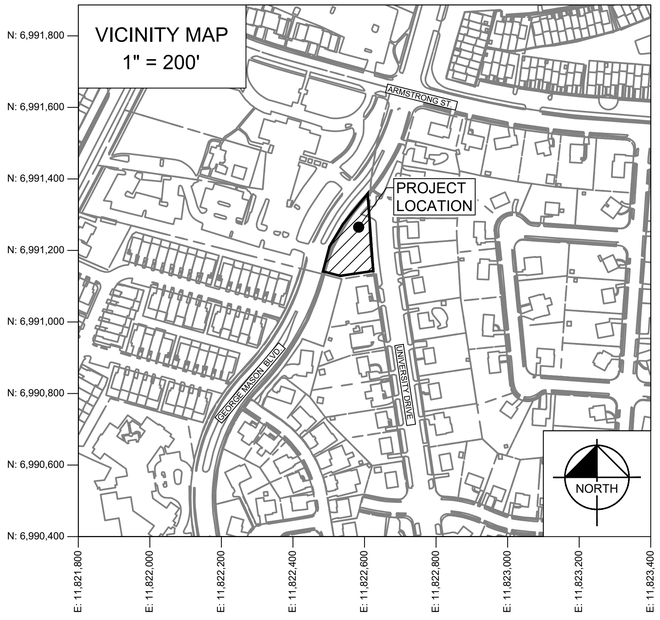
PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE MAINTENANCE, ENHANCEMENT, AND RETROFIT OF THE STORMWATER MANAGEMENT POND LOCATED AT 10455 ARMSTRONG STREET (CITY HALL POND). THE POND DRAINS APPROXIMATELY 3.49 ACRES FROM GEORGE MASON BOULEVARD AND ADJACENT NEIGHBORHOODS. THE POND RETROFIT PROJECT INCLUDES INSTALLATION OF A SEDIMENT FOREBAY AND INCREASE IN POND TREATMENT VOLUME. AS PART OF THE DESIGN, A VEGETATIVE BENCH HAS BEEN INCLUDED AND SINUOSITY HAS BEEN ADDED TO THE POND FLOOR TO INCREASE STORMWATER HYDRAULIC RESIDENCE TIME. THE ADDITION OF THE FOREBAY WILL PROVIDE A MAINTENANCE FEATURE FOR THE FACILITY THAT WILL ALLOW FOR EASE OF MAINTENANCE AFTER IMPLEMENTATION. THE POLLUTANT OF CONCERN (POC) CREDITS GENERATED FROM THE THE RETROFIT OF THIS POND WILL BE APPLIED TO THE THE CITY'S CHESAPEAKE BAY TMDL REDUCTION REQUIREMENTS. THE RETROFIT OF THIS POND WILL GENERATE 1130.94 LBS./YR. OF TOTAL SUSPENDED SOLIDS (TSS), 7.36 LBS./YR. OF NITROGEN, AND .40 LBS./YR. OF PHOSPHORUS. ALL CREDITING WAS PERFORMED IN ACCORDANCE WITH GUIDANCE MEMO NO. 20-2003 TITLED "CHESAPEAKE BAY TMDL SPECIAL CONDITION GUIDANCE" DATED FEBRUARY 6, 2021.

GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PLAN IS THE FOLLOWING:
   - 1.1. TAX MAP NUMBER: 57 4 02 013 A
   - 1.2. PARCEL AREA: 8.26 ACRES (359,805.60 SF)
   - 1.3. DEED BOOK AND NUMBER: DB 1808, PG 166
   - 1.4. ESTIMATED DISTURBED AREA: 0.45 AC
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PREPARED BY RICE ASSOCIATES ON JUNE, 2021. THE HORIZONTAL DATUM IS NAD83 WHILE THE VERTICAL DATUM IS NAVD88. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM. NOTE: KIMLEY-HORN PERFORMED A VERTICAL DATUM CONVERSION ON APRIL 11, 2022 TO CONVERT THE ORIGINAL RICE ASSOCIATES SURVEY FROM NAVD88 TO NGVD29. AN ELEVATION ADJUSTMENT OF 0.78 FEET WAS APPLIED TO ALL POINT AND ELEVATION DATA THROUGHOUT THIS PLAN SET. THE DATUM SHIFT WAS PERFORMED USING THE NOAA "ORTHOMETRIC HEIGHT CONVERSION" TOOL.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.
6. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAPS (FIRM), COMMUNITY PANEL NO. 5155240005D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240005D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).
7. TO THE BEST KNOWLEDGE OF THE ENGINEER, THERE ARE NO EXISTING GRAVES OR BURIAL SITES LOCATED ON THE PROPERTY. THE SUBJECT PROPERTY IS NOT LISTED UNDER THE NATIONAL REGISTER OF HISTORICAL PLACES.
8. TO THE BEST KNOWLEDGE OF THE ENGINEER, THIS SITE PLAN CONFORMS TO ALL APPLICABLE ORDINANCES, REGULATIONS AND ADOPTED STANDARDS, UNLESS OTHERWISE SPECIFICALLY NOTED.
9. TO THE BEST KNOWLEDGE OF THE ENGINEER, THERE ARE NO WETLANDS ON THIS SITE.
10. THERE ARE NO RESOURCE PROTECTION AREAS (RPA's) ON THE SUBJECT PROPERTY.

	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO, P.E.
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589



Sheet List Table	
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03	NOTES AND DETAILS - 2
04	EXISTING CONDITIONS
05	PHOTOSTATION LOCATION MAP
06	PHOTOSTATION LOCATION - PHOTOS
07	DEMOLITION AND ACCESS PLAN
08	EROSION AND SEDIMENT CONTROL PLAN - PHASE I
09	EROSION AND SEDIMENT CONTROL PLAN - PHASE II
10	EROSION AND SEDIMENT CONTROL - NOTES
11	EROSION AND SEDIMENT CONTROL - DETAILS I
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AGENT AUTHORIZATION LETTER

To Whom IT May Concern:

I/We, The City of Fairfax, the undersigned title owner(s) of the property identified below do hereby authorize Jon D'Alessandro of Kimley-Horn, to act as my/our agent(s) in the furtherance of an application for a Major Site Plan on my/our property located at: 10455 Armstrong Street in Fairfax, Virginia 22030

Tax Map No: 5 4 02 013 A

Thank you in advance for your cooperation.

Date: _____ By: _____

COMMONWEALTH/STATE OF: Virginia

CITY/COUNTY: City of Fairfax, TO WIT:

The forgoing instrument was acknowledged before me this _____ day of _____,

20____, by _____.

_____
Notary Public (Signature)

AFFIX NOTARY SEAL/STAMP

Notary Registration No: _____

My Commission Expires: _____

ALL TITLE OWNERS MUST SIGN IN PRESENCE OF NOTARY. IF THERE IS MORE THAN ON OWNER, FILL OUT MULTIPLE APPLICATIONS

City of Fairfax
APPROVED SITE PLAN

_____ _____
Zoning Official **Date**

Review approval by:

_____ **Fire Marshal (for water distribution system & fire hydrant location)**
_____ **Fairfax Water**
_____ **Director CDP**
_____ **Director of Public Works**
_____ **City Engineer**
_____ **PW Plan Reviewer**
_____ **Code Admin. Asst. Chief**
_____ **Site Plan Coordinator**
_____ **BAR Liaison**
_____ **Environmental Reviewer**
_____ **Wastewater Reviewer**
_____ **GIS Manager**
_____ **Bonding Administrator** _____ **Date**

CITY OF FAIRFAX
Site Plan Checklist and Certification Statement

The following affidavit and checklist must be printed on the cover page and signed by a certified engineer, architect or land surveyor.

Certification for Completeness and Accuracy

I Jon D'Alessandro do hereby certify that this site plan checklist is complete and accurate for use in staff's evaluation of the attached site plan that is required pursuant to Section 110-6.8 in the Code of the City of Fairfax.

(signature) _____ (date) _____ (SEAL)

Know what's below. Call before you dig.

COMMONWEALTH OF VIRGINIA
JONATHAN JOSEPH D'ALESSANDRO
Lic No. 052336
05/09/2022
PROFESSIONAL ENGINEER

No.	REVISIONS	DATE	BY
1	FROM CITY OF FAIRFAX	08/07/2022	KH

Kimley»Horn
© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
11400 COMMERCE PARK DR., SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

KHA PROJECT 110557005
DATE 08/25/2022
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

FAIRFAX CITY HALL POND RETROFIT
PREPARED FOR
CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

PROPERTY INFORMATION

1. TAX REFERENCE NUMBER: 57 4
2. PROPERTY PARCEL NUMBER: 57 4 02 013 A
3. ADDRESS: 10455 ARMSTRONG STREET FAIRFAX, VA 22030
4. GEOGRAPHIC COORDINATES: LATITUDE 38.841025, LONGITUDE -77.308268

PROPERTY OWNER INFORMATION

1. NAME: CITY OF FAIRFAX
2. ADDRESS: 10455 ARMSTRONG STREET FAIRFAX, VA 22030
3. TELEPHONE NUMBER: 703-385-7810

THIS PROJECT CONSISTS OF THE MAINTENANCE, ENHANCEMENT, AND RETROFIT OF THE STORMWATER MANAGEMENT POND LOCATED AT 10455 ARMSTRONG STREET (CITY HALL POND). THE POND DRAINS APPROXIMATELY 3.49 ACRES FROM GEORGE MASON BOULEVARD AND ADJACENT NEIGHBORHOODS. THE POND RETROFIT PROJECT INCLUDES INSTALLATION OF A SEDIMENT FOREBAY AND INCREASE IN POND TREATMENT VOLUME. AS PART OF THE DESIGN, A VEGETATIVE BENCH HAS BEEN INCLUDED AND SINUOSITY HAS BEEN ADDED TO THE POND FLOOR TO INCREASE STORMWATER HYDRAULIC RESIDENCE TIME. THE ADDITION OF THE FOREBAY WILL PROVIDE A MAINTENANCE FEATURE FOR THE FACILITY THAT WILL ALLOW FOR EASE OF MAINTENANCE AFTER IMPLEMENTATION. THE PROPOSED STORMWATER MANAGEMENT FACILITY WILL BE MAINTAINED THROUGH THE CITY OF FAIRFAX'S PUBLIC BMP MAINTENANCE PROGRAM.

NO MODIFICATIONS WILL BE MADE TO THE EXISTING STORM SEWER INFRASTRUCTURE ON SITE AND NO ADDITIONAL STORMWATER INFLOWS WILL BE ADDED TO THE STORMWATER MANAGEMENT FACILITY. THERE IS ONE (1) EXISTING 18" RCP INFLOW PIPE THAT DISCHARGES INTO THE FACILITY. FLOW ATTENUATION IS PROVIDED BY A 48" DIAMETER RISER STANDPIPE WITH A 1.5" DIAMETER ORIFICE PLATE AND AN 18" PRINCIPAL SPILLWAY PIPE. THE PRINCIPAL SPILLWAY PIPE TIES THE STORMWATER MANAGEMENT FACILITY BACK INTO THE CITY'S MS4 THROUGH A 36" RCP.

CITY HALL POND DISCHARGES THROUGH A SERIES OF PIPES, TO DANIELS RUN WHICH IS A MAIN TRIBUTARY OF ACCOTINK CREEK. ACCOTINK CREEK HAS A BENTHIC (SEDIMENT), CHLORIDE, AND FECAL COLIFORM TMDL. THE RETROFIT OF THIS FACILITY WILL NOT ONLY PROVIDE THE CHESAPEAKE BAY TMDL CREDIT FOR THE CITY, BUT WILL ALSO HELP ADDRESS THE CITY'S LOCAL TMDL REQUIREMENTS FOR SEDIMENT IMPAIRMENTS IN ACCOTINK CREEK.

VRRM RE-DEVELOPMENT COMPLIANCE SITE SHEET

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

2011 BMP Standards and Specifications | 2013 Draft BMP Standards and Specifications

Project Name:	City Hall Pond Retrofit - 100% Design	CLEAR ALL (Ctrl+Shift+R)	data input cells
Date:	6/7/2022		constant values
Linear Development Project?	No		calculation cells
			final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* →	0.45	*Check:*	
		BMP Design Specifications List:	2013 Draft Stds & Specs
Maximum reduction required:	10%	*Linear project?*	No
The site's net increase in impervious cover (acres) is:	0	*Land cover areas entered correctly?*	✔
Post-Development TP Load Reduction for Site (lb/yr):	0.51	*Total disturbed area entered?*	✔

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed forest/open space					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed			0.63	0.89	1.52
Impervious Cover (acres)			0.08	1.89	1.97
					3.49

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed			0.63	0.89	1.52
Impervious Cover (acres)			0.08	1.89	1.97
Area Check	OK.	OK.	OK.	OK.	3.49

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre

Pre-ReDevelopment	Listed	Adjusted[1]
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	1.52	1.52
Weighted Rv(turf)	0.24	0.24
% Managed Turf	44%	44%
Impervious Cover (acres)	1.97	1.97
Rv(impervious)	0.95	0.95
% Impervious	56%	56%
Total Site Area (acres)	**3.49**	**3.49**
Site Rv	**0.64**	**0.64**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)

Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	1.52
Weighted Rv (turf)	0.24
% Managed Turf	44%
Impervious Cover (acres)	1.97
Rv(impervious)	0.95
% Impervious	56%
Final Site Area (acres)	**3.49**
Final Post Dev Site Rv	**0.64**

Land Cover Summary-Post

Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	1.52
Weighted Rv (turf)	0.24
% Managed Turf	44%
ReDev. Impervious Cover (acres)	1.97
Rv(impervious)	0.95
% Impervious	56%
Total ReDev. Site Area (acres)	**3.49**
ReDev Site Rv	**0.64**

Land Cover Summary-Post

Post-Development New Impervious	
New Impervious Cover (acres)	0.00
Rv(impervious)	--

Treatment Volume and Nutrient Load

	Listed	Adjusted
Pre-ReDevelopment Treatment Volume (acre-ft)	0.1861	0.1861
Pre-ReDevelopment Treatment Volume (cubic feet)	8,104	8,104
Pre-ReDevelopment TP Load (lb/yr)	**5.09**	**5.09**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	1.46	1.46
Baseline TP Load (lb/yr) (**0.41 lbs/acre/yr** applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*1.43*

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	0.1861
Final Post-Development Treatment Volume (cubic feet)	8,104
Final Post-Development TP Load (lb/yr)	**5.09**
Final Post-Development TP Load per acre (lb/acre/yr)	1.46

Post-ReDevelopment Treatment Volume (acre-ft)	0.1861
Post-ReDevelopment Treatment Volume (cubic feet)	8,104
Post-ReDevelopment Load (TP) (lb/yr)*	5.09
Post-ReDevelopment TP Load per acre (lb/acre/yr)	1.46
Max. Reduction Required (Below Pre-ReDevelopment Load)	10%
TP Load Reduction Required for Redeveloped Area (lb/yr)	**0.51**

Post-Development Treatment Volume (acre-ft)	--
Post-Development Treatment Volume (cubic feet)	--
Post-Development TP Load (lb/yr)	--
TP Load Reduction Required for New Impervious Area (lb/yr)	**0**

[1] Adjusted Land Cover Summary:
Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	0.51

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	36.43
Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	36.43

VRRM RE-DEVELOPMENT COMPLIANCE DRAINAGE AREA A SHEET

Drainage Area A

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	0.63	0.89	1.52	0.24
Impervious Cover (acres)	0.00	0.00	0.08	1.89	1.97	0.95
				Total	3.49	

Total Phosphorus Available for Removal in D.A. A (lb/yr)	5.09
Post Development Treatment Volume in D.A. A (ft³)	8,104

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0	1.52	1.97	0	0	8,104	8,104	15	0.00	5.09	0.76	4.32	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	36.39	3.64	32.75

TOTAL IMPERVIOUS COVER TREATED (ac)	1.97	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.52	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	5.09	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.76	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	4.33	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	3.64

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

TOTAL IMPERVIOUS COVER TREATED (ac)	1.97	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.52	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	0.51	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	5.09	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.76	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	0.76	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	4.33	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	3.64
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	3.64

CITY HALL POND RETROFIT CHESAPEAKE BAY TMDL POLLUTANT OF CONCERN (POC) - REDUCTION CALCULATIONS

Methodology used was obtained from the *DEQ Guidance Memo No. 20-2003 - Chesapeake Bay TMDL Special Condition Guidance*, dated November 12, 2020.

BMP Retrofit Type:	BMP Enhancement	
BMP Treatment Practice:	Dry Detention Pond	
Note: Classification obtained from Table V.C.1 - Chesapeake Bay Program BMPs, Established Efficiencies		
Drainage Basin Information		
Drainage Basin =	Potomac River Basin	-
Nitrogen Loading Rate		
Regulate Impervious =	16.86	lbs/ac/yr
Regulate Pervious =	10.07	lbs/ac/yr
Phosphorus Loading Rate		
Regulate Impervious =	1.62	lbs/ac/yr
Regulate Pervious =	0.41	lbs/ac/yr
Total Suspend Solids Loading Rate		
Regulate Impervious =	1,171.32	lbs/ac/yr
Regulate Pervious =	175.8	lbs/ac/yr
Note: Loading rates obtained from Table 3b of the Virginia Administrative Code (9VAC25-890-40) General Permit		
BMP Drainage Basin Information		
Total Drainage Area =	3.49	ac
Impervious =	1.56	ac
Pervious =	1.93	ac
Total Pollutant Load In The BMP Drainage Basin		
Nitrogen =	45.74	lbs/yr
Phosphorus =	3.32	lbs/yr
Total Suspend Solids =	2,166.55	lbs/yr
Existing BMP Effiency		
Nitrogen =	5	%
Phosphorus =	10	%
Total Suspend Solids =	10	%
Note: Efficiencies obtained from Table V.C.1 - Chesapeake Bay Program BMPs, Established Efficiencies (Dry Detention Pond)		
Existing BMP Effiency Modification		
Missing Forebay=	10	%
Missing Micropool =	10	%
Missing Length/Width =	2	%
Total =	22	%
Revised Existing BMP Effiency		
Nitrogen =	3.9	%
Phosphorus =	7.8	%
Total Suspend Solids =	7.8	%
Proposed BMP Effiency		
Nitrogen =	20	%
Phosphorus =	20	%
Total Suspend Solids =	60	%
Note: Efficiencies obtained from Table V.C.1 - Chesapeake Bay Program BMPs, Established Efficiencies (Dry Extended Detention Pond)		
BMP Effiency Difference		
Nitrogen =	16.1	%
Phosphorus =	12.2	%
Total Suspend Solids =	52.2	%
Final Polutant Load Recution		
Nitrogen =	7.36	lbs/yr
Phosphorus =	0.40	lbs/yr
Total Suspend Solids =	1130.94	lbs/yr

COMMONWEALTH OF VIRGINIA
JONATHAN JOSEPH D'ALESSANDRO
Lic No. 052336
05/09/2022
PROFESSIONAL ENGINEER

No.	REVISIONS	DATE	BY
1	FROM CITY OF FAIRFAX	08/07/2022	KH

Kimley»Horn

11400 COMMERCE PARK DR., SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

KHA PROJECT 110557005
DATE 08/25/2022
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY J.A.C
CHECKED BY J.J.D

STORMWATER MANAGEMENT NOTES & CREDITING

FAIRFAX CITY HALL POND RETROFIT

PREPARED FOR
CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
16

Appendix B. Lion Run Outfall and Gully Stabilization Sediment Reduction Calculations

100% CONSTRUCTION PLANS
LION RUN SITE
OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 48 3 02 020 & 58 1 02 003
3501 LION RUN
CITY OF FAIRFAX, VIRGINIA

PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY 375 LINEAR FEET OF AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 60" RCP PIPE AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN THE VICINITY OF FAIRFAX HIGH SCHOOL IN THE CITY OF FAIRFAX, VIRGINIA. THE LIMITS OF DISTURBANCE ARE 0.85 ACRES. THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION. THE SOIL SAMPLE BULK DENSITY WAS 78.66 LB/FT^3 AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 45,077.02 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 36.06 LBS/YR OF NITROGEN, AND 14.97 LBS/YR OF PHOSPHORUS.

GENERAL NOTES

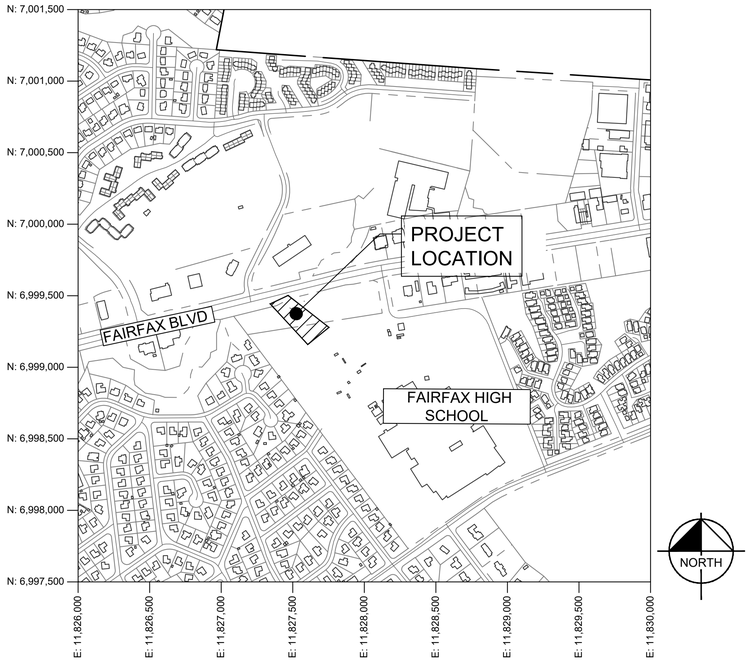
1. THE SUBJECT PROPERTIES OF THIS PROJECT IS TAX MAP NUMBER: 48 3 02 020 & 58 1 02 003
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY RICE ASSOCIATES ON JULY, 2021. THE TOPOGRAPHIC INFORMATION HAS BEEN CONVERTED FROM VERTICAL DATUM NAVD88 TO NGVD29 BY KIMLEY-HORN. THE HORIZONTAL DATUM IS NAD83. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.

DECLARATION OF NO IMPACT TO THE FLOODPLAIN NARRATIVE: THE DEVELOPMENT WITHIN THE FLOODPLAIN IS RELATED TO THE MAINTENANCE AND RESTORATION OF THE EXISTING MANMADE STORM SEWER OUTFALL CHANNEL. THE INTENT OF THE CHANNEL REPAIR AND RESTORATION IS TO RETURN THE ERODED RECEIVING CHANNEL TO A STABLE CONDITION AND PREVENT FUTURE EROSION. THE PROJECT EARTHWORK IS A NET CUT AND THE PROPOSED CHANGES IN THE FLOODPLAIN CROSS SECTIONAL AREA ARE ASSUMED AS NEGLIGIBLE WHEN COMPARED TO THE OVERALL FLOODPLAIN CROSS SECTIONAL AREA. THE PROPOSED CHANNEL REPAIR WILL NOT MODIFY THE EXISTING FLOODPLAIN HYDRAULICS, NOR WILL IT IMPACT OFFSITE PROPERTY OR THE EXISTING FLOODPLAIN BOUNDARY / BASE FLOOD ELEVATIONS. THERE WILL BE NO CHANGE TO PRE AND POST DEVELOPMENT FLOODPLAIN FLOWRATE AND VELOCITY ONSITE, UPSTREAM OR DOWNSTREAM WITHIN THE STREAM CORRIDOR. ALL WORK PROPOSED AS PART OF THIS CHANNEL MAINTENANCE PROJECT IS IN COMPLIANCE WITH CITY CODE SECTION 4.15.8 APPROVAL CRITERIA.

Checklist of Submittal Requirements		
Impervious surface in the floodplain:	0.17	ac.
Area of floodplain vegetation disturbed:	0.85	ac.
Area of floodplain land graded:	0.35	ac.
Maximum depth of cut or fill on floodplain land:	5.21 (cut)	ft.

VICINITY MAP

1" = 500'



	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX SCHOOL BOARD	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Sheet List Table	
Sheet Number	Sheet Title
01	COVER SHEET
02	GENERAL NOTES & DETAILS
03	CORRESPONDENCE
04	EXISTING CONDITIONS
05	EXISTING CONDITIONS
06	PHOTO LOCATION MAP
07	EROSION & SEDIMENT CONTROL PHASE I
08	EROSION & SEDIMENT CONTROL PHASE II
09	EROSION & SEDIMENT CONTROL NOTES & DETAILS
10	EROSION & SEDIMENT CONTROL NOTES & DETAILS
11	EROSION & SEDIMENT CONTROL NOTES & DETAILS
12	EROSION & SEDIMENT CONTROL NOTES & DETAILS
13	EXISTING HYDROLOGY
14	LAND COVER ANALYSIS (TR55)
15	EXISTING CONDITIONS HYDROGRAPH
16	POC CREDITING SUMMARY
17	OUTFALL RESTORATION
18	LANDSCAPING PLAN
19	PLANTING DETAILS
20	EXISTING TREE INVENTORY
21	EXISTING TREE INVENTORY

Know what's **below.** **Call** before you dig.

JUAN A. CAMPOS
Lic. No. 0402061628
PROFESSIONAL ENGINEER
COMMONWEALTH OF VIRGINIA
07/27/2022

No.	REVISIONS	DATE	BY
1	PUBLIC WORKS COMMENTS	06/16/2022	J.A.C
2	PUBLIC WORKS COMMENTS	07/27/2022	J.A.C

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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY RESTORATION
LION RUN SITE

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

Field Data		
Bulk Density =	78.66	*lb./ft^3*
1 ton of sediment =	0.664	*lb. of (P)*
1 ton of sediment =	1.6	*lb. of (N)*

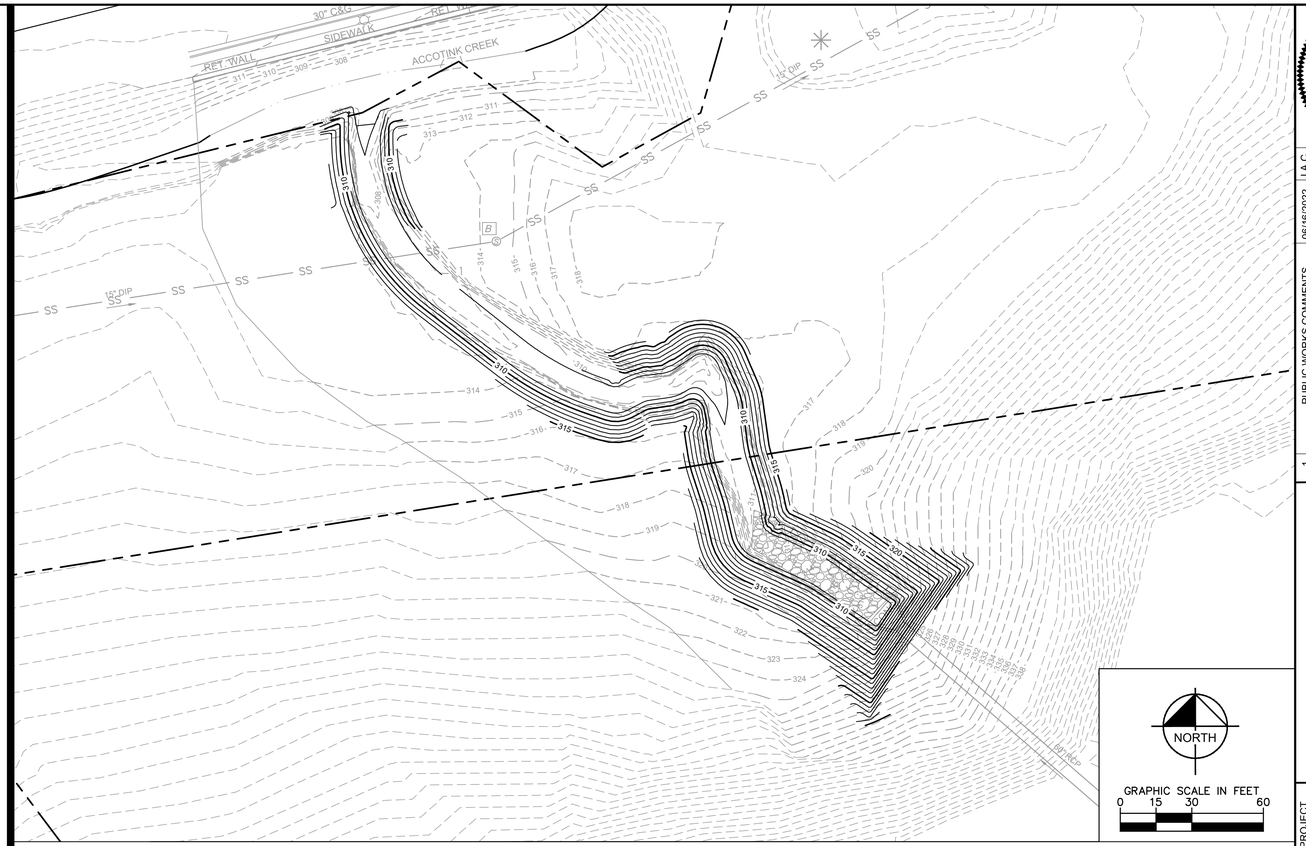
Project Information	
Project Name:	CITY OF FAIRFAX OUTFALL AND GULLY STABILIZATION
Project Number:	110557012
Date:	5/19/2022
Design By:	JJD

Existing Outfall Channel Condition Parameters

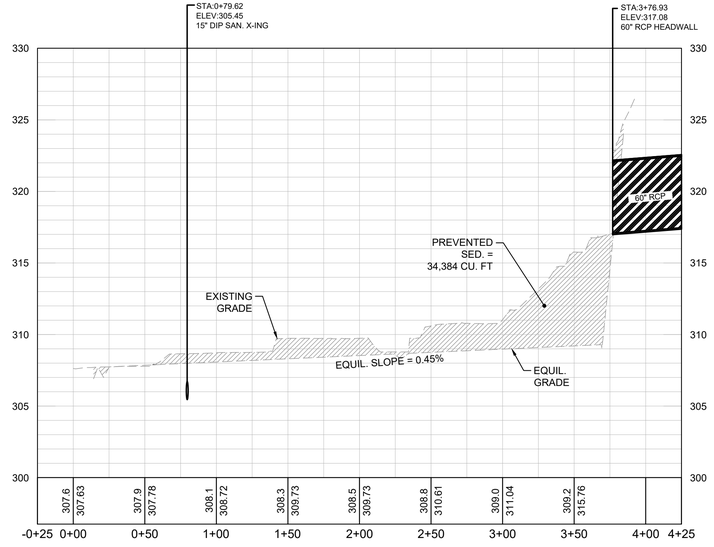
Drainage Area (A_d) =	56.8	*ac*
Drainage Area (A_d) =	0.2300	*km^2*
Mean Flow Depth =	3.500	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	376.930	*ft*
Channel Slope =	0.025	*ft/ft*
Bank Height =	5.363	*ft*
Bottom Width =	9.633	*ft*
Top Width =	27.233	*ft*
Bulk Density (Estimate) =	84.278	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0045	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	10	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	1,273.47	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	34,383.69	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	573.06	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	45,077.02	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	78.66	*lb./ft^3*
1 ton of sediment =	0.66	*lb. of (P)*
1 ton of sediment =	1.60	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	45,077.02	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	14.97	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	36.06	*lbs./year*

Pollutant of Concern (POC) Crediting Summary

Total Suspended Solids (TSS) Removal Rate =	45,077.02	*lbs./year*
Phosphorus (P) Removal Rate =	14.97	*lbs./year*
Nitrogen (N) Removal Rate =	36.06	*lbs./year*



THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 04/21/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 05/02/2022. THE SOIL SAMPLE BULK DENSITY WAS 78.66 LB/FT^3 AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.45%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 34,383.69 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 45,077.02 LB/YR OF SEDIMENT, 14.97 LB/YR OF PHOSPHORUS, AND 36.06 LB/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.



OUTFALL CHANNEL
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

JUAN A. CAMPOS
Lic. No. 0402061628
07/27/2022
COMMONWEALTH OF VIRGINIA
PROFESSIONAL ENGINEER

No.	REVISIONS	DATE	BY
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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

POC CREDITING SUMMARY

OUTFALL AND GULLY RESTORATION
LION RUN SITE

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
16

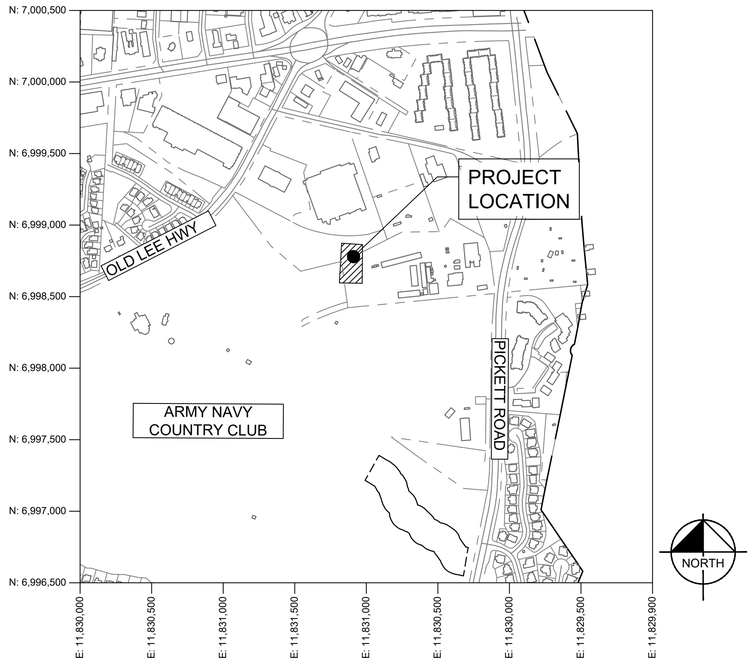
Appendix C. Pickett Road Outfall and Gully Stabilization Sediment Reduction Calculations

100% CONSTRUCTION PLANS
PICKETT ROAD SITE
OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 58 1 02 28
3410 PICKETT ROAD
CITY OF FAIRFAX, VIRGINIA

VICINITY MAP

1" = 500'



PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY 150 LINEAR FEET OF AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A CONCRETE CHANNEL AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN THE VICINITY OF THE CITY OF FAIRFAX PROPERTY YARD. THE LIMITS OF DISTURBANCE ARE 0.49 ACRES. THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION. THE SOIL SAMPLE BULK DENSITY WAS 71.17 LB/FT^3 AND THE CONCENTRATIONS WERE 0.64 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 3.20 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 11,570.53 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 18.51 LBS/YR OF NITROGEN, AND 3.70 LBS/YR OF PHOSPHORUS.

GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PROJECT IS TAX MAP NUMBER: 58 1 02 28
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY RICE ASSOCIATES ON JULY, 2021. THE TOPOGRAPHIC INFORMATION HAS BEEN CONVERTED FROM VERTICAL DATUM NAVD88 TO NGVD29 BY KIMLEY-HORN. THE HORIZONTAL DATUM IS NAD83. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.

DECLARATION OF NO IMPACT TO THE FLOODPLAIN NARRATIVE: THE DEVELOPMENT WITHIN THE FLOODPLAIN IS RELATED TO THE MAINTENANCE AND RESTORATION OF THE EXISTING MANMADE STORM SEWER OUTFALL CHANNEL. THE INTENT OF THE CHANNEL REPAIR AND RESTORATION IS TO RETURN THE ERODED RECEIVING CHANNEL TO A STABLE CONDITION AND PREVENT FUTURE EROSION. THE PROJECT EARTHWORK IS A NET CUT AND THE PROPOSED CHANGES IN THE FLOODPLAIN CROSS SECTIONAL AREA ARE ASSUMED AS NEGLIGIBLE WHEN COMPARED TO THE OVERALL FLOODPLAIN CROSS SECTIONAL AREA. THE PROPOSED CHANNEL REPAIR WILL NOT MODIFY THE EXISTING FLOODPLAIN HYDRAULICS, NOR WILL IT IMPACT OFFSITE PROPERTY OR THE EXISTING FLOODPLAIN BOUNDARY / BASE FLOOD ELEVATIONS. THERE WILL BE NO CHANGE TO PRE AND POST DEVELOPMENT FLOODPLAIN FLOWRATE AND VELOCITY ONSITE, UPSTREAM OR DOWNSTREAM WITHIN THE STREAM CORRIDOR. ALL WORK PROPOSED AS PART OF THIS CHANNEL MAINTENANCE PROJECT IS IN COMPLIANCE WITH CITY CODE SECTION 4.15.8 APPROVAL CRITERIA.

Checklist of Submittal Requirements		
Impervious surface in the floodplain:	0.23	ac.
Area of floodplain vegetation disturbed:	0.49	ac.
Area of floodplain land graded:	0.10	ac.
Maximum depth of cut or fill on floodplain land:	4.61 (cut)	ft.

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05	PHOTO LOCATION MAP
06	EROSION & SEDIMENT CONTROL PHASE I
07	EROSION & SEDIMENT CONTROL PHASE II
08	EROSION & SEDIMENT CONTROL NOTES & DETAILS
09	EROSION & SEDIMENT CONTROL NOTES & DETAILS
10	EROSION & SEDIMENT CONTROL NOTES & DETAILS
11	EROSION & SEDIMENT CONTROL NOTES & DETAILS
12	EXISTING HYDROLOGY
13	LAND COVER ANALYSIS (TR55)
14	EXISTING CONDITIONS HYDROGRAPH
15	POC CREDITING SUMMARY
16	OUTFALL RESTORATION
17	LANDSCAPING PLAN
18	PLANTING DETAILS
19	EXISTING TREE INVENTORY

	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Kimley»Horn

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COMMONWEALTH OF VIRGINIA
JUAN A. CAMPOS
Lic. No. 0402061628
PROFESSIONAL ENGINEER
07/27/2022

No.	REVISIONS	DATE	BY
1	PUBLIC WORKS COMMENTS	06/16/2022	J.A.C
2	PUBLIC WORKS COMMENTS	07/27/2022	J.A.C

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KHA PROJECT 110057012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET
OUTFALL AND GULLY RESTORATION
PICKETT ROAD SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

Field Data		
Bulk Density =	71.17	*lb./ft^3*
1 ton of sediment =	0.64	*lb. of (P)*
1 ton of sediment =	3.2	*lb. of (N)*

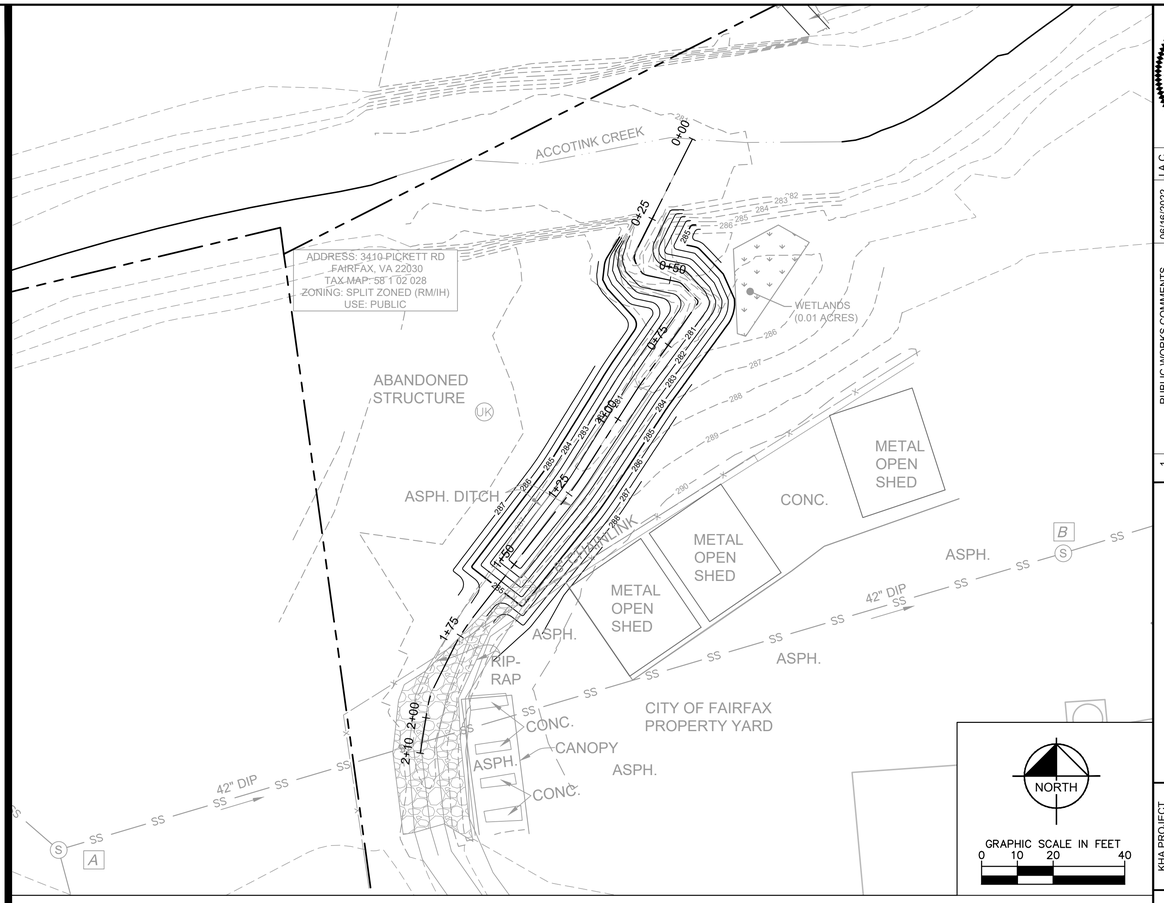
Project Information	
Project Name:	CITY OF FAIRFAX OUTFALL AND GULLY STABILIZATION
Project Number:	110557012
Date:	5/19/2022
Design By:	JJD

Existing Outfall Channel Condition Parameters

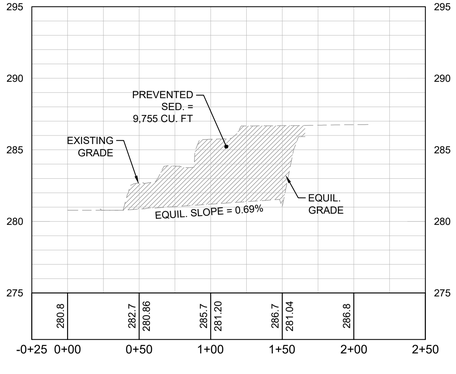
Drainage Area (A_d)=	15.98	*ac*
Drainage Area (A_d)=	0.0647	*km^2*
Mean Flow Depth =	1.330	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	150.000	*ft*
Channel Slope =	0.039	*ft/ft*
Bank Height =	3.733	*ft*
Bottom Width =	4.133	*ft*
Top Width =	18.533	*ft*
Bulk Density (Estimate) =	84.278	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0069	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	3.5	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	361.28	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	9,754.56	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	162.58	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	11,570.53	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	71.17	*lb./ft^3*
1 ton of sediment =	0.64	*lb. of (P)*
1 ton of sediment =	3.20	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	11,570.53	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	3.70	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	18.51	*lbs./year*

Pollutant of Concern (POC) Crediting Summary

Total Suspended Solids (TSS) Removal Rate =	11,570.53	*lbs./year*
Phosphorus (P) Removal Rate =	3.70	*lbs./year*
Nitrogen (N) Removal Rate =	18.51	*lbs./year*



THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 04/21/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 05/02/2022. THE SOIL SAMPLE BULK DENSITY WAS 71.17 LB/FT^3 AND THE CONCENTRATIONS WERE 0.64 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 3.20 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.69%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 9,755 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 11,570.53 LB/YR OF SEDIMENT, 3.70 LB/YR OF PHOSPHORUS, AND 18.51 LB/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.



OUTFALL CHANNEL
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

COMMONWEALTH OF VIRGINIA
JUAN A. CAMPOS
Lic. No. 0402061628
PROFESSIONAL ENGINEER
07/27/2022

No.	REVISIONS	DATE	BY
1	PUBLIC WORKS COMMENTS	06/16/2022	J.A.C
2	PUBLIC WORKS COMMENTS	07/27/2022	J.A.C

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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

POC CREDITING SUMMARY
OUTFALL AND GULLY RESTORATION
PICKETT ROAD SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
15

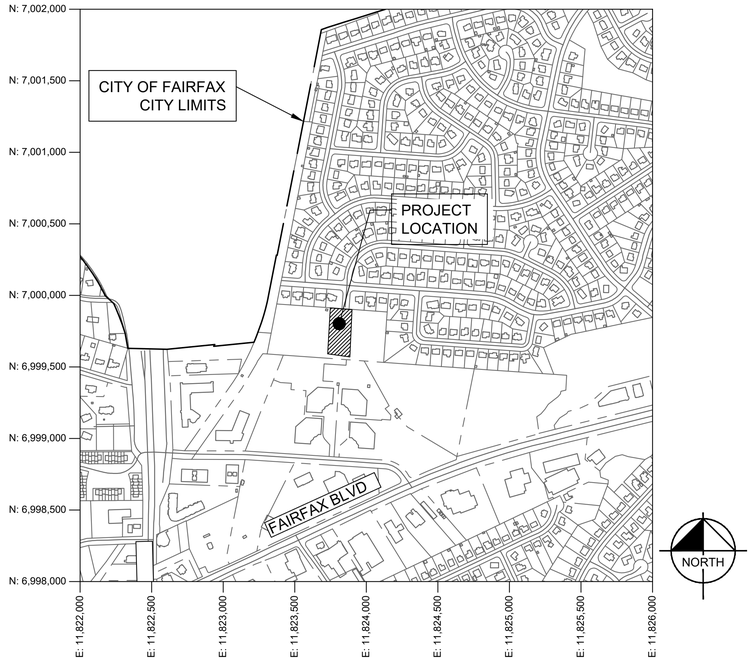
Appendix D. Shiloh Street Outfall and Gully Stabilization Sediment Reduction Calculations

100% CONSTRUCTION PLANS
SHILOH STREET SITE
OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 47 4 01 002 C
10400 SHILOH STREET
CITY OF FAIRFAX, VIRGINIA

VICINITY MAP

1" = 500'



PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY 250 LINEAR FEET OF AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 36" RCP PIPE AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN THE VICINITY OF RANGER ROAD PARK IN THE CITY OF FAIRFAX, VIRGINIA. THE LIMITS OF DISTURBANCE ARE 0.51 ACRES. THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION. THE SOIL SAMPLE BULK DENSITY WAS 87.40 LB/FT^3 AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.22 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 28,100.89 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 17.09 LBS/YR OF NITROGEN, AND 9.25 LBS/YR OF PHOSPHORUS.

GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PROJECT IS TAX MAP NUMBER: 47 4 01 002 C
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY RICE ASSOCIATES ON JULY, 2021. THE TOPOGRAPHIC INFORMATION HAS BEEN CONVERTED FROM VERTICAL DATUM NAVD88 TO NGVD29 BY KIMLEY-HORN. THE HORIZONTAL DATUM IS NAD83. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.

DECLARATION OF NO IMPACT TO THE FLOODPLAIN NARRATIVE: THE DEVELOPMENT WITHIN THE FLOODPLAIN IS RELATED TO THE MAINTENANCE AND RESTORATION OF THE EXISTING MANMADE STORM SEWER OUTFALL CHANNEL. THE INTENT OF THE CHANNEL REPAIR AND RESTORATION IS TO RETURN THE ERODED RECEIVING CHANNEL TO A STABLE CONDITION AND PREVENT FUTURE EROSION. THE PROJECT EARTHWORK IS A NET CUT AND THE PROPOSED CHANGES IN THE FLOODPLAIN CROSS SECTIONAL AREA ARE ASSUMED AS NEGLIGIBLE WHEN COMPARED TO THE OVERALL FLOODPLAIN CROSS SECTIONAL AREA. THE PROPOSED CHANNEL REPAIR WILL NOT MODIFY THE EXISTING FLOODPLAIN HYDRAULICS, NOR WILL IT IMPACT OFFSITE PROPERTY OR THE EXISTING FLOODPLAIN BOUNDARY / BASE FLOOD ELEVATIONS. THERE WILL BE NO CHANGE TO PRE AND POST DEVELOPMENT FLOODPLAIN FLOWRATE AND VELOCITY ONSITE, UPSTREAM OR DOWNSTREAM WITHIN THE STREAM CORRIDOR. ALL WORK PROPOSED AS PART OF THIS CHANNEL MAINTENANCE PROJECT IS IN COMPLIANCE WITH CITY CODE SECTION 4.15.8 APPROVAL CRITERIA.

Checklist of Submittal Requirements		
Impervious surface in the floodplain:	0.08	ac.
Area of floodplain vegetation disturbed:	0.51	ac.
Area of floodplain land graded:	0.11	ac.
Maximum depth of cut or fill on floodplain land:	2.23 (cut)	ft.

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	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY RESTORATION
SHILOH STREET SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

Field Data		
Bulk Density =	87.4	*lb./ft^3*
1 ton of sediment =	0.658	*lb. of (P)*
1 ton of sediment =	1.216	*lb. of (N)*

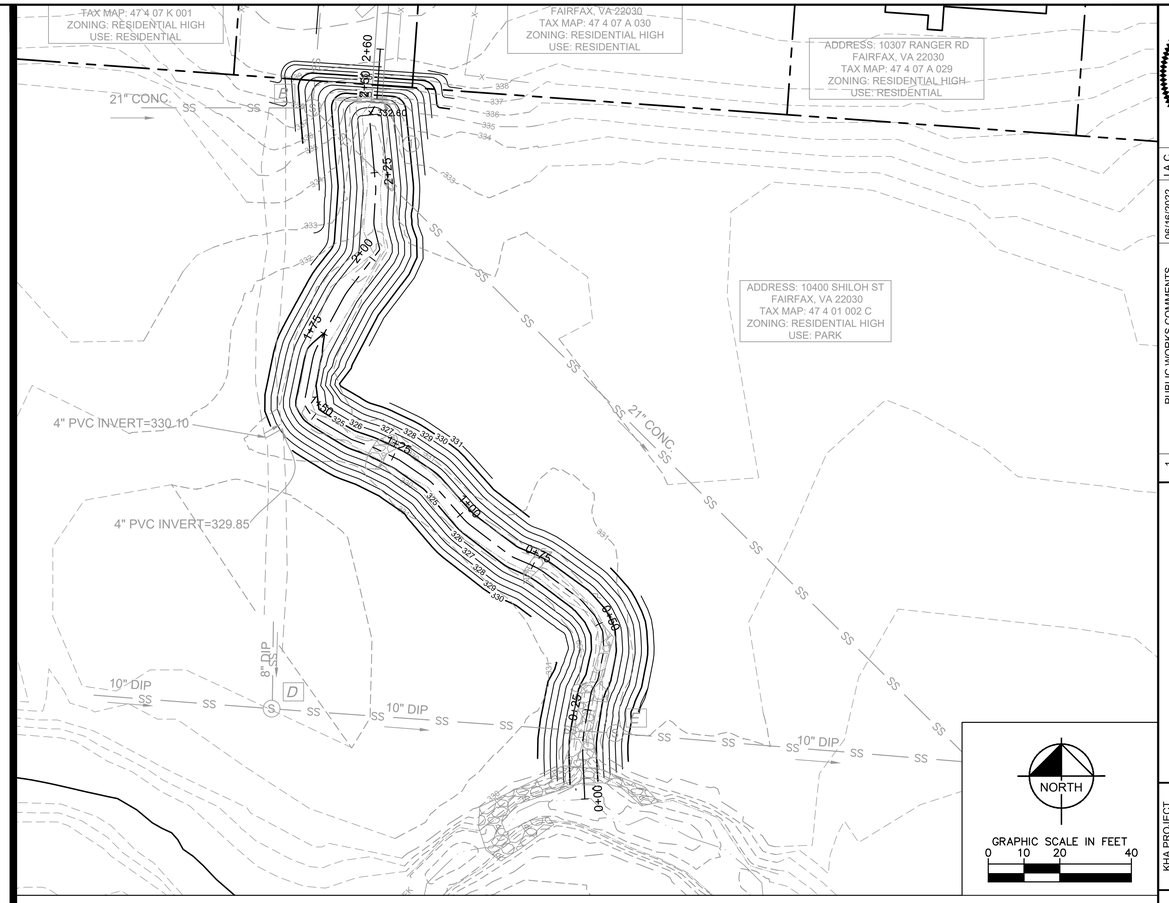
Project Information	
Project Name:	CITY OF FAIRFAX OUTFALL AND GULLY STABILIZATION
Project Number:	110557012
Date:	5/19/2022
Design By:	JJD

Existing Outfall Channel Condition Parameters

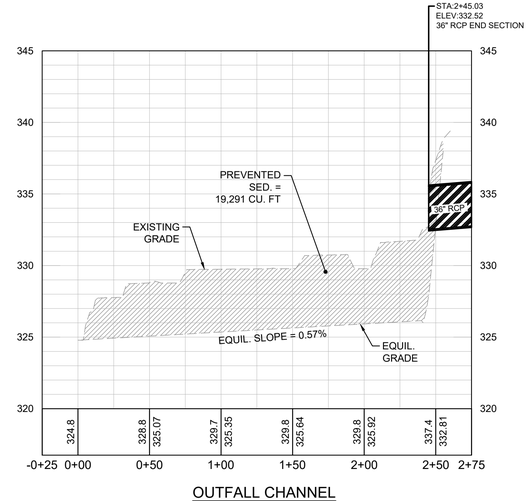
Drainage Area (A_d) =	28.77	*ac*
Drainage Area (A_d) =	0.1165	*km^2*
Mean Flow Depth =	1.933	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	245.120	*ft*
Channel Slope =	0.032	*ft/ft*
Bank Height =	2.457	*ft*
Bottom Width =	7.600	*ft*
Top Width =	30.100	*ft*
Bulk Density (Estimate) =	84.278	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0057	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	6	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	714.49	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	19,291.23	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	321.52	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	28,100.89	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	87.40	*lb./ft^3*
1 ton of sediment =	0.66	*lb. of (P)*
1 ton of sediment =	1.22	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	28,100.89	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	9.25	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	17.09	*lbs./year*

Pollutant of Concern (POC) Crediting Summary

Total Suspended Solids (TSS) Removal Rate =	28,100.89	*lbs./year*
Phosphorus (P) Removal Rate =	9.25	*lbs./year*
Nitrogen (N) Removal Rate =	17.09	*lbs./year*



THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 04/21/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 05/02/2022. THE SOIL SAMPLE BULK DENSITY WAS 87.40 LB/FT^3 AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.22 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.57%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 19,291.23 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 28,100.89 LB/YR OF SEDIMENT, 9.25 LB/YR OF PHOSPHORUS, AND 17.09 LB/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.



OUTFALL CHANNEL
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

JUAN A. CAMPOS
Lic. No. 0402061628
07/27/2022

No.	REVISIONS	DATE	BY
1	PUBLIC WORKS COMMENTS	06/16/2022	J.A.C
2	PUBLIC WORKS COMMENTS	07/27/2022	J.A.C

Kimley»Horn
11400 COMMERCE PARK DR, SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM
© 2021 KIMLEY-HORN AND ASSOCIATES, INC.

KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

POC CREDITING SUMMARY
OUTFALL AND GULLY RESTORATION
SHILOH STREET SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
15

Appendix E. Stafford Drive Stream and Outfall Restoration Sediment Reduction Calculations

STAFFORD DRIVE STREAM RESTORATION
60% DESIGN

SP-##-#####

3300 STAFFORD DRIVE, FAIRFAX, VA 22030

PIN #: 47402001A, 47402002

CITY OF FAIRFAX, VA

PROJECT NARRATIVE

THIS PROJECT OUTLINES THE USE OF NATURAL CHANNEL DESIGN (NCD) TECHNIQUES FOR THE RESTORATION OF APPROXIMATELY 2,300 LINEAR FEET OF STREAM CHANNEL ON THE NORTH FORK OF ACCOTINK CREEK. THE PROJECT LIMITS BEGIN AT A 8' DIAMETER DOUBLE-BARREL CULVERT UNDERNEATH PLANTATION PARKWAY AND ENDS AT THE CONFLUENCE OF THE NORTH FORK OF ACCOTINK CREEK WITH THE MAIN STEM OF ACCOTINK CREEK. THERE IS A 9' X 8' DOUBLE-BOX CULVERT THAT PASSES UNDERNEATH STAFFORD DRIVE AND 5 PIPED INFLOWS ALONG THE PROPOSED RESTORATION REACH. THE PROJECT AREA IS LOCATED IN STAFFORD DRIVE PARK AND THE PROJECT LIMITS ENCOMPASS 2 SEPARATE PARCELS, BOTH OF WHICH ARE OWNED BY THE CITY OF FAIRFAX. THE ESTIMATED LIMITS OF DISTURBANCE IS 7.90 AC. THE OVERALL GOAL OF THIS PROJECT IS TO PROVIDE THE CITY WITH POLLUTANT OF CONCERN (POC) CREDITS THAT CAN BE APPLIED TO THEIR OVERALL CHESAPEAKE BAY TMDL REQUIREMENTS THROUGH THE RESTORATION OF THE DEGRADED STREAM CHANNEL.THE TOTAL POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 78,492.86 LB/YR OF TOTAL SUSPENDED SOLIDS (TSS), 323.66 LB/YR OF NITROGEN, AND 181.04 LB/YR OF PHOSPHORUS.

UTILITY CONTACTS

NAMES AND TELEPHONE NUMBERS OF POSSIBLE OPERATORS OF UNDERGROUND UTILITY LINES APPEAR BELOW. THESE NUMBERS SHALL ALSO BE USED TO SERVE IN AN EMERGENCY CONDITION.

GAS	COLUMBIA GAS TRANSMISSION CORP.	(703) 327 - 6331
	WASHINGTON GAS	(800) 752 - 7520
	CNG TRANSMISSION CORP.	(814) 583 - 5171
ELECTRIC	DOMINION VIRGINIA POWER	(888) 667 - 3000
	NOVEC	(888) 335 - 0500
TELEPHONE	AT&T	(800) 288 - 2747
	VERIZON	(800) 256 - 4646
CABLE	COMCAST	(888) 375 - 4888
WATER & SEWER	FAIRFAX WATER	(703) 698 - 5600
OTHER	CENTURY LINK	(800) 366 - 8201

MISS UTILITY
DIAL 811, OR 1-800-552-7001
BEFORE DIGGING

NON-EMERGENCY

FIRE AND RESCUE: (703) 385 - 7940
FOR EMERGENCIES, CALL 911

SOURCE OF TITLE:

THE SUBJECT PROJECT COVERS TWO (2) DISTINCT PARCELS. THE PARCEL SITES SHOWN HEREON ARE LOCATED IN THE CITY OF FAIRFAX. THE PARCEL INFORMATION IS INCLUDED BELOW:

1. PARCEL ID: 47 4 02 001 A ; DEED BOOK 16304 PAGE 911 ; AREA = 14.07 ACRES (612,737 SF) ; OWNER OF RECORD: CITY OF FAIRFAX
2. PARCEL ID: 47 4 02 002 ; DEED BOOK 16304 PAGE 911 ; AREA = 9.17 ACRES (399,262 SF) ; OWNER OF RECORD: CITY OF FAIRFAX

GENERAL NOTES

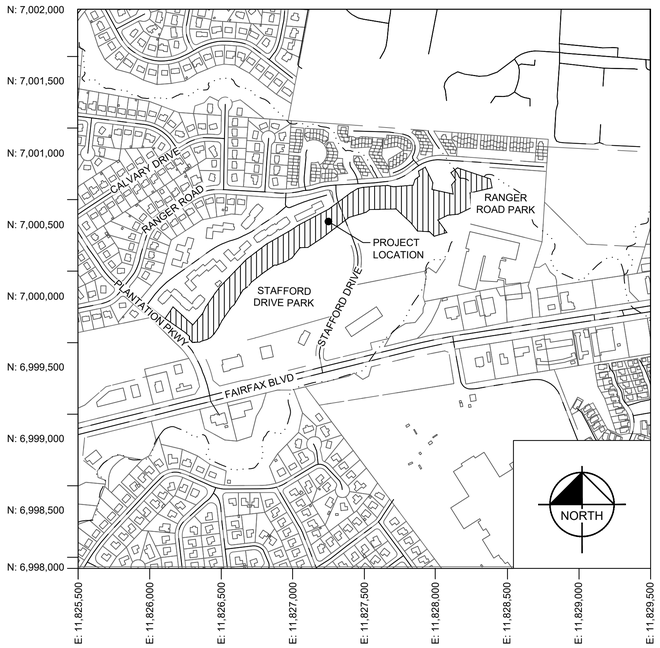
1. THE TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY TIMMONS GROUP ON AUGUST, 2020 - SEPTEMBER, 2020. THE SURVEY HAS BEEN SUPPLEMENTED WITH AN ADDITIONAL GROUND SURVEY CONDUCTED BY RICE ASSOCIATES ON JULY, 2021. THE HORIZONTAL DATUM IS NAD83 AND THE VERTICAL DATUM IS NGVD29. THE GROUND SURVEYS HAVE ALSO BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
2. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
3. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
4. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAPS (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006.
5. TO THE BEST KNOWLEDGE OF THE ENGINEER, THERE ARE NO EXISTING GRAVES OR BURIAL SITES LOCATED ON THE PROPERTY. THE SUBJECT PROPERTY IS NOT LISTED UNDER THE NATIONAL REGISTER OF HISTORICAL PLACES.
6. TO THE BEST KNOWLEDGE OF THE ENGINEER, THIS SITE PLAN CONFORMS TO ALL APPLICABLE ORDINANCES, REGULATIONS AND ADOPTED STANDARDS, UNLESS OTHERWISE SPECIFICALLY NOTED.
7. WETLAND INFORMATION IS BASED ON WETLAND DELINEATION CONDUCTED BY TIMMONS GROUP ON 08/06/2020.
8. DUE TO THE PROJECT BEING A STREAM RESTORATION, RESOURCE PROTECTION AREAS (RPA) ARE LOCATED ON THE SUBJECT PROPERTIES.

	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX DEPARTMENT OF PUBLIC WORKS	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Kimley»Horn

VICINITY MAP

1" = 500'



City of Fairfax
APPROVED SITE PLAN

_____ _____
Zoning Official **Date**

Review approval by:

_____ **Fire Marshal (for water distribution system & fire hydrant location)**
_____ **Fairfax Water**
_____ **Director CDP**
_____ **Director of Public Works**
_____ **City Engineer**
_____ **PW Plan Reviewer**
_____ **Code Admin. Asst. Chief**
_____ **Site Plan Coordinator**
_____ **BAR Liaison**
_____ **Environmental Reviewer**
_____ **Wastewater Reviewer**
_____ **GIS Manager**
_____ **Bonding Administrator** _____ **Date**

AGENT AUTHORIZATION LETTER

To Whom IT May Concern:

I/We, The City of Fairfax, the undersigned title owner(s) of the property identified below do hereby authorize Jon D'Alessandro of Kimley-Horn, to act as my/our agent(s) in the furtherance of an application for a Major Site Plan on my/our property located at:
Stafford Drive Park

Tax Map No: 47402001A & 47402002

Thank you in advance for your cooperation.

Date: _____ By: _____

COMMONWEALTH/STATE OF: Virginia

CITY/COUNTY: City of Fairfax, TO WIT:

The forgoing instrument was acknowledged before me this _____ day of _____.

20___, by _____.

_____
Notary Public (Signature)

AFFIX NOTARY SEAL/STAMP

Notary Registration No: _____

My Commission Expires: _____

Sheet List Table	
Sheet Number	Sheet Title
01	COVER SHEET
02	LEGENDS AND SYMBOLS
03	GENERAL NOTES
04	GENERAL NOTES
05	CORRESPONDENCE
06	VIEWPORT LEGEND
07	EXISTING CONDITIONS
08	EXISTING CONDITIONS
09	EXISTING CONDITIONS
10	PHOTO LOCATION MAP
11	PHOTO LOCATION MAP
12	PHOTO LOCATION MAP
13	EXISTING SITE PHOTOS
14	EXISTING SITE PHOTOS
15	DESIGN TABLE AND NARRATIVE
16	EXISTING PROFILE AND MORPHOLOGY
17	EXISTING PROFILE AND MORPHOLOGY
18	EXISTING MORPHOLOGY TABLE
19	EXISTING CROSS-SECTIONS & PEBBLE COUNT
20	EXISTING STREAM HYDROLOGY
21	EXISTING STREAM HYDROLOGY
22	EXISTING CURVE NUMBER CALCULATIONS
23	EROSION & SEDIMENT CONTROL PHASE I
24	EROSION & SEDIMENT CONTROL PHASE I
25	EROSION & SEDIMENT CONTROL PHASE I
26	EROSION & SEDIMENT CONTROL PHASE II
27	EROSION & SEDIMENT CONTROL PHASE II
28	EROSION & SEDIMENT CONTROL PHASE II
29	EROSION & SEDIMENT CONTROL NOTES & DETAILS
30	EROSION & SEDIMENT CONTROL NOTES & DETAILS
31	EROSION & SEDIMENT CONTROL NOTES & DETAILS
32	EROSION & SEDIMENT CONTROL NOTES & DETAILS
33	STREAM RESTORATION PLAN
34	STREAM RESTORATION PLAN
35	STREAM RESTORATION PLAN
36	LONGITUDINAL PROFILE
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41	STREAM OUTFALL CHANNELS
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43	PROPOSED WETLANDS PLAN
44	PROPOSED WETLANDS PLAN
45	PROPOSED WETLANDS PLAN
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60	SEEDING PLAN
61	PLANTING PLAN
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64	SEEDING AND PLANTING SCHEDULES
65	LANDSCAPING NOTES
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67	TREE REMOVAL PLAN
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69	TREE REMOVAL PLAN
70	TREE REMOVAL TABLE

CITY OF FAIRFAX
Site Plan Checklist and Certification Statement

The following affidavit and checklist must be printed on the cover page and signed by a certified engineer, architect or land surveyor.

Certification for Completeness and Accuracy

I Jon D'Alessandro do hereby certify that this site plan checklist is complete and accurate for use in staff's evaluation of the attached site plan that is required pursuant to Section 110-6.8 in the Code of the City of Fairfax.

(signature) _____ (date) _____ (SEAL)

Know what's **below.**
Call before you dig.

LICENSED PROFESSIONAL

No.	REVISIONS	DATE	BY

Kimley»Horn

11400 COMMERCE PARK DR, SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

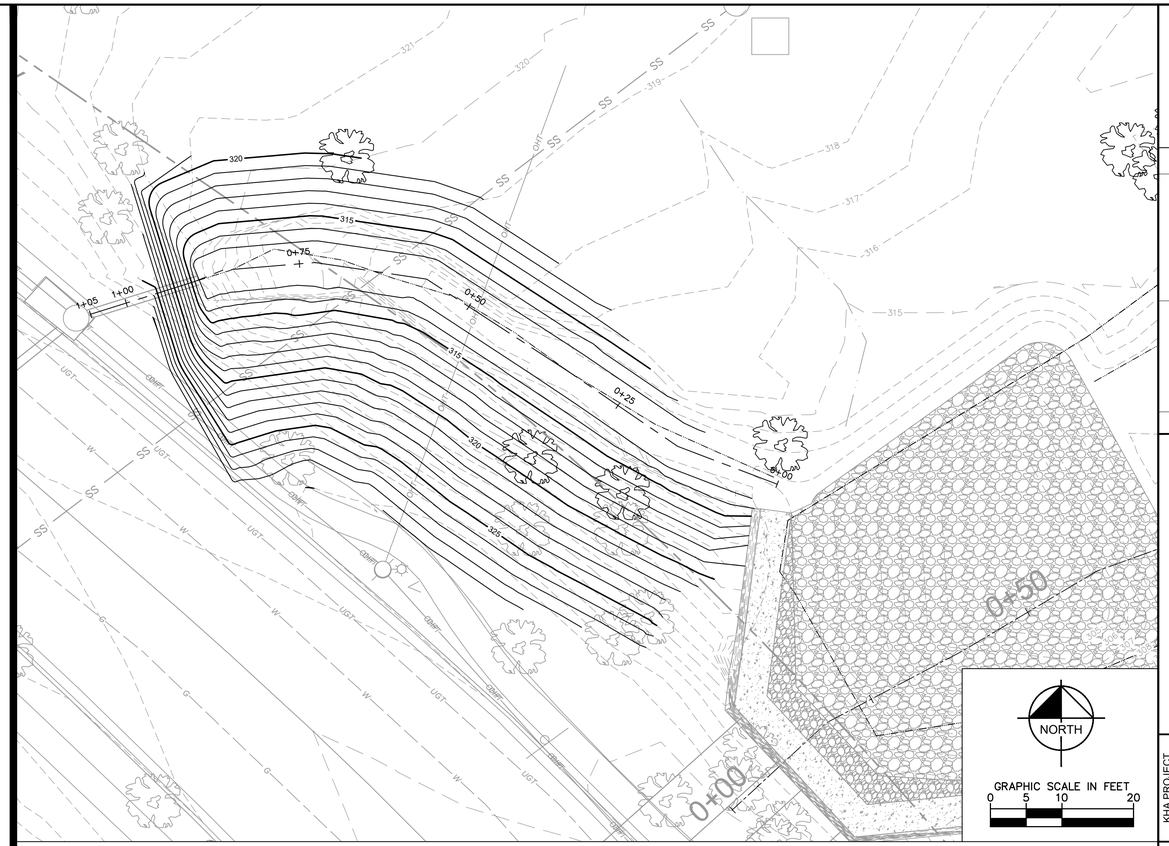
KHA PROJECT 110557018
DATE 09/09/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

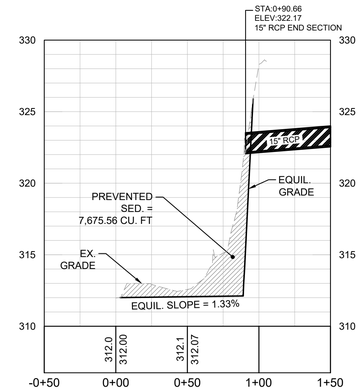
STAFFORD DRIVE STREAM RESTORATION DESIGN
PREPARED FOR
CITY OF FAIRFAX -DEPARTMENT OF PUBLIC WORKS
CITY OF FAIRFAX - VIRGINIA

SHEET NUMBER
01

Existing Outfall Channel Condition Parameters		
Drainage Area (A_d)=	2.21	*ac*
Drainage Area (A_d)=	0.0089	*km^2*
Mean Flow Depth =	0.400	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	90.660	*ft*
Channel Slope =	0.11	*ft/ft*
Bank Height =	2.62	*ft*
Bottom Width =	5.55	*ft*
Top Width =	11.04	*ft*
Bulk Density (Estimate) =	84.28	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0133	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	3	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	284.28	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	7,675.56	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	127.93	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	7,506.70	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	58.68	*lb./ft^3*
1 ton of sediment =	2.60	*lb. of (P)*
1 ton of sediment =	0.90	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	7,506.70	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	9.76	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	3.38	*lbs./year*
Pollutant of Concern (POC) Crediting Summary		
Total Suspended Solids (TSS) Removal Rate =	7,506.70	*lbs./year*
Phosphorus (P) Removal Rate =	9.76	*lbs./year*
Nitrogen (N) Removal Rate =	3.38	*lbs./year*



THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 07/13/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 07/22/2022. THE SOIL SAMPLE BULK DENSITY WAS 58.68 LB/FT^3 AND THE CONCENTRATIONS WERE 0.90 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 2.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 1.33%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 7,675.56 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, THIS OUTFALL RESTORATION WILL PROVIDE 7,506.70 LB/YR OF SEDIMENT, 9.76 LB/YR OF PHOSPHORUS, AND 3.38 LB/YR OF NITROGEN.



OUTFALL CHANNEL 1
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

LICENSED PROFESSIONAL

No.	REVISIONS	DATE	BY

Kimley»Horn

11400 COMMERCE PARK DR., SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

KHA PROJECT 110557018
DATE 09/09/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

POC CREDITING SUMMARY (OUTFALL 1)

STAFFORD DRIVE STREAM RESTORATION DESIGN
PREPARED FOR
CITY OF FAIRFAX -DEPARTMENT OF PUBLIC WORKS
CITY OF FAIRFAX - VIRGINIA

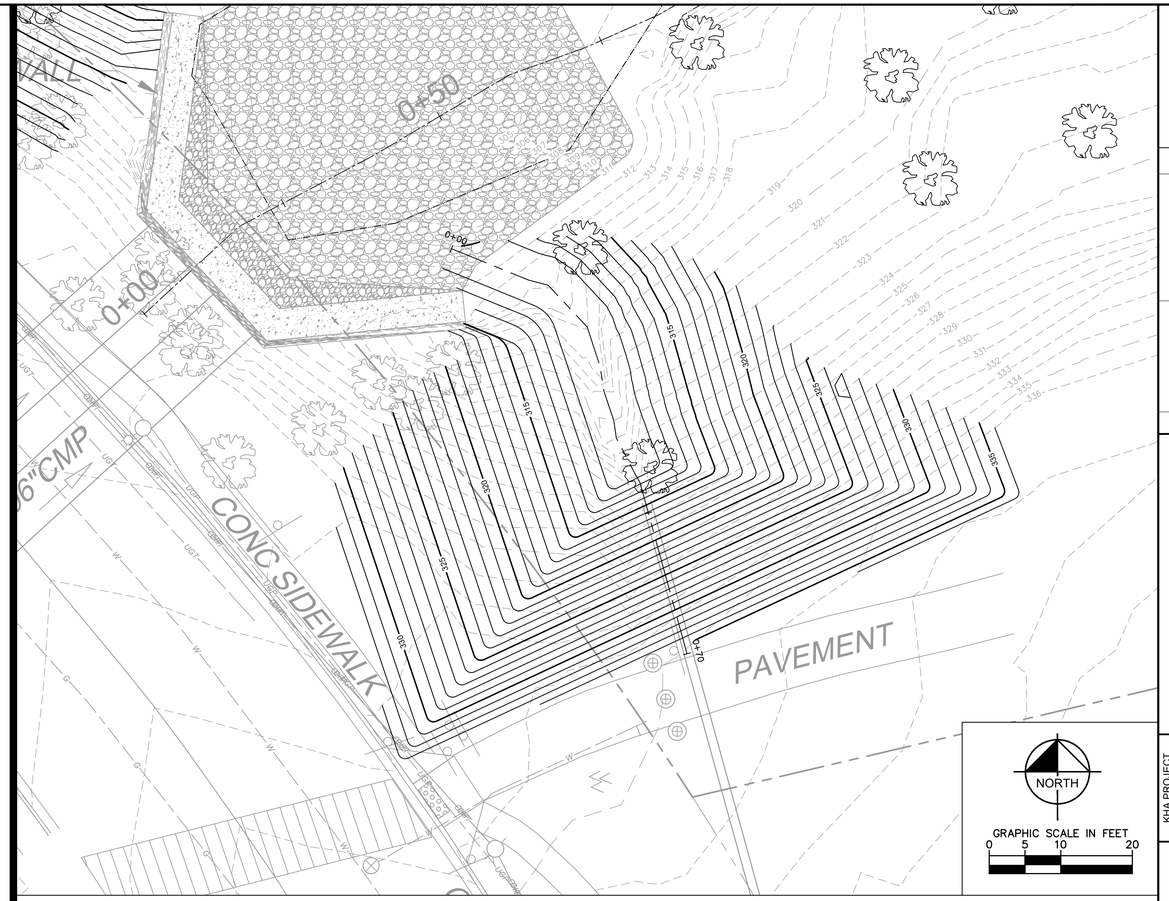
SHEET NUMBER
54

Existing Outfall Channel Condition Parameters

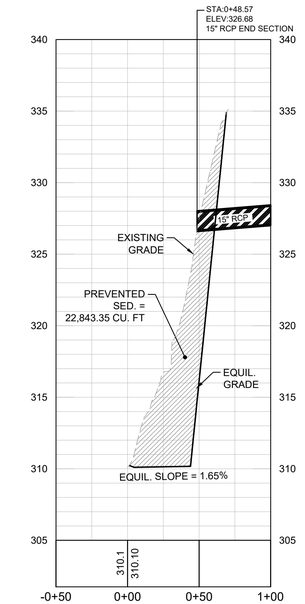
Drainage Area (A_d)=	1.15	*ac*
Drainage Area (A_d)=	0.0047	*km^2*
Mean Flow Depth =	0.53	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	48.57	*ft*
Channel Slope =	0.28	*ft/ft*
Bank Height =	2.40	*ft*
Bottom Width =	2.70	*ft*
Top Width =	6.87	*ft*
Bulk Density (Estimate) =	84.28	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0165	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	3	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	846.05	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	22,843.35	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	380.72	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	21,628.85	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	56.81	*lb./ft^3*
1 ton of sediment =	2.19	*lb. of (P)*
1 ton of sediment =	0.87	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	21,628.85	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	23.68	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	9.41	*lbs./year*

Pollutant of Concern (POC) Crediting Summary

Total Suspended Solids (TSS) Removal Rate =	21,628.85	*lbs./year*
Phosphorus (P) Removal Rate =	23.68	*lbs./year*
Nitrogen (N) Removal Rate =	9.41	*lbs./year*



THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 07/13/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 07/22/2022. THE SOIL SAMPLE BULK DENSITY WAS 56.81 LB/FT^3 AND THE CONCENTRATIONS WERE 0.87 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 2.19 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 1.65%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 22,843.35. CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, THIS OUTFALL RESTORATION WILL PROVIDE 21,628.85 LB/YR OF SEDIMENT, 23.68 LB/YR OF PHOSPHORUS, AND 9.41 LB/YR OF NITROGEN.



OUTFALL CHANNEL 2
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

LICENSED PROFESSIONAL

No.	REVISIONS	DATE	BY

Kimley»Horn

11400 COMMERCE PARK DR, SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

KHA PROJECT 110557018
DATE 08/09/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

POC CREDITING SUMMARY (OUTFALL 2)

STAFFORD DRIVE STREAM RESTORATION DESIGN
PREPARED FOR
CITY OF FAIRFAX -DEPARTMENT OF PUBLIC WORKS
CITY OF FAIRFAX - VIRGINIA

SHEET NUMBER
55

Appendix F. Ashby Pond Conservancy Wet Pond Enhancement Sediment Reduction Calculations

ASHBY POND CONSERVANCY

WET POND ENHANCEMENT PLANS (30% DESIGN)

9817 ASHBY ROAD, FAIRFAX, VA, 22031

PIN#: 58 1 03 000 A

CITY OF FAIRFAX, VA

NOTICE REQUIRED

CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION. NAMES AND TELEPHONE NUMBERS OF POSSIBLE OPERATORS OF UNDERGROUND UTILITY LINES APPEAR BELOW. THESE NUMBERS SHALL ALSO BE USED TO SERVE IN AN EMERGENCY CONDITION.

UTILITY CONTACTS

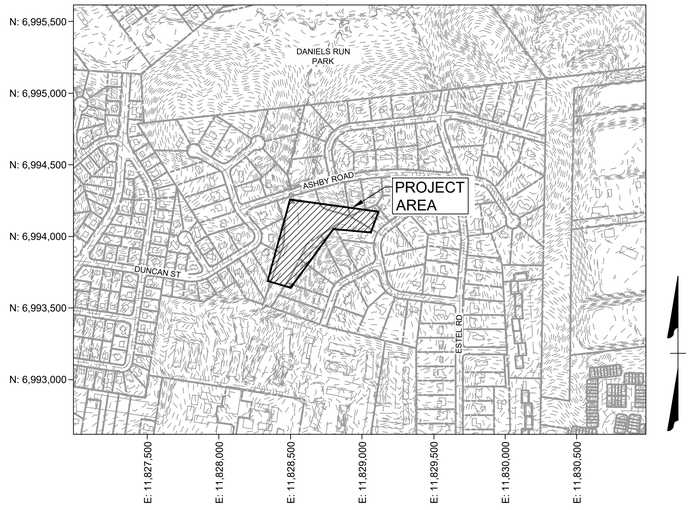
GAS	COLUMBIA GAS TRANSMISSION CORP.	(703) 327-6331
	WASHINGTON GAS	(800) 752-7520
	CNG TRANSMISSION CORP.	(814) 583-5171
ELECTRIC	DOMINION VIRGINIA POWER	(888) 667-3000
	NOVEC	(888) 335-0500
TELEPHONE	AT&T	(800) 288-2747
	VERIZON	(800) 256-4646
CABLE	COMCAST	(888) 375-4888
WATER & SEWER	FAIRFAX WATER	(703) 698-5800
OTHER	CENTURY LINK	(800) 366-8201

MISS UTILITY
DIAL 811, OR 1-800-552-7001
BEFORE DIGGING

NON-EMERGENCY

POLICE: (703) 385-7924
FIRE AND RESCUE: (703) 385-7940
(FOR EMERGENCY CALL: 911)

LOCATION MAP



VICINITY MAP

SCALE: 1" = 500'

HORIZONTAL DATUM: NAD 83
VERTICAL DATUM: NGVD29

OWNER/CLIENT:
CITY OF FAIRFAX
DEPARTMENT OF PUBLIC WORKS
10455 ARMSTRONG ST
FAIRFAX, VA 22030
CONTACT: SATOSHI ETO
PHONE: (703) 273 6073

CIVIL ENGINEER:
TIMMONS GROUP
20110 ASHBROOK PLACE, SUITE 100
ASHBURN, VA 20147
CONTACT: JON D'ALESSANDRO, P.E.
PHONE: (703) 554-6713

PROJECT NARRATIVE

THIS PROJECT IS THE 30% PLAN DEVELOPMENT OUTLINING THE PROPOSED METHODOLOGY TO RETROFIT, RESTORE, AND ENHANCE ASHBY POND AND ITS INFLOW CHANNELS IN THE CITY OF FAIRFAX. THE DESIGNED RETROFIT AIMS TO RESTORE THE DETENTION VOLUME OF THE POND TO THE ORIGINAL 2010-2011 DESIGN CONDITIONS, AS WELL AS ENHANCE THE NUTRIENT REMOVAL CAPABILITY OF THE POND. THE POND ENHANCEMENTS OUTLINED IN THIS PLAN HAVE BEEN EVALUATED IN ACCORDANCE WITH SPECIFICATION NO. 14 IN THE VIRGINIA BMP CLEARINGHOUSE. THIS PLAN ILLUSTRATES THE INCLUSION OF TWO (2) LARGE FOREBAYS WITHIN THE POND IMPOUNDMENT AREA, AS WELL AS AN AQUATIC PLANTING AREA, AND A RESTORATION OF ONE (1) INFLOW CHANNEL UTILIZING PROTOCOL 5. IT IS ASSUMED THAT THE POND WILL BE DREDGED AT THE TIME OF ENHANCEMENT, WHICH HAS BEEN REFLECTED IN THE PRELIMINARY GRADING.

THIS PROJECT IS INTENDED TO PROVIDE PHOSPHORUS, NITROGEN, AND TOTAL SUSPENDED SOLIDS (TSS) REDUCTIONS WITHIN THE ACCOTINK CREEK (POTOMAC RIVER) WATERSHED. THE NUTRIENT REMOVAL CREDITS ACHIEVED THROUGH THE POND RETROFIT, RESTORATION, AND ENHANCEMENT WILL BE APPLIED TO THE CITY OF FAIRFAX'S CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) REQUIREMENTS. A PRELIMINARY CHESAPEAKE BAY TMDL POLLUTANT OF CONCERN (POC) REDUCTION ANALYSIS HAS BEEN PERFORMED ON THE 30% DESIGN AND IS INCLUDED IN THIS PLAN SET.

Sheet List Table

AGENT AUTHORIZATION LETTER

To Whom IT May Concern:

I/We, _____, the undersigned title owner(s) of the property identified below do hereby authorize _____of _____, to act as my/our agent(s) in the furtherance of an application for a _____on my/our property located at: _____

Tax Map No: _____

Thank you in advance for your cooperation.

Date: _____ By: _____

COMMONWEALTH/STATE OF: _____

CITY/COUNTY: _____, TO WIT:

The forgoing instrument was acknowledged before me this _____ day of _____, 20____, by _____.

_____
Notary Public (Signature)

AFFIX NOTARY SEAL/STAMP

Notary Registration No: _____

My Commission Expires: _____

City of Fairfax
APPROVED SITE PLAN

_____ _____
Zoning Official **Date**

Review approval by:

_____ **Fire Marshal (for water distribution system & fire hydrant location)**
_____ **Fairfax Water**
_____ **Director CDP**
_____ **Director of Public Works**
_____ **City Engineer**
_____ **PW Plan Reviewer**
_____ **Code Admin. Asst. Chief**
_____ **Site Plan Coordinator**
_____ **BAR Liaison**
_____ **Environmental Reviewer**
_____ **Wastewater Reviewer**
_____ **GIS Manager**
_____ **Bonding Administrator** _____ **Date**

NOT FOR CONSTRUCTION

COMMONWEALTH OF VIRGINIA
JONATHAN JOSEPH D'ALESSANDRO
Lic. No. 034356
PROFESSIONAL ENGINEER

THIS DRAWING PREPARED AT THE
NORTHERN VIRGINIA OFFICE
20110 Ashbrook Place, Suite 100 | Ashburn, VA 20147
TEL 703.726.1342 FAX 703.726.1345 www.timmons.com

YOUR VISION ACHIEVED THROUGH OURS.

REVISION DESCRIPTION

DATE

DATE: 12/15/2020
DRAWN BY: JJD
DESIGNED BY: JJD
CHECKED BY: JJD
SCALE: AS SHOWN

TIMMONS GROUP

WET POND ENHANCEMENT PLANS (30% DESIGN)
9817 ASHBY ROAD, FAIRFAX, VA 22031
COVER

JOB NO. 45558.014
SHEET NO. 0.0

Pollution Reduction Calculation Methodology narrative

The pollutant reduction calculations for the Ashby Pond Wet Pond Enhancements project were determined multiple ways due to the different components of the project. A cumulative summary of the pollutant reductions provided by the proposed restoration and enhancement is shown in Table 1.

Table 1. Ashby Pond Wet Pond Enhancement Project Pollutant of Concern (POC) Reduction Summary

Ashby Pond Potential Project(s) and corresponding estimated Chesapeake Bay Total Maximum Daily Load (TMDL) - Pollutant of Concern (POC) Load Reduction Summary			
Pollutant of Concern (POC)	Project 1 Ashby Pond Outfall Channel Restoration	Project 2 Restoration of Ashby Pond to 2011 (Original) Design Conditions	Total estimated POC Reductions provided by Projects 1 and 2
Est. Sediment (TSS) Removal (lbs./yr.)	27,662.76	20,000.00	47,662.76
Est. Phosphorous (P) Removal (lbs./yr.)	14.52	73.00	87.52
Est. Nitrogen (N) Removal (lbs./yr.)	31.54	320.00	351.54
Estimated Pollutant of Concern Reduction Crediting Source	*Channel 2 - Outfall Restoration (30% Design) - Prepared by Timmons Group (July 2020)*	*Ashby Pond Demonstration Project Plans - Prepared by William H. Gordon Associates, et.al. (January 2011)*	Notes: These POC reductions are preliminary estimates only. Future iterations of design and analysis will further refine these numbers, and could potentially increase the POC reductions provided by each potential project.

Narratives for the Outfall Channel 2 Restoration, as well as Pond Restoration and Enhancement are outlined below.

Outfall Channel 2 Restoration – Crediting Narrative

Crediting for the Outfall Channel 2 Restoration was performed utilizing the methodologies outlined in Protocol 5 (*Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed*). Calculation methodologies and preliminary crediting for the outfall restoration can be found in the Plan Set Assemblies located in the Section F Appendix.

Pond Restoration, Enhancement, and Retrofit

In determining a calculation methodology for the pond, consideration of the pond being credited, designed, and constructed in 2010 – 2011 during the infancy of the Virginia Runoff Reduction Method (VRRM) and BMP Clearinghouse Specification Development cannot be ignored. During this time there was a loose interpretation of design regulations, standards, and calculation methodologies because of the change from the Technical II.C Design Criteria to the Technical II.B Design Criteria.

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - **Version 3.0**

☐ 2011 BMP Standards and Specifications ☒ 2013 Draft BMP Standards and Specifications

Project Name: Ashby Pond Wet Pond Enhancements - SLAF Grant Section E
Date: 7/14/2021
BMP Design Specifications List: 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	7.14	53.86	23.16	84.16
Impervious Cover (acres)	0.00	0.30	13.56	37.82	51.68
					135.84

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**99.76**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary	
Forest/Open Space Cover (acres)	0.00
Weighted Rv (forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	84.16
Weighted Rv (turf)	0.23
% Managed Turf	62%
Impervious Cover (acres)	51.68
Rv (impervious)	0.95
% Impervious	38%
Site Area (acres)	**135.84**
Site Rv	**0.50**

Treatment Volume and Nutrient Loads	
Treatment Volume (acre-ft)	5.6800
Treatment Volume (cubic feet)	247,423
TP Load (lb/yr)	155.46
TN Load (lb/yr) (Informational Purposes Only)	1,112.10

Appendix G. Van Dyck Park Outfall and Gully Stabilization Sediment Reduction Calculations

30% CONSTRUCTION PLANS
VAN DYCK PARK
OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 57 2 02 176 & 57 2 02 175
3720 BLENHEIM BOULEVARD
CITY OF FAIRFAX, VIRGINIA

PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 15" RCP PIPE AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN VAN DYCK PARK IN THE CITY OF FAIRFAX, VIRGINIA.

THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019.REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION.

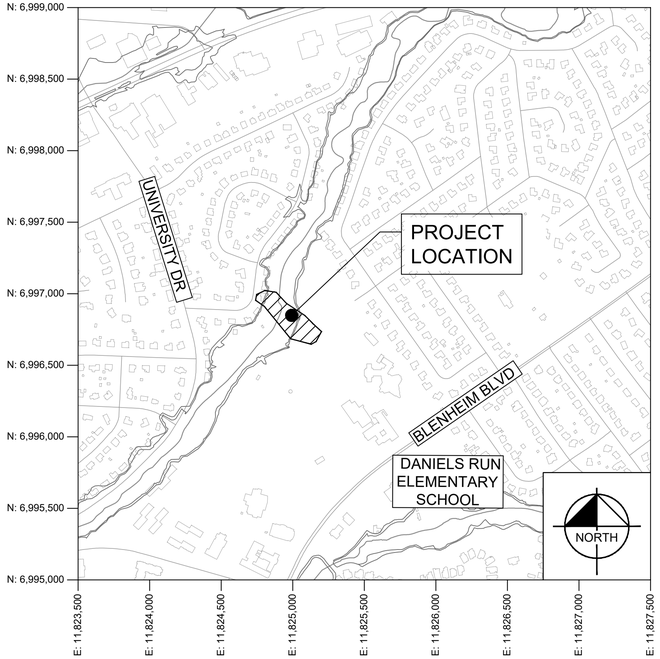
THE SOIL SAMPLE BULK DENSITY WAS 62.43 LB/FT^3 AND THE CONCENTRATIONS WERE 1.08 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.78 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 150,862.10 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 134.27 LBS/YR OF NITROGEN, AND 81.47 LBS/YR OF PHOSPHORUS.

GENERAL NOTES:

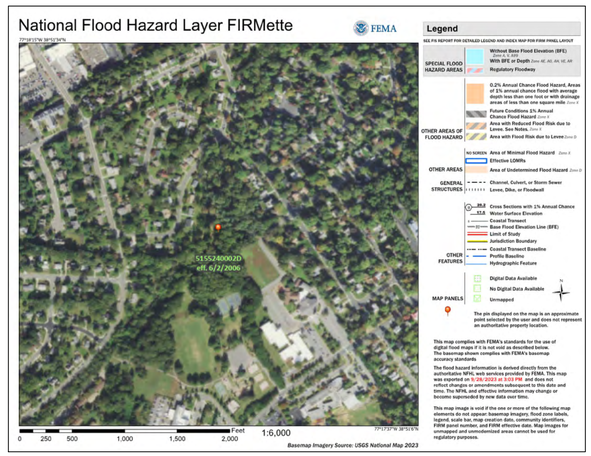
1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 57 2 02 176 & 57 2 02 175
   PARCEL AREA: 8.87 ACRES (386,380 SF) & 13.21 ACRES (575,430 SF)
   DEED BOOK AND NUMBER: N/A & N/A
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON THE READILY AVAILABLE GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR THE PROJECT AREA. THE SITE IS INTENDED TO BE SURVEYED AS PART OF THE NEXT STAGE OF THE DESIGN PROCESS.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240002D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).

VICINITY MAP

1" = 500'



Sheet List Table	
Sheet Number	Sheet Title
01	COVER SHEET
02	GENERAL NOTES & DETAILS
03	GENERAL NOTES & DETAILS
04	PHOTO STATION MAP
05	EXISTING CONDITIONS
06	EXISTING HYDROLOGY
07	PRELIMINARY POC CREDITING SUMMARY



	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Kimley»Horn

Know what's **below.**
Call before you dig.

No.	REVISIONS	DATE	BY

Kimley»Horn
11400 COMMERCE PARK DR. SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

KHA PROJECT 110057041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY C.D.C
CHECKED BY J.J.D

COVER SHEET
OUTFALL AND GULLY STABILIZATION PROJECT
VAN DYCK PARK
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

Pollution Reduction Calculation Methodology narrative

Preliminary crediting for the Van Dyck Park Outfall Restoration Projects was determined utilizing the crediting methodology outlined in the *"Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed"* – specifically Protocol 5 (*Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed*). Calculation methodologies and crediting for the outfall restoration can be found in the Conceptual Plan Set Assembly located in the Section F Appendix. Table 1 outlines the Pollutant of Concern (POC) Reduction summary for the potential restoration of the outfall channel.

Table 1. Van Dyck Park – Outfall Restoration Project – Preliminary Pollutant of Concern Reduction Summary

Outfall-ID	Outfall Length (ft.)	Outfall Drainage Area (Ac.)	Estimated Phosphorous Reduction Provided (lbs./yr.)	Estimated Nitrogen Reduction Provided (lbs./yr.)	Estimated TSS Reduction Provided (lbs./yr.)
Outfall 1	329.00	3.30	81.47	134.27	150,862.10

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0

○ 2011 BMP Standards and Specification | ◉ 2013 Draft BMP Standards and Specification

Project Name: Van Dyck Outfall #1
Date: 9/20/2023

BMP Design Specifications List: 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.82	0.22	0.00	1.04 *
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	0.00	0.97	0.33	1.30
Impervious Cover (acres)	0.00	0.02	0.19	0.70	0.91
					3.25

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	1.39

LAND COVER SUMMARY -- POST DEVELOPMENT

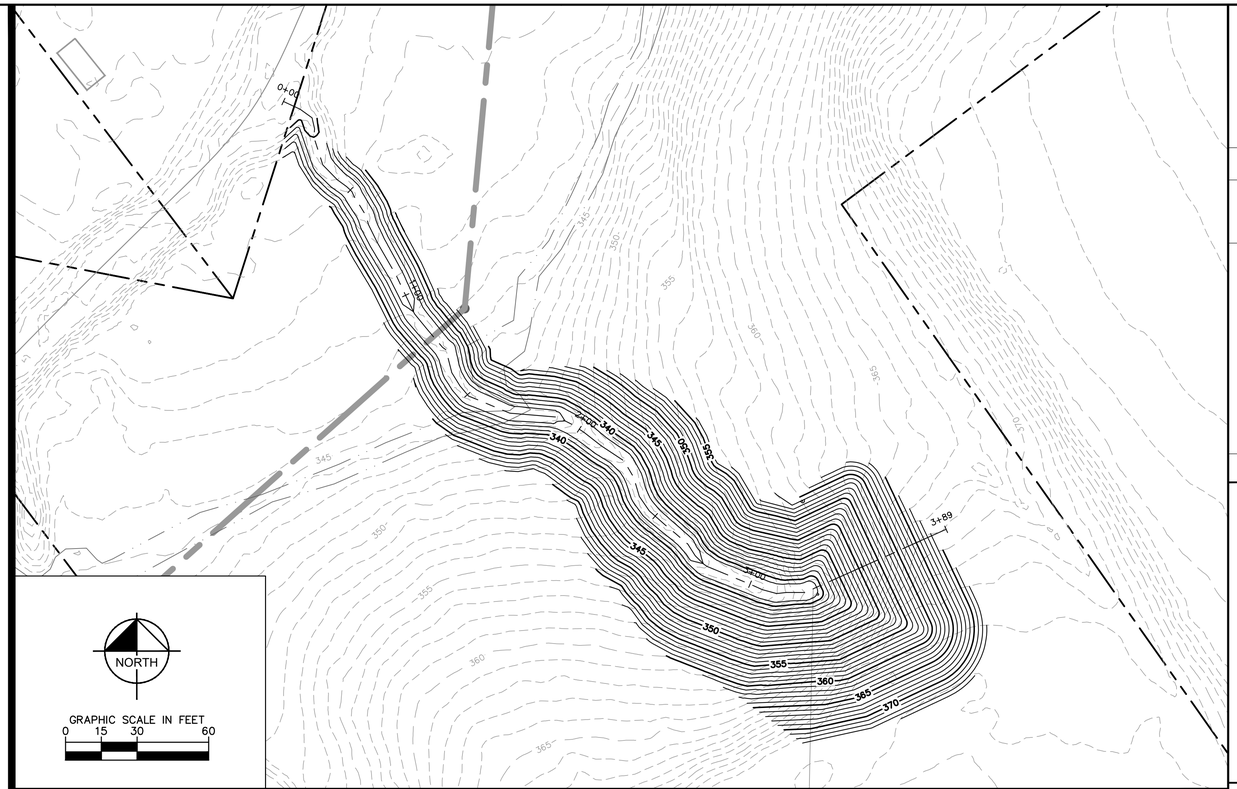
Land Cover Summary

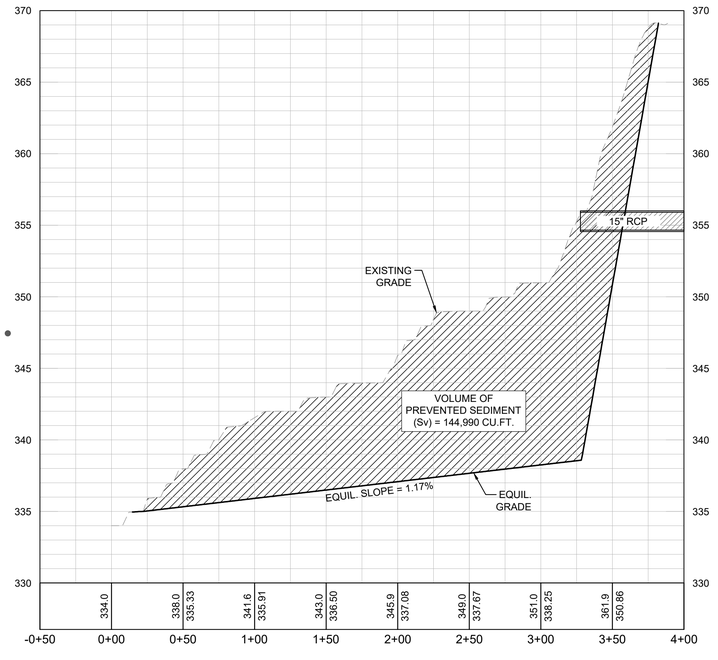
Forest/Open Space Cover (acres)	1.04
Weighted Rv (forest)	0.03
% Forest	32%
Managed Turf Cover (acres)	1.30
Weighted Rv (turf)	0.23
% Managed Turf	40%
Impervious Cover (acres)	0.91
Rv (impervious)	0.95
% Impervious	28%
Site Area (acres)	3.25
Site Rv	0.37

Treatment Volume and Nutrient Loads

Treatment Volume (acre-ft)	0.0997
Treatment Volume (cubic feet)	4,341
TP Load (lb/yr)	2.73
TN Load (lb/yr) (Informational Purposes Only)	19.51

Existing Outfall Channel Condition Parameters		
Drainage Area (A_d)=	3.28	*ac*
Drainage Area (A_d)=	0.0133	km^2
Mean Flow Depth =	0.433	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	328.640	*ft*
Channel Slope =	0.063	*ft/ft*
Bank Height =	2.80	*ft*
Bottom Width =	5.57	*ft*
Top Width =	18.43	*ft*
Bulk Density (Estimate) =	70.00	$lb./ft^3$
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0117	*ft/ft*
Bed Condition 2: Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Condition 3: Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	5.5	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	5,370.00	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	144,990.00	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	2,416.50	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	150,862.10	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	62.43	$lb./ft^3$
1 ton of sediment =	1.08	*lb. of (P)*
1 ton of sediment =	1.78	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	150,862.10	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	81.47	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	134.27	*lbs./year*
Pollutant of Concern (POC) Crediting Summary		
Total Suspended Solids (TSS) Removal Rate =	150,862.10	*lbs./year*
Phosphorus (P) Removal Rate =	81.47	*lbs./year*
Nitrogen (N) Removal Rate =	134.27	*lbs./year*





VAN DYCK CREDITING PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY C.D.C
CHECKED BY J.J.D

PRELIMINARY POC CREDITING SUMMARY
OUTFALL AND GULLY STABILIZATION PROJECT
VAN DYCK PARK
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
07

Appendix H. Traveler Street Outfall and Gully Stabilization Sediment Reduction Calculations

30% CONSTRUCTION PLANS
OLD ROBIN STREET
(FORMALLY TRAVELER STREET)
OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 47 4 01 039
3157 FAIR WOODS PKWY
CITY OF FAIRFAX, VIRGINIA

PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF TWO ACTIVELY ERODING OUTFALL CHANNELS.

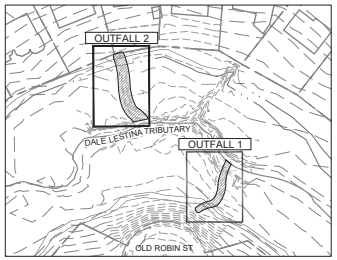
THE PROJECT LIMITS OF OUTFALL 1 BEGIN AT THE DISCHARGE OF A 15" RCP PIPE AND END AT THE CONFLUENCE OF THE OUTFALL CHANNEL WITH THE DALE LESTINA TRIBUTARY. THE PROJECT LIMITS OF OUTFALL 2 BEGIN AT THE DISCHARGE OF A 21" RCP AND END AT THE CONFLUENCE OF THE OUTFALL CHANNEL WITH THE DALE LESTINA TRIBUTARY. BOTH OUTFALLS ARE LOCATED WITHIN DALE LESTINA PARK.

THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITES AND PROCESSED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION.

THE SOIL SAMPLE RESULTS FOR OUTFALL 1 ARE AS FOLLOWS:
- BULK DENSITY - 64.3 LB/FT^3
- 0.86 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT
- 2.11 LBS OF NITROGEN PER 1 TON OF SEDIMENT

THE SOIL SAMPLE RESULTS FOR OUTFALL 2 ARE AS FOLLOWS:
- BULK DENSITY - 56.19 LB/FT^3
- 0.79 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT
- 2.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT

THE TOTAL POLLUTANT OF CONCERN CREDIT REDUCTION FROM BOTH OUTFALL LOCATIONS IS 14,300 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 16 LBS/YR OF NITROGEN, AND 6 LBS/YR OF PHOSPHORUS.

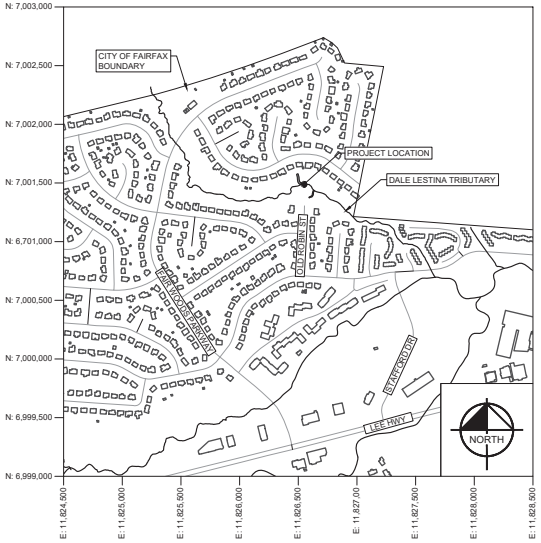


GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 47 4 01 039
   PARCEL AREA: 7.78 ACRES (339,000 SF)
   DEED BOOK AND NUMBER: UNKNOWN
   ESTIMATED DISTURBED AREA: 0.66 ACRES
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEY PREPARED BY JOHNSON, MIRIAM, & THOMPSON (JMT) ON OCTOBER 3, 2022. THE HORIZONTAL DATUM IS NAD83 WHILE THE VERTICAL DATUM IS NGVD29. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY'S OPEN GIS DATA HUB.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240002D INDICATES THAT THE PROJECT AREA IS LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA) ZONE AE.

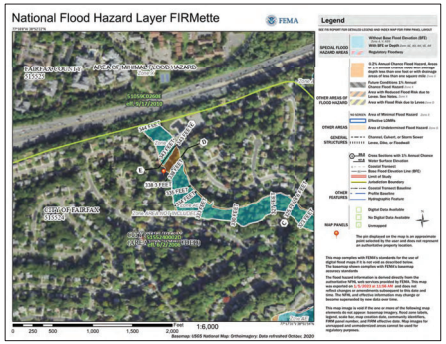
VICINITY MAP

1" = 500'



	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Sheet List Table	
Sheet Number	Sheet Title
01	COVER SHEET
02	GENERAL NOTES & DETAILS
03	GENERAL NOTES & DETAILS
04	PHOTO LOCATION MAP - OUTFALL 1
05	PHOTO LOCATION MAP - OUTFALL 2
06	EXISTING CONDITIONS - OUTFALL 1
07	EXISTING CONDITIONS - OUTFALL 2
08	EXISTING HYDROLOGY
09	POC CREDITING SUMMARY



Know what's below. Call before you dig.

Kimley»Horn
© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
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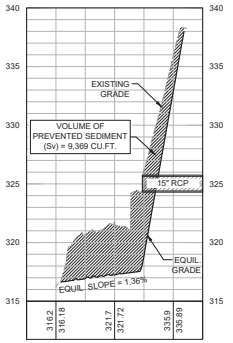
No.	REVISIONS	DATE	BY

KHA PROJECT 110057037
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY M.J.M
CHECKED BY J.J.D

COVER SHEET
OUTFALL AND GULLY STABILIZATION PROJECT
OLD ROBIN STREET
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

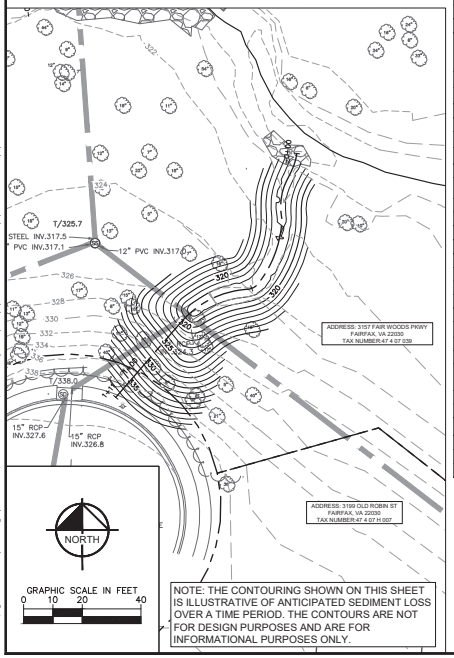
SHEET NUMBER 01

OUTFALL 1



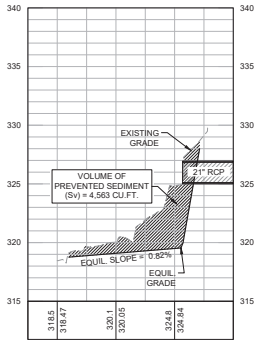
OUTFALL 1 LONGITUDINAL PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

Existing Outfall Channel Condition Parameters		
Drainage Area (A_d)=	2.06	*ac*
Drainage Area (A_d)=	0.0083	*km^2*
Mean Flow Depth =	0.767	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	69.110	*ft*
Channel Slope =	0.11	*ft/ft*
Bank Height =	2.17	*ft*
Bottom Width =	2.73	*ft*
Top Width =	6.83	*ft*
Bulk Density (Estimate) =	84.28	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?	Yes	
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Gravel (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{0.33}$		
Equilibrium Slope (S_{eq})=	0.0136	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	2.73	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	347.00	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	9,369.00	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	156.15	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	10,040.45	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	64.30	*lb./ft^3*
1 ton of sediment =	0.86	*lb. of (P)*
1 ton of sediment =	2.11	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	10,040.45	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	4.30	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	10.59	*lbs./year*
Pollutant of Concern (POC) Crediting Summary		
Total Suspended Solids (TSS) Removal Rate =	10,040.45	*lbs./year*
Phosphorus (P) Removal Rate =	4.30	*lbs./year*
Nitrogen (N) Removal Rate =	10.59	*lbs./year*



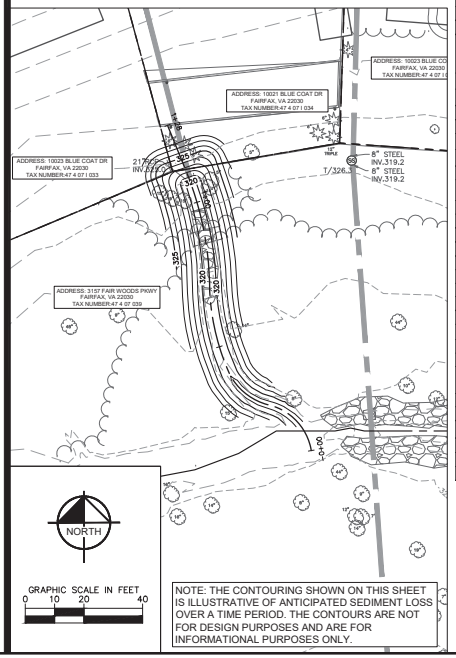
NOTE: THE CONTOURING SHOWN ON THIS SHEET IS ILLUSTRATIVE OF ANTICIPATED SEDIMENT LOSS OVER A TIME PERIOD. THE CONTOURS ARE NOT FOR DESIGN PURPOSES AND ARE FOR INFORMATIONAL PURPOSES ONLY.

OUTFALL 2



OUTFALL 2 LONGITUDINAL PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

Existing Outfall Channel Condition Parameters		
Drainage Area (A_d)=	9.411	*ac*
Drainage Area (A_d)=	0.0381	*km^2*
Mean Flow Depth =	2.211	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	98.000	*ft*
Channel Slope =	0.06	*ft/ft*
Bank Height =	3.27	*ft*
Bottom Width =	2.07	*ft*
Top Width =	0.00	*ft*
Bulk Density (Estimate) =	84.28	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?	Yes	
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Gravel (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{0.33}$		
Equilibrium Slope (S_{eq})=	0.0082	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	2.07	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	169.00	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	4,563.00	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	76.05	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	4,273.25	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	56.19	*lb./ft^3*
1 ton of sediment =	0.79	*lb. of (P)*
1 ton of sediment =	2.60	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	4,273.25	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	1.70	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	5.56	*lbs./year*
Pollutant of Concern (POC) Crediting Summary		
Total Suspended Solids (TSS) Removal Rate =	4,273.25	*lbs./year*
Phosphorus (P) Removal Rate =	1.70	*lbs./year*
Nitrogen (N) Removal Rate =	5.56	*lbs./year*



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No	REVISIONS	DATE	BY

Kimley»Horn

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KHA PROJECT 110057037
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY M.J.M
CHECKED BY J.J.D

POC CREDITING SUMMARY

OUTFALL AND GULLY STABILIZATION PROJECT
OLD ROBIN STREET

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
09

Appendix I. Mathy Park BMP Retrofit Sediment Reduction Calculations

Memo

To: City of Fairfax

Attn: Mr. Satoshi Eto

From: Brice Kutch, PE
Sean Mowery, PE

Date: March 31, 2023

Re: Mathy Park BMP Project – TMDL Pollutant Removal Calculations (GKY TO#21)

Project Information

GKY was tasked with performing an analysis regarding TMDL credits for the Mathy Park BMP (sheet flow to open space) project located at 10251 Main Street in Fairfax, Virginia. The goal of this analysis was to identify the total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) reductions for three (3) sheet flow to open space drainage divides (Figure 1) as follows:

Area 1: Sheet flow area treated to the existing curb line along the museum building and parking parcels (red area).

Area 2: Sheet flow area treated from Ratcliffe Park (blue area).

Area 3: Sheet flow area treated through residential lots along Sager Avenue (yellow area).

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4229 LAFAYETTE CENTER DRIVE : SUITE 1850 : CHANTILLY, VA 20151
WATER RESOURCES & ENVIRONMENTAL SOLUTIONS

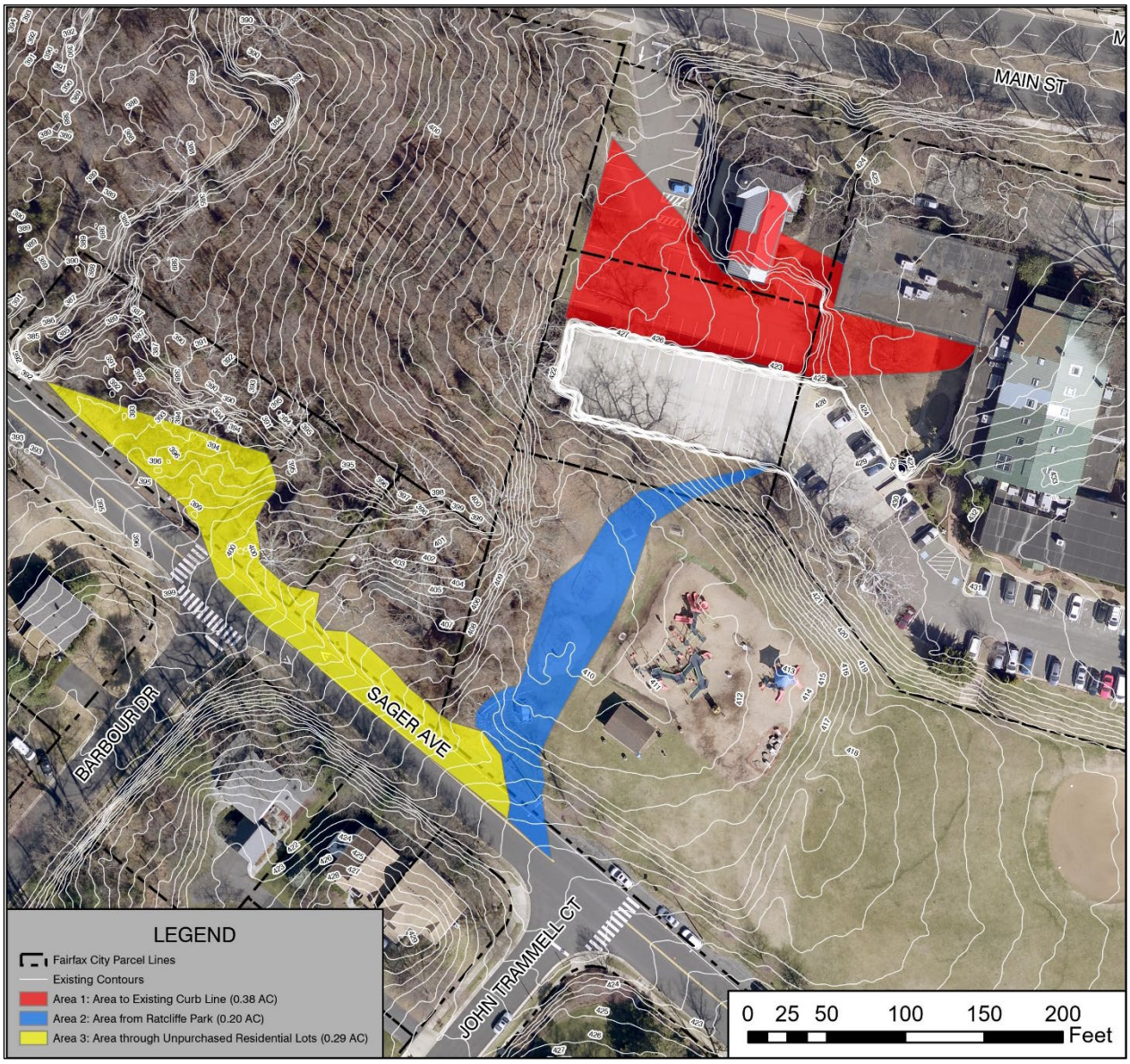


Figure 1. Potential Sheet Flow to Open Space Drainage Areas

GKY utilized the Chesapeake Bay TMDL Special Condition Guidance Memo No. GM20-2003 dated February 6, 2021 (DEQ Guidance) for the following analysis.

Area 1. Sheet Flow to Open Space: Existing Curb Line Analysis

GKY evaluated the TMDL pollutant reduction credit for diverting flow from the museum building and parking parcels (57-4-02-138B and 57-4-02-138C, respectively) as sheet flow to the Mathy Park open space parcel (57-4-02-142). GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the drainage divide for this area and found that approximately *0.25 impervious acres* and *0.13 pervious acres* make up the 0.38-acre drainage divide for the sheet flow area to existing curb line. It was assumed that all areas of the drainage divide were within MS4 service areas. This drainage divide is shown in red on Figure 1.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the sheet flow area to existing curb line drainage divide. These results are presented in Table 1.

Table 1. Total Pollutant Loads (TN, TP, and TSS) for the Sheet Flow Area to Existing Curb Line

Land Use	Drainage Area, ac	Loading Rate - TN, lbs/ac/yr	Total Load - TN, lbs/yr	Loading Rate - TP, lbs/ac/yr	Total Load - TP, lbs/yr	Loading Rate - TSS, lbs/ac/yr	Total Load - TSS, lbs/yr
Impervious	**0.25**	16.86	4.22	1.62	0.41	1,171.32	292.83
Pervious	**0.13**	10.07	1.31	0.41	0.05	175.80	22.85
		Total Load - TN, lbs/yr	5.52	Total Load - TP, lbs/yr	0.46	Total Load - TSS, lbs/yr	315.68

The baseline efficiency of all areas shown in Figure 1 is 0% for TN, TP, and TSS since the areas are currently not being treated by an existing BMP.

GKY then determined the efficiency of the proposed sheet flow to open space for all areas shown in Figure 1 using Table V.A.1 (Virginia Stormwater BMP Clearinghouse BMPs, Established Efficiencies Comparative Runoff Reduction and Nutrient Removal for Practices) in the DEQ Guidance. Using "Sheet Flow to Veg. Filter or Conserve Open Space" as the BMP and designed as flow to open space with C and D soils, the established efficiencies for TN and TP are shown in Table 2.

Table 2. Sheet Flow to Open Space Pollutant Efficiencies for the Area Treated to the Existing Curb Line

BMP	TN	TP	TSS
Sheet Flow to Open Space (C/D Soils)	50%	50%	75%

TSS percent effectiveness was determined using the retrofit curves/equations found in Appendix V.B (Chesapeake Bay Program, Retrofit Curves/Equations) of the DEQ Guidance. The nutrient curves are divided into two categories: runoff reduction practices (RR) and stormwater treatment practices (ST). Sheet flow to open space was found to be an RR practice per Table V.B.1 (Chesapeake Bay Program, Established Efficiencies) in the DEQ Guidance; therefore, the RR curve shown in Figure 2 was used to determine the TSS efficiency for all sheet flow to open space areas as shown in Figure 1.

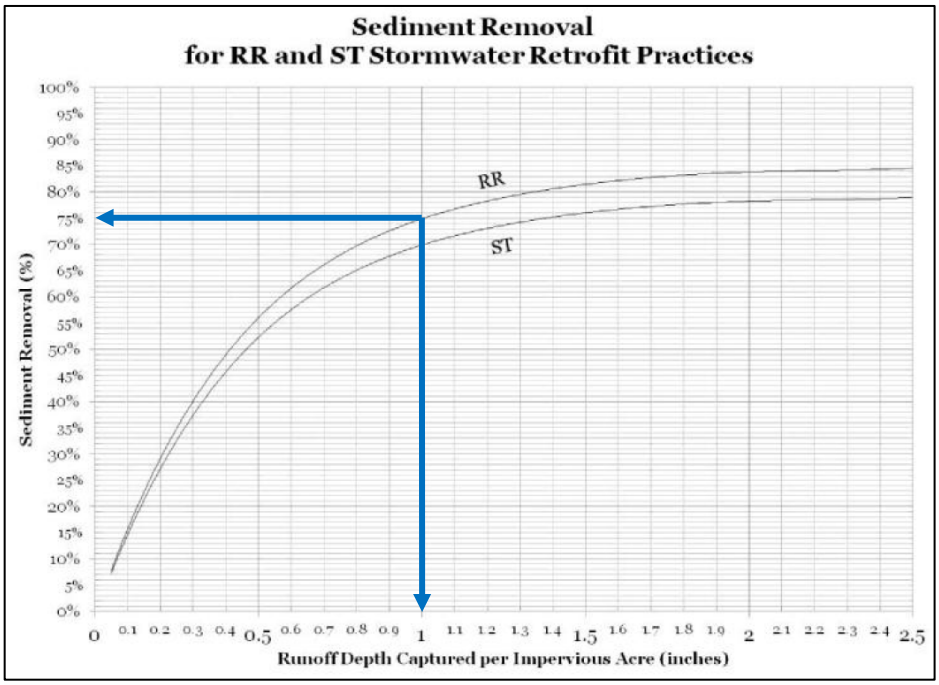


Figure 2. Sediment Removal Percent Effectiveness Based on Runoff Depth Captured Per Impervious Acre

For purposes of determining the sediment (TSS) removal efficiency, a runoff depth captured per impervious acre of 1" was used. Utilizing the RR curve shown in Figure 2, the sediment (TSS) removal efficiency for all sheet flow to open space areas entering Mathy Park (shown in Figure 1) was determined to be 75% as shown in Table 2.

See Table 3 for the resulting credits from converting the untreated area to the existing curb line to sheet flow to open space utilizing the efficiences shown in Table 2. The total credits gained for this conversion is *2.76 lbs/year* of TN, *0.23 lbs/year* of TP, and *236.76 lbs/year* of TSS as shown in Table 3.

Table 3. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for the Area Treated to the Existing Curb Line

	Pollutants of Concern Credits Gained, lbs/year		
	TN	TP	TSS
Total Credits Gained for Sheet Flow to Open Space	**2.76**	**0.23**	**236.76**

Area 2. Sheet Flow to Open Space: Ratcliffe Park Analysis

GKY evaluated the TMDL pollutant reduction credit for converting flow from the Ratcliffe Park parcel (57-4-02-138A) to sheet flow to the Mathy Park open space parcel (57-4-02-142). GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the drainage divide for this area and found that approximately *0.02 impervious acres* and *0.18 pervious acres* make up the 0.20-acre drainage divide for the sheet flow area from Ratcliffe Park. It was assumed that all areas of the drainage divide were within MS4 service areas. This drainage divide is shown in blue on Figure 1.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the sheet flow area from the Ratcliffe Park drainage divide. These results are presented in Table 4.

Table 4. Total Pollutant Loads (TN, TP, and TSS) for the Sheet Flow Area from Ratcliffe Park

Land Use	Drainage Area, ac	Loading Rate - TN, lbs/ac/yr	Total Load - TN, lbs/yr	Loading Rate - TP, lbs/ac/yr	Total Load - TP, lbs/yr	Loading Rate - TSS, lbs/ac/yr	Total Load - TSS, lbs/yr
Impervious	**0.02**	16.86	0.34	1.62	0.03	1,171.32	23.43
Pervious	**0.18**	10.07	1.81	0.41	0.07	175.80	31.64
		Total Load - TN, lbs/yr	2.15	Total Load - TP, lbs/yr	0.11	Total Load - TSS, lbs/yr	55.07

See Table 5 for the resulting credits from converting the untreated area from Ratcliffe Park to sheet flow to open space utilizing the efficiences shown in Table 2. The total credits gained for this conversion is *1.07 lbs/year* of TN, *0.05 lbs/year* of TP, and *41.30 lbs/year* of TSS as shown in Table 5.

Table 5. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for the Area Treated from Ratcliffe Park

	Pollutants of Concern Credits Gained, lbs/year		
	TN	TP	TSS
Total Credits Gained for Sheet Flow to Open Space	**1.07**	**0.05**	**41.30**

Area 3. Sheet Flow to Open Space: Sager Avenue Analysis

GKY evaluated the TMDL pollutant reduction credit for converting flow from the Sager Avenue parcels (57-4-02-139, 57-4-02-140, and 57-4-02-141) to sheet flow to the Mathy Park open space parcel (57-4-02-142). GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the drainage divide for this area and found that approximately *0.10 impervious acres* and *0.19 pervious acres* make up the 0.29-acre drainage divide for the sheet flow area from the Sager Avenue parcels. It was assumed that all areas of the drainage divide were within MS4 service areas. This drainage divide is shown in yellow on Figure 1.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the sheet flow area from the Sager Avenue drainage divide. These results are presented in Table 6.

Table 6. Total Pollutant Loads (TN, TP, and TSS) for the Sheet Flow Area from the Sager Avenue Parcels

Land Use	Drainage Area, ac	Loading Rate - TN, lbs/ac/yr	Total Load - TN, lbs/yr	Loading Rate - TP, lbs/ac/yr	Total Load - TP, lbs/yr	Loading Rate - TSS, lbs/ac/yr	Total Load - TSS, lbs/yr
Impervious	**0.10**	16.86	1.69	1.62	0.16	1,171.32	117.13
Pervious	**0.19**	10.07	1.91	0.41	0.08	175.80	33.40
		Total Load - TN, lbs/yr	3.60	Total Load - TP, lbs/yr	0.24	Total Load - TSS, lbs/yr	150.53

See Table 6 for the resulting credits from converting the untreated area from the Sager Avenue parcels to sheet flow to open space utilizing the efficiences shown in Table 2. The total credits gained for this conversion is *1.80 lbs/year* of TN, *0.12 lbs/year* of TP, and *112.90 lbs/year* of TSS as shown in Table 7.

Table 7. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for the Area Treated from the Sager Avenue Parcels

	Pollutants of Concern Credits Gained, lbs/year		
	TN	**TP**	**TSS**
Total Credits Gained for Sheet Flow to Open Space	**1.80**	**0.12**	**112.90**

Conclusion

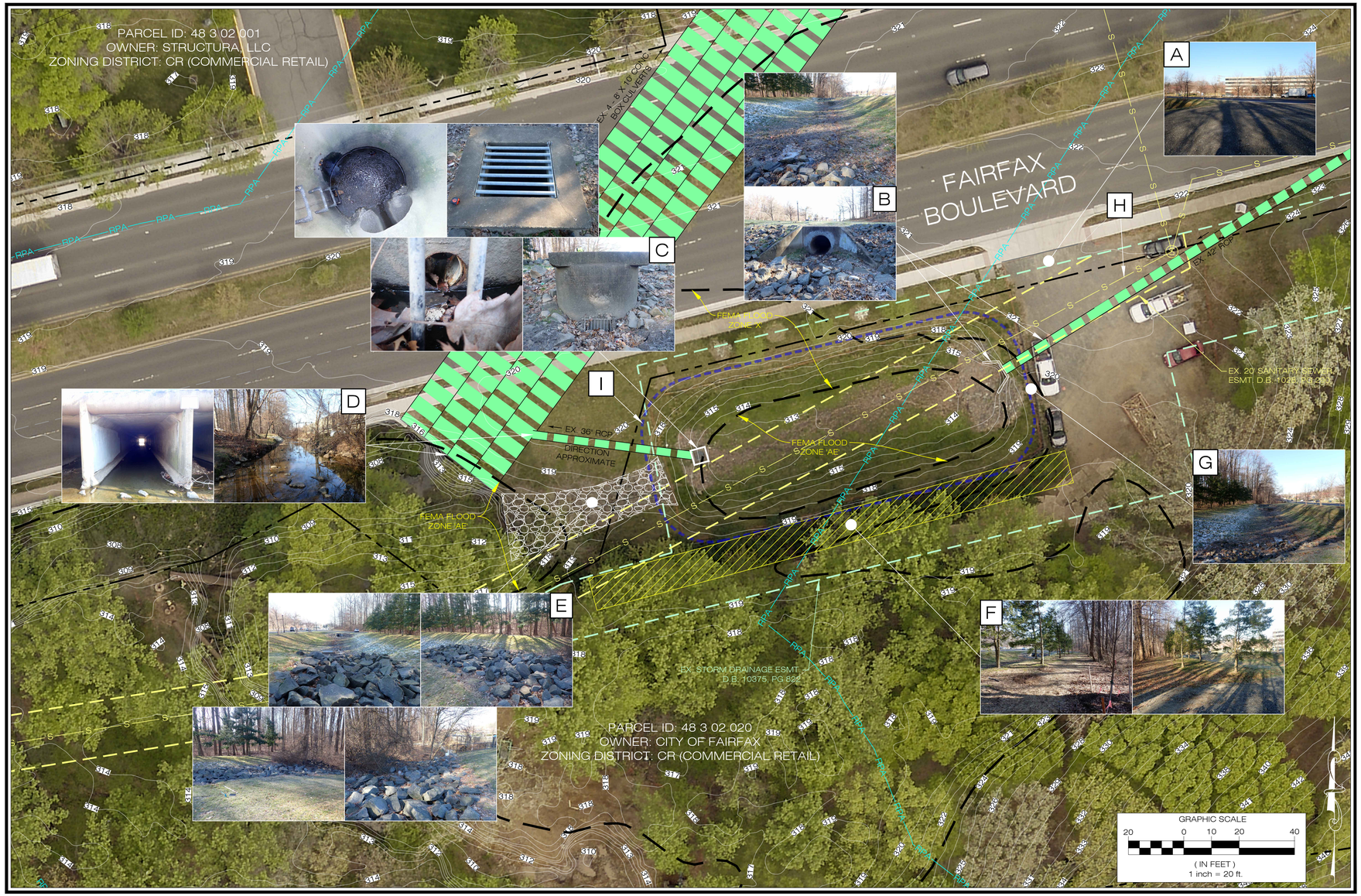
Table 8 identifies the total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) reductions for the three (3) sheet flow to open space drainage divides (Figure 1).

Table 8. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for All Areas

Mathy Park Drainage Divides	Impervious Area (Acres)	Pervious Area (Acres)	TN Credits Gained (lbs/year)	TP Credits Gained (lbs/year)	TSS Credits Gained (lbs/year)
Area 1	0.25	0.13	2.76	0.23	236.76
Area 2	0.02	0.18	1.07	0.05	41.3
Area 3	0.10	0.19	1.80	0.12	112.9
		Total:	**5.63**	**0.40**	**390.96**

Appendix J. Lion Run (Fairfax High School Pond) BMP Retrofit Sediment Reduction Calculations

FAIRFAX HIGH SCHOOL POND RETROFIT CONCEPT PLAN



NOTE: ALL AERIAL IMAGERY, TOPOGRAPHIC, AND PIPE NETWORK DATA WAS RETRIEVED FROM THE FAIRFAX COUNTY AND CITY OF FAIRFAX GIS DATABASES. THE EASEMENT AND BOX CULVERT PIPE LINES WERE DIGITIZED FROM ATLA / ACSM LAND TITLE SURVEY OF THE PROPERTY OF MARGURITE O. PITTS, DATED DECEMBER 1987. SUPPLEMENTAL PHOTOGRAPHS WERE TAKEN BY GKY ENGINEERS DURING A SITE VISIT ON FEBRUARY 20TH, 2024.

ALL INFORMATION HEREIN, INCLUDING THE PLAN AND COST ESTIMATE, IS IN PRELIMINARY FORM AT A CONCEPTUAL LEVEL OF DESIGN, PRODUCED AS AN INTERIM PRODUCT. INFORMATION WILL CHANGE AS SUBSEQUENT LEVELS OF DESIGN ARE COMPLETED.

PROJECT NARRATIVE

THE EXISTING FAIRFAX HIGH SCHOOL DRY POND FACILITY IS LOCATED AT 9985 FAIRFAX BOULEVARD, PARCEL ID 48 3 02 020, AND IS OWNED AND MAINTAINED BY THE CITY OF FAIRFAX. NO FACILITY DESIGN PLANS COULD BE LOCATED FOR THE POND. AN ATLA / ACSM LAND TITLE SURVEY OF THE PROPERTY OF MARGURITE O. PITTS, DATED DECEMBER 1987 SHOWS SOME PROPERTY, EASEMENT, AND UTILITY INFORMATION IN THE AREA OF THE EXISTING POND FACILITY. GKY PREVIOUSLY EVALUATED THIS POND AS A RETROFIT OPPORTUNITY TO PROVIDE EDUCATIONAL OUTREACH FOR THE COMMUNITY AND THE ADJACENT HIGH SCHOOL, AS WELL AS CLAIM SOME TMDL POLLUTANT REDUCTION CREDITS FOR THE CITY. THE EXISTING DELINEATED DRAINAGE AREA TO THE FACILITY IS 8.19 ACRES. THE OUTFALL OF THE FACILITY EXITS INTO EXISTING QUADRUPLE 8'X10' BOX CULVERTS CONVEYING ACCOTINK CREEK FROM SOUTHWEST TO NORTHEAST UNDERNEATH FAIRFAX BOULEVARD, AND ULTIMATELY EMPTIES INTO THE POTOMAC RIVER AT GUNSTON COVE.

THE OBJECTIVE FOR THIS PROJECT IS TO RETROFIT THE EXISTING DRY POND FACILITY TO A LEVEL 1 EXTENDED DETENTION POND. PROPOSED IMPROVEMENTS FOR THIS FACILITY INCLUDE A SEDIMENT FOREBAY AT THE INFLOW, TWO MICROPOOLS ON THE POND FLOOR, AQUATIC BENCHES AROUND THE FOREBAY AND MICROPOOLS, INCREASED STORAGE VOLUME TO MEET TREATMENT VOLUME DESIGN REQUIREMENTS, MEANDERING FLOW PATH, AND MODIFICATIONS TO THE EXISTING RISER STRUCTURE TO MEET ALLOWABLE FLOWS. APPROXIMATELY 0.54 ACRES ARE PROPOSED TO BE DISTURBED WITH THIS PROJECT.

THE REQUIRED TREATMENT VOLUME BASED ON VRRM CALCULATIONS (SEE SHEET 3) IS 15,758 CF. A MINIMUM OF 15% OF THE REQUIRED TREATMENT VOLUME SHALL BE CONTAINED BELOW THE PERMANENT POOLS OF THE FOREBAY AND MICROPOOLS. THE TOTAL PROPOSED STORAGE BELOW PERMANENT POOL WITH THIS PLAN IS 4,573 CF (29%) AS SHOWN IN THE WET STAGE-STORAGE TABLES ON SHEET 4. THE TOTAL TREATMENT VOLUME BELOW 314.91' (THE 2-YR ORIFICE INVERT ELEVATION OF THE MODIFIED CONTROL STRUCTURE) IS 15,766 CF, WHICH IS GREATER THAN THE REQUIRED TREATMENT VOLUME OF 15,758 CF.

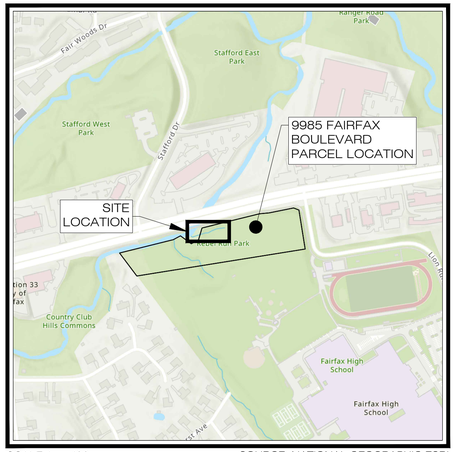
GKY PERFORMED AN ANALYSIS REGARDING TMDL CREDITS TO CALCULATE POLLUTANT CREDITS GAINED FOR RETROFITTING THE EXISTING DRY POND FACILITY TO A LEVEL 1 EXTENDED DETENTION POND FACILITY. SEE SHEET 3 FOR THE TMDL CREDIT ANALYSIS SUMMARY.

THE FACILITY'S PROPOSED DRY DETENTION VOLUME CAPACITY IS PROPOSED TO INCREASE. EXISTING AND PROPOSED STAGE-STORAGE TABLES ARE SHOWN ON SHEET 4. EXISTING POND STAGE-STORAGE WAS DEVELOPED USING 2018 FAIRFAX COUNTY 1-FT CONTOUR GIS DATA. AN ANALYSIS OF PEAK OUTFLOWS AND ROUTED PEAK WATER SURFACE ELEVATIONS WAS PERFORMED FOR THE EXISTING POND AND THE PROPOSED LEVEL 1 EXTENDED DETENTION POND FACILITY WITH RESULTS SHOWN ON SHEET 4.

LEGEND

A	EXISTING MAINTENANCE ACCESS ROAD ENTRANCE VIA FAIRFAX BOULEVARD.
B	EXISTING 42" RCP INFLOW, WITH 60" H X 72" W HEADWALL, AND WINGWALLS. SEE EXISTING INFLOW HEADWALL AND WINGWALL DETAIL ON SHEET 5.
C	EXISTING 6' DIA. CONCRETE CONTROL STRUCTURE WITH 64" X 64" X 8" TOP SLAB, 3' X 3' GRATE DROP INLET, 3" LOW-FLOW ORIFICE, AND 36" PRINCIPAL SPILLWAY PIPE. SEE EXISTING CONTROL STRUCTURE DETAIL ON SHEET 5.
D	FACILITY OUTFALLS INTO EXISTING QUADRUPLE 8' X 10' BOX CULVERTS CONVEYING ACCOTINK CREEK.
E	EXISTING EMERGENCY SPILLWAY CHANNEL; APPROXIMATE 10' BOTTOM WIDTH, 16' TOP WIDTH, AND 3:1 SIDE SLOPES. SEE EXISTING EMERGENCY SPILLWAY DETAIL ON SHEET 5.
F	EXISTING AREA OF LANDSCAPING ADJACENT TO POND; 19 TREES AND 2 SHRUBS TO BE REMOVED FOR POND EXPANSION.
G	EXISTING DRY POND FACILITY, OVERALL, LOOKING SOUTHWEST.
H	EXISTING 14" SANITARY SEWER LINE FROM CITY GIS DATA. THE EXISTING SANITARY SEWER LINE RUNS UNDERNEATH THE EXISTING POND AT AN APPROXIMATE ELEVATION BETWEN 302' AND 305' AS SHOWN ON ATLA / ACSM LAND TITLE SURVEY OF THE PROPERTY OF MARGURITE O. PITTS, DATED DECEMBER 1987.
I	EXISTING POND FOOTPRINT.

VICINITY MAP



SCALE 1" = 400' SOURCE: NATIONAL GEOGRAPHIC ESRI

SHEET INDEX

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FAIRFAX HIGH SCHOOL POND RETROFIT CONCEPT PLAN
CITY OF FAIRFAX, VA

EXISTING CONDITIONS

NOT FOR CONSTRUCTION

DATE	DESCRIPTION
4/3/2024	1ST SUB.

H SCALE:	1" = 20'
H DATUM:	NAD83
V SCALE:	N/A
V DATUM:	NGVD29
DESIGNED:	SM
DRAFTED:	BW
CHECKED:	BK
PROJECT#:	2023-002
CONTRACT#:	TO#11
SHEET:	1 OF 5

Project: Fairfax High School Pond Retrofit					
Estimate Type: Conceptual Plan Estimate					
Prepared by: GKY & Associates, Inc.					
Date: Arpil 3, 2024					
#	ITEM	QUANTITY	UNIT	UNIT COST	COST
1	**DEMOLITION**				
2	Removal of Existing Inflow Endwall and Wing Walls	1	EA	$5,000 / EA	$5,000
3	Removal of Existing Portion of 42" RCP Inflow and Disposal Offsite	40	LF	$130 / LF	$5,200
4	Relocation of Trees Along South Side of Pond	19	EA	$1,050 / EA	$19,950
5	Relocation of Shrubs Along South Side of Pond	2	EA	$500 / EA	$1,000
6	Removal of Existing Trees (6"-12" diameter)	15	EA	$1,000 / EA	$15,000
7	Removal of Emergency Spillway Riprap and Store on Site	80	TN	$150 / TN	$12,000
8				**DEMOLITION SUB TOTAL:**	**$58,150**
9	**EROSION & SEDIMENT CONTROL**				
10	Erosion and Sediment Controls	1	LS	$150,000 / LS	$150,000
11				**EROSION & SEDIMENT CONTROL SUB TOTAL:**	**$150,000**
12	**PROPOSED IMPROVEMENTS**				
13	Riser Modifications (low-flow trash rack, BMP orifice plate, new orifice)	1	LS	$10,000 / LS	$10,000
14	Excavation and Hauling Excess Soil Off-Site	1,350	CY	$77 / CY	$103,950
15	Fine Grading of Pond	1,750	SY	$20 / SY	$35,000
16	Aquatic Bench Plantings	1	LS	$20,000 / LS	$20,000
17	Inflow Headwall and Wing Walls	1	EA	$15,000 / EA	$15,000
18	Riprap for Inflow and Emergency Spillway	120	TN	$150 / TN	$18,000
19	Gravel for Access Road	350	SY	$12 / SY	$4,200
20	Widening the Emergency Spillway Channel	50	CY	$80 / CY	$4,000
21	Landscaping and Miscellaneous Restoration	1	LS	$8,000 / LS	$8,000
22				**PROPOSED IMPROVEMENTS SUB TOTAL:**	**$218,150**
23	**MISCELLANEOUS**				
24	Maintenance of Traffic	1	LS	$5,000 / LS	$5,000
25	Survey, Design, & Permitting	1	LS	$100,000 / LS	$100,000
26				**MISCELLANEOUS SUB TOTAL:**	**$105,000**
27					
28				**PROJECT SUB TOTAL:**	**$531,300**
29				**MOBILIZATION (5% of PROJECT SUB TOTAL):**	**$26,565**
30				**TOTAL:**	**$557,865**
31				**CONTINGENCY (30% of PROJECT SUB TOTAL):**	**$167,360**
32				**PROJECT TOTAL:**	**$725,225**

ALL INFORMATION HEREIN, INCLUDING THE PLAN AND COST ESTIMATE, IS IN PRELIMINARY FORM AT A CONCEPTUAL LEVEL OF DESIGN, PRODUCED AS AN INTERIM PRODUCT. INFORMATION WILL CHANGE AS SUBSEQUENT LEVELS OF DESIGN ARE COMPLETED.

LEVEL 1 EXTENDED DETENTION POND DESIGN GUIDANCE MATRIX		
Level 1 Design Criteria Per VA Stormwater BMP Clearinghouse	Proposed Level 1 Extended Detention Pond Design Per This Planset	Criteria Met?
Required Treatment Volume (T_V) is equal to the calculated Treatment Volume.	Required Treatment Volume is 15,758 ft^3 per the VRRM spreadsheet calculations shown on this sheet. The Treatment Volume proposed with this design, below elevation 314.91' (crest of BMP pool at modified riser), is 15,766 ft^3.	✓
A minimum of 15% of the Treatment Volume (T_V) is required below permanent pool of forebay and micropool(s).	One (1) forebay is proposed with 1,621 ft^3 of storage below permanent pool (313') and one (1) with 357 ft^3 of storage below permanent pool (313'). The combined storage below permanent pool for the forebay and micropools is 4,573 ft^3, which is 29.0% of the required treament volume of 15,758 ft^3.	✓
Length/width ratio or flow path = 2:1 or more. Length of shortest flow path/overall length = 0.4 or more. In the case of multiple inflows, the flow path is measured from the dominant inflows (that comprise 80% or more of the total pond inflow).	The flow path length of the proposed extended detention pond is approximately 227 ft and the width of the proposed extended detention pond is approximately 80 ft, which is a length/width ratio of approximately 2.8:1. There is one (1) piped inflow to the facility. The piped inflow comprises more than 80% of the total pond inflow.	✓
Average Treatment Volume (T_V) extended detention time is required to be 24 hours.	The extended detention drawdown time is proposed to be 24 hours.	✓
Vertical Treatment Volume (T_V) extended detention fluctuation cannot extend more than 5 ft above the pond floor.	The maximum head correseponding to the required water quality volume is proposed to be 1.91 ft'.	✓
Turf cover is required on the floor of the pond.	Turf cover is proposed on the pond floor.	✓
At least one (1) forebay and one (1) micropool are required in the design of the extended detention pond.	One (1) forebay and two (2) micropools are proposed with this design.	✓

FAIRFAX HS POND RETROFIT TMDL CREDIT ANALYSIS

GKY

Memo

To: City of Fairfax

From: Brian Wilson, EIT
Sean Mowery, PE

Date: April 3, 2024

Re: Fairfax High School Pond Retrofit – TMDL Credit Analysis (GKY TO#11)

Project Information

GKY was tasked with performing an analysis regarding TMDL credits for the retrofit project of the existing Fairfax High School dry pond facility located at 9985 Fairfax Boulevard, in Fairfax, Virginia. The goal of this analysis was to identify the total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) reductions for the following retrofit:

1. Converting the existing dry pond to a Level 1 extended detention pond.

GKY utilized the Chesapeake Bay TMDL Special Condition Guidance Memo No. GM20-2003 dated February 6, 2021 (DEQ Guidance).

1. Existing Fairfax High School Dry Pond to Level 1 Extended Detention Pond Analysis

GKY evaluated the conversion of the existing Fairfax High School dry pond to a Level 1 Extended Detention Pond. GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the existing dry pond's drainage shed. GKY delineated the drainage shed for this facility under TO#11 and found that approximately *4.02 impervious acres* and *4.17 pervious acres* make up the 8.19-acre drainage shed for the existing dry pond. It was assumed that all areas of the drainage shed for the dry pond were within MS4 service areas.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the existing dry pond drainage shed. These results are presented in Table 1.

Table 1. Total Pollutant Loads (TN, TP, and TSS) for the Existing Dry Pond

Land Use	Drainage Area, ac	Loading Rate - TN, lbs/ac/yr	Total Load - TN, lbs/yr	Loading Rate - TP, lbs/ac/yr	Total Load - TP, lbs/yr	Loading Rate - TSS, lbs/ac/yr	Total Load - TSS, lbs/yr
Impervious	**4.02**	16.86	67.78	1.62	6.51	1,171.32	4,708.71
Pervious	**4.17**	10.07	41.99	0.41	1.71	175.80	733.09
		Total Load - TN, lbs/yr	109.77	Total Load - TP, lbs/yr	8.22	Total Load - TSS, lbs/yr	5,441.79

GKY then determined the baseline efficiency of the existing dry pond using Table V.C.1 (Chesapeake Bay Program BMPs, Established Efficiencies) in the DEQ Guidance. Using "Dry Detention Ponds and Hydrodynamic Structures" as the BMP, the established efficiencies are presented in Table 2.

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4229 LAFAYETTE CENTER DRIVE - SUITE 1850 - CHANTILLY, VA 20151
WATER RESOURCES & ENVIRONMENTAL SOLUTIONS

Table 2. Existing Dry Pond Pollutant Efficiencies

BMP	TN	TP	TSS
Dry Pond	5%	10%	10%

GKY also looked for missing design criteria for the existing dry pond to determine if the BMP efficiency should be modified downward. Specifically, 10% downward reductions in efficiency were applied for two missing water quality features as presented in Table 3. These included a missing sediment forebay and no micro pool near the outlet. No reduction in efficiency was applied for an undersized practice based on the existing water quality storage volume of 0.49 acre-feet (based on Fairfax County 1-ft contours), which is more than 2*WQ_V, where WQ_V = 0.5" x impervious area draining to the pond or 0.17 acre-feet. Based on an impervious area of 4.02 acres, 2*WQ_V = 0.34 acre-feet. Furthermore, no additional reduction in efficiency was applied as the existing 3' low-flow orifice has a calculated drawdown of 12.1 hours.

Table 3. Existing Dry Pond Efficiency Adjustment

Dry Extended Detention Pond Efficiency Adjustments (Place a Y beside each one applicable)		
Existing Dry Pond Criteria	Applicable	Efficency Reduction
Absence of sediment forebay	**Y**	10%
Absence of micropool or other form of riser outlet protection	**Y**	10%
Short circuting due to initial inlet placement (design flow only)	**N**	0%
Drainage Area <5 acres and drainage orifice > 3 inches or	**N**	0%
Less than 12-hour draw down time	**N**	0%
Undersized practice based on the existing water quality storage volume	**N**	0%
	Total Adjustment	20%

GKY modified the BMP efficiencies downward by 20% to obtain the adjusted existing dry pond pollutant efficiencies, as presented in Table 4.

Table 4. Adjusted Existing Dry Pond Pollutant Efficiencies

BMP	TN	TP	TSS
Dry Pond	4%	8%	8%

GKY then determined the total loads for all pollutants of concern (TN, TP, and TSS) within the proposed level 1 extended detention pond's drainage shed. GKY delineated the drainage shed for this facility under TO#11 and found that approximately *4.02 impervious acres* and *5.08 pervious acres* make up the 9.20-acre drainage shed for the proposed level 1 extended detention pond. It was assumed that all areas of the drainage shed for the extended detention pond were within MS4 service areas.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the proposed level 1 extended detention pond drainage shed. These results are presented in Table 5.

Table 5. Total Pollutant Loads (TN, TP, and TSS) for the Proposed Level 1 Extended Detention Pond

Land Use	Drainage Area, ac	Loading Rate - TN, lbs/ac/yr	Total Load - TN, lbs/yr	Loading Rate - TP, lbs/ac/yr	Total Load - TP, lbs/yr	Loading Rate - TSS, lbs/ac/yr	Total Load - TSS, lbs/yr
Impervious	**4.02**	16.86	67.78	1.62	6.51	1,171.32	4,708.71
Pervious	**5.18**	10.07	52.16	0.41	2.12	175.80	910.64
		Total Load - TN, lbs/yr	119.94	Total Load - TP, lbs/yr	8.64	Total Load - TSS, lbs/yr	5,619.35

GKY then determined the efficiency of the proposed level 1 extended detention pond using Table V.A.1 (Virginia Stormwater BMP Clearinghouse BMPs, Established Efficiencies Comparative Runoff Reduction and Nutrient Removal for Practices) in the DEQ Guidance. Using "Ext. Det. Ponds" as the BMP and design level 1, the established efficiencies for TN and TP are shown in Table 5.

TSS percent effectiveness was determined using Table V.C.1 (Chesapeake Bay Program BMPs, Established Efficiencies) in the DEQ Guidance. Using "Dry Extended Detention Ponds" as the BMP, the established efficiency for TSS is shown in Table 6.

Table 6. Level 1 Extended Detention Pond Pollutant Efficiencies: Runoff Depth Captured Per Impervious Acre = 1.0"

BMP	TN	TP	TSS
Level 1 Extended Detention Pond	10%	15%	60%

Pollutant load reductions from converting the existing Fairfax High School dry pond to a level 1 extended detention pond were determined by taking the difference between the exsiting dry pond pollutant load efficiencies and level 1 extended detention pond pollutant load efficiencies. See Table 7 for the resulting credits for the level 1 extended detention pond retrofit.

Table 7. Credits Gained: Converting Existing Dry Pond to Level 1 Extended Detention Pond (Runoff Depth Captured Per Impervious Acre = 1.0")

	Pollutants of Concern Credits Gained, lbs/year		
	TN	TP	TSS
Proposed Level 1 Extended Detention Pond	11.99	1.30	3,371.61
Existing Dry Pond	(4.39)	(0.66)	(435.34)
MS4 Area Credits Gained for Retrofit	**7.60**	**0.64**	**2,936.27**

Therefore, the total credits gained for converting the existing Fairfax High School dry pond to a level 1 extended detention pond is *7.60 lbs/year* of TN, *0.64 lbs/year* of TP, and *2,936.27 lbs/year* of TSS as shown in Table 7.

FAIRFAX HIGH SCHOOL POND RETROFIT VRRM CALCULATIONS FOR TREATMENT VOLUME

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested		2.69	0.15	0.06	2.89 *
Managed Turf (acres) -- disturbed, graded for yards or other turf to be		0.23	1.30	0.76	2.29
Impervious Cover (acres)		0.51	1.49	2.02	4.02
					9.20

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

Land Cover Summary	
Forest/Open Space Cover (acres)	2.89
Weighted Rv (forest)	0.03
% Forest	31%
Managed Turf Cover (acres)	2.29
Weighted Rv (turf)	0.23
% Managed Turf	25%
Impervious Cover (acres)	4.02
Rv (impervious)	0.95
% Impervious	44%
Site Area (acres)	**9.20**
Site Rv	**0.48**

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)		2.69	0.15	0.06	2.89	0.03
Managed Turf (acres)		0.23	1.30	0.76	2.29	0.23
Impervious Cover (acres)		0.51	1.49	2.02	4.02	0.95
				Total	9.20	

Post Development Treatment Volume in D.A. A (ft^3) 15,758

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FAIRFAX HIGH SCHOOL
POND RETROFIT
CONCEPT PLAN
CITY OF FAIRFAX, VA

SWM ANALYSIS (1 OF 2)

NOT FOR CONSTRUCTION

DATE	DESCRIPTION
4/3/2024	1ST SUB.

H SCALE: N/A
H DATUM: NAD83
V SCALE: N/A
V DATUM: NGVD29

DESIGNED: SM
DRAFTED: BW
CHECKED: BK

PROJECT#: 2023-002
CONTRACT#: TO#11

SHEET: 3 OF 5

Appendix K. City of Fairfax / Fairfax County Memorandum of Understanding – Difficult Run Benthic Local TMDL

City of Fairfax, Virginia
10455 Armstrong Street • Fairfax, VA 22030-3630
703-385-7810 • www.fairfaxva.gov

David Summers
Director of Public Works
(703) 385 7810
David.Summers@fairfaxva.gov

Monday, March 25, 2023

MEMORANDUM

TO:

FROM:

DATE:

RE: City of Fairfax – Proposed Means and Methods to Address the City's Aggregate portion of the Difficult Run Benthic Local TMDL

Per the City of Fairfax's (City) MS4 Permit Requirements, the City has a duty to meet the Local TMDL Special Conditions outlined in Part II of the MS4 Permit titled "*TMDL Special Conditions*". The United States Environmental Protection Agency (USEPA) approved a Benthic (Sediment) Local TMDL for the Difficult Run watershed in November of 2008 (Approval Letter provided in **Appendix A**). As part of the TMDL, the MS4 Permittees that comprise the drainage area for Difficult Run were assigned an aggregate Waste Load Allocation (WLA), as well as an annual load reduction requirement which is shown in Table 1.

Table 1. Difficult Run Total Wasteload Allocation by MS4 Location (Aggregated)

Difficult Run - Aggregated MS-4s	Existing Sediment Load (tons/yr.)	Baseline Sediment Load (lbs./yr.)	Allocated Sediment Load (tons/yr.)	Allocated Sediment Load (lbs./yr.)	Percent Reduction	Load Reduction Required (lbs./yr.)
Town of Vienna	5,316.60	10,633,200.00	3,595.00	7,190,000.00	32.38%	3,443,200.00
City of Fairfax						
Fairfax County						
Total VDOT						
Fairfax County Public Schools						
GW Memorial Parkway						

This memo outlines a calculation methodology to disaggregate the City's portion of their Local TMDL load reduction requirements as to determine an annual target sediment load reduction. Also included in this memo is the City's proposed Means and Methods to meet their disaggregated TMDL load reduction requirements.

All data and calculations outlined in this Memo are derived from the following sources:

- Approval Letter for the Sediment Total Maximum Daily Load (TMDL) to address the aquatic life use (Benthic) impairment in the Difficult Run Watershed (VAN-A11R-01) in Fairfax, County – USA EPA (November 2008)
- Readily available City of Fairfax, Fairfax County. Town of Vienna, and State and Federal GIS data.
- City of Fairfax – Difficult Run Sediment TMDL Action Plan (Revised February 2022)
- Fairfax County – Benthic TMDL Action Plan (March 2017)

CALCULATION METHODOLOGY TO DISAGGREGATE THE CITY OF FAIRFAX'S SEDIMENT LOAD REDUCTION REQUIREMENTS FOR THE DIFFICULT RUN WATERSHED

The first step in disaggregating the City's sediment load reduction requirements was to determine the City's contributing drainage area (CDA) to the Difficult Run watershed. The City's CDA to the Difficult Run watershed is ± 113.16 acres, with the overall Difficult Run Watershed standing at 37,179 acres. The City comprises ± 0.30% of the overall drainage area to Difficult Run. Table 1 illustrates the CDA features of Difficult Run.

Table 2. Difficult Run Contributing Drainage Area (CDA) Features

Difficult Run Contributing Drainage Area Features	
City of Fairfax - Contributing Drainage Area to Difficult Run (Ac.)	113.16
Town of Vienna - Contributing Drainage Area to Difficult Run (Ac.)	1,691.93
Fairfax County, VDOT, FFX Co Public Schools, GW Memorial Parkway combined Drainage Area to Difficult Run (Ac.)	35,373.91
Difficult Run Total Drainage Area (Ac.)	37,179.00
City of Fairfax total contributing Drainage Area to Difficult Run (%)	0.30%

Because impervious land cover is a primary factor contributing to instream channel erosion and ultimately Benthic impairments, an analysis was performed to determine the City's Difficult Run CDA percent imperviousness and compare it with the Difficult Run overall drainage area imperviousness. This comparison determined an impervious order of magnitude factor, as to not assume each aggregated MS4's Difficult Run CDA landcover was equally impervious. Table 3 outlines the City's impervious land cover features versus that of the overall Difficult Run watershed. It was determined that the City of Fairfax CDA is approximately 2.5x more impervious than the overall Difficult Run watershed.

Table 3. City of Fairfax Impervious Landcover vs. Difficult Run Overall Impervious Landcover

Difficult Run Watershed Land Cover Characteristics				
	Drainage Area (Acres)	Impervious Landcover (Acres)	Impervious (%)	City of Fairfax Land Cover Imperviousness vs. Difficult Run - Order of Magnitude
City of Fairfax - Difficult Run Contributing Drainage Area Land Cover Characteristics	113.16	62.64	55.36%	2.47
Difficult Run - Overall Drainage Area Land Cover Characteristics	37179	8,347.45	22.45%	

The calculations in Tables 2 and 3, as well as the GIS Landcover Analysis provided in **Appendix B**, confirm the City has a very small, highly impervious drainage area that contributes to Difficult Run. Utilizing the data derived in Tables 2 and 3, paired with the Difficult Run Overall Load Reduction Requirements shown in Table 4, a disaggregated range of the City's sediment load reduction requirements were calculated and are shown in Table 5.

Table 4. Difficult Run TMDL Information and Required Load Reduction (Aggregate)

Difficult Run - Aggregated MS-4s	Existing Load (tons/yr.)	Existing Load (lbs./yr.)	Allocated Sediment Load (tons/yr.)	Allocated Sediment Load (lbs./yr.)	Percent Reduction	Load Reduction Required (lbs./yr.)
Town of Vienna	5,316.60	10,633,200.00	3,595.00	7,190,000.00	32.38%	3,443,200.00
City of Fairfax						
Fairfax County						
Total VDOT						
Fairfax County Public Schools						
GW Memorial Parkway						

Table 5. City of Fairfax Estimated TMDL Load Reduction Range

City of Fairfax Estimated TMDL Load Reduction Range based on Proposed Calculation Methodology	
Total aggregate load reduction required among all MS-4 permittees (lbs./yr.)	3,443,200.00
City of Fairfax total contributing Drainage Area to Difficult Run (%)	0.30%
Estimated sediment reductions required from the City assuming all landcover conditions are consistent (lbs./yr.)	10,479.91
City of Fairfax order of magnitude factor for % Imperviousness landcover differential with overall Difficult Run watershed	2.47
Estimated sediment reductions required from the City when accounting for ~2.5x greater impervious landcover than that of the Difficult Run watershed (lbs./yr.)	25,885.37
Disaggregated sediment reduction requirement mean value based on calculated range (lbs./yr.)	18,182.64

If all MS4 permittee's CDA landcover characteristics are weighted equally throughout the watershed, the City has an estimated disaggregated annual sediment load reduction of 10,479.91 lbs. When the 2.5x imperviousness factor is applied to the calculation methodology, the City's estimated disaggregated annual sediment load reduction climbs to 25,885.37 lbs. Due to the simplistic nature of the disaggregation calculation presented in this memo, a mean annual required reduction of 18,182.62 lbs. was also calculated. This mean value was calculated to allow some allowance for the unknown model input parameters, calculation methodologies, and modeling assumptions utilized to derive the original TMDL, as well as the original aggregate sediment load reductions. At this time the City assumes their required Difficult Run annual disaggregated sediment load reduction requirement is 18,182.62 lbs.

MEANS AND METHODS PROPOSED TO MEET THE CITY OF FAIRFAX DIFFICULT RUN BENTHIC TMDL LOAD REDUCTION REQUIRMENTS

The majority of the City's 4000+ acres drain to Accotink Creek. Because of this, there are ample project locations within the City's Accotink Creek CDA to implement means and methods to provide sediment reductions for TMDLs (Both Local and Chesapeake Bay). As shown in Figure 1, the City of Fairfax's CDA to Difficult Run is 113.16 acres with Figure 2 showing the landcover and composition of the City's CDA to Difficult Run. Figures 1 and 2 illustrate the space constraints within the City to implement projects that provide sediment reductions.

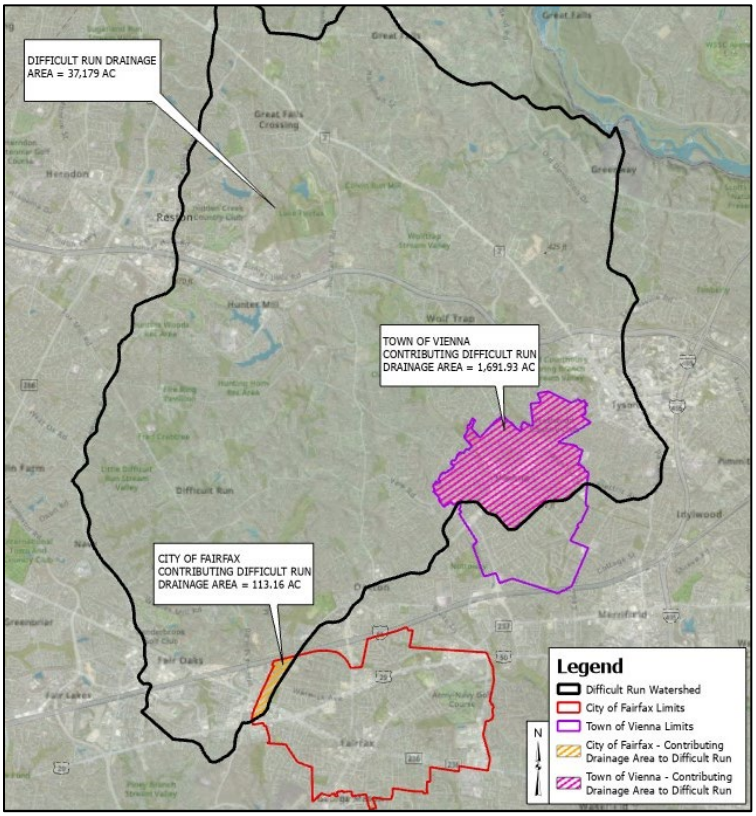


Figure 1. City of Fairfax Contributing Drainage Area (CDA) to Difficult Run

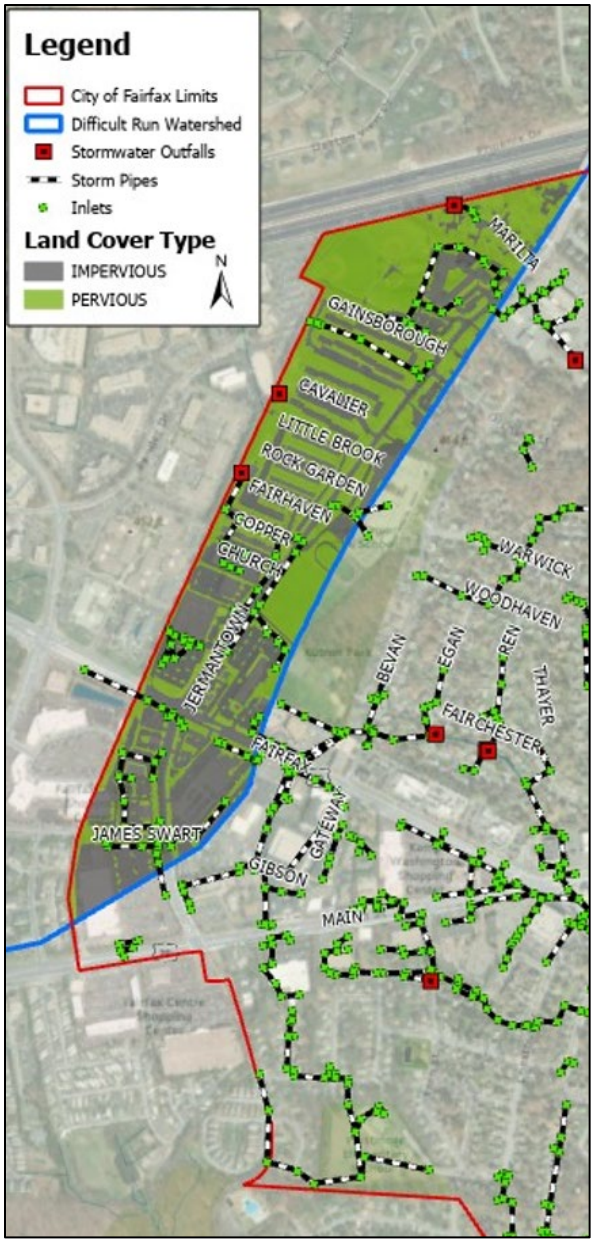


Figure 2. City of Fairfax Contributing Drainage Area to Difficult Run Land Cover and Composition

A field reconnaissance effort was conducted within the City's Difficult Run CDA. One (1) potential project, located on private property, was identified as having the capability to yield the necessary annual sediment reductions required for the City to meet their portion of the Difficult Run disaggregated load reduction requirements. **Appendix C** of this memo contains a preliminary sediment, nitrogen and phosphorus Pollutant of Concern (POC) crediting analysis for the potential Snug Haven Lane Stormwater Outfall Restoration Project.

The Snug Haven Lane Stormwater Outfall Restoration Project has the potential to yield the required annual sediment reduction needed to satisfy the City's portion of the Difficult Run disaggregated load reduction requirements, though the project would have significant constraints. The project location

parallels a large sanitary trunk line and has two (2) large, corrugated metal pipes (CMPs) that underly the existing stormwater outfall channel. The CMPs have an unknown upstream terminus that could pose design, demolition, and constructability constraints. Permanent easement acquisition from multiple City and County property owners would potentially be needed to construct and maintain the project as well. Finally, the potential project is in very close proximity to the City of Fairfax and Fairfax County border which would pose several interjurisdictional constraints with regards to design plan submittal and permitting requirements.

Once the Snug Haven Lane project constraints were realized, the City began an evaluation of alternative means and methods to meet their Difficult Run load reduction requirements. The City initiated discussions with Fairfax County regarding joint project opportunities within the Difficult Run Watershed. Through the discussions it was determined that Fairfax County has already implemented projects in the Difficult Run watershed that provide 1,846,427 lbs./year of sediment reduction. Furthermore, they anticipate another 3,487,240 lbs./year of sediment reductions to come online once construction is complete on the Brittonford Drive Stream Restoration Project. This would total 5,333,677.80 lbs./year. of sediment reductions within the Difficult Run Watershed which would significantly exceed the overall aggregate load reduction required by all Difficult Run MS4 permittees.

As discussions progressed between the City and Fairfax County, sediment credit trading between two MS4's came to the forefront. Both the City and the County have sediment reduction requirements tied to the Accotink Creek Benthic TMDL. The City can implement a project in the Accotink Creek watershed that can provide a sediment load reduction of 18,182.62 lbs./year (Difficult Run estimated disaggregated load reduction requirement), and those credits could be traded with the excess credits Fairfax County has generated in the Difficult Run watershed. This would allow the City to provide their contribution to meet the Difficult Run Benthic TMDL, through project implementation in the Accotink Creek watershed where project and land constraints are much less prevalent.

A Memorandum of Understanding (MOU) between Fairfax County and the City of Fairfax to exchange MS4 TMDL Sediment Reduction Credits for projects implemented in the Difficult Run and Accotink Creek watersheds is currently being developed containing the following framework terms:

1. No financial exchange will be necessary to exchange the credits.
    a. The County will implement a project in the Difficult Run watershed and agrees to transfer 18,182.62 lbs. of sediment reduction to the City of Fairfax.
    b. The City of Fairfax will implement a project in the Accotink Creek Watershed and agrees to transfer 18,182.62 lbs. of sediment reduction to the County.
2. Each MS4 will be responsible for design, construction, long-term maintenance and monitoring, inspection, and TMDL Action Plan required calculations, tracking, and required reporting to DEQ.
3. The County will provide example of our current Local TMDL Project Reporting Ledger to confirm data exchange and documentation requirements.

A Draft of this MOU is provided in **Appendix D** of this Memorandum.

CONCLUSION

Per the information outlined in this memo, the City of Fairfax is requesting that Virginia DEQ provide the following:

- Approval of the disaggregation calculation methodology outlined in this memo, as well as confirmation that the City's load reduction requirement of 18,182.62 lbs./year of sediment is an acceptable target sediment reduction for the City.
- Approval of sediment trading between the City of Fairfax and Fairfax County as an acceptable Means and Methods to meet their portion of the Difficult Run Benthic TMDL reduction requirements.
- Approval of the terms of the City and County MOU to exchange sediment credits among the Difficult Run and Accotink Creek watersheds for Local TMDL Compliance.

APPENDICIES

The following **Appendices** supporting the information outlined in this memo report are included:

- **Appendix A** – Approval Letter for the Sediment Total Maximum Daily Load (TMDL) to address the aquatic life use (Benthic) impairment in the Difficult Run Watershed (VAN-A11R-01) – USA EPA (November 2008)
- **Appendix B** – Difficult Run GIS Landcover Analysis supporting the disaggregated load reduction calculation methodology.
- **Appendix C** – Preliminary Pollutant of Concern (POC) Credit Analysis – Snug Haven Lane Outfall and Gully Stabilization Project (OGSP)
- **Appendix D** – City of Fairfax and Fairfax County Memorandum of Understanding (MOU) for exchange of MS4 TMDL Sediment Reduction Credits.

Closure

Please call me at (###) ###-#### should you have any questions regarding the information outlined in this memorandum.

Signature:

(Insert Name)
(Insert Title)

Appendix A

Approval Letter for the Sediment Total Maximum Daily Load (TMDL) to address the aquatic life use (Benthic) impairment in the Difficult Run Watershed (VAN-A11R-01) – USA EPA (November 2008)

Appendix B

Difficult Run GIS Landcover Analysis

Appendix C

Preliminary Pollutant of Concern (POC) Credit Analysis – Snug Haven Lane Outfall and Gully Stabilization Project (OGSP)

Appendix D

City of Fairfax and Fairfax County Memorandum of Understanding (MOU) for exchange of MS4 TMDL Sediment Reduction Credits

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
11/7/2008

Ellen Gilinsky, Ph.D.
Director, Division of Water Quality Programs
Virginia Department of Environmental Quality
629 E. Main Street
P.O. Box 1105
Richmond, Virginia 23218

Dear Dr. Gilinsky:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the Sediment Total Maximum Daily Load (TMDL) to address the aquatic life use (Benthic) impairment in the Difficult Run Watershed (VAN-A11R-01), which is located in Fairfax County and discharges into the Potomac River. The TMDL was submitted to EPA for review on April 29, 2008. The TMDL was established and submitted in accordance with Sections 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified in Virginia's Section 303(d) List.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) be designed to attain and maintain the applicable water quality standards; (2) include a total allowable loading and as appropriate, wasteload allocations for point sources and load allocations for nonpoint sources; (3) consider the impacts of background pollutant contributions; (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated); (5) consider seasonal variations; (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality); and (7) be subject to public participation. The TMDL for Difficult Run satisfies each of these requirements. In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met. A copy of EPA's Decision Rationale for approval of these TMDLs is included with this letter.

As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL wasteload allocation pursuant to 40 CFR §122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated September 29, 1998.

If you have further questions, please call me or have your staff contact Ms. Helene Drago at (215) 814-5796.

Sincerely,

/Signed/

Jon M. Capacasa, Director
Water Protection Division

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Decision Rationale
Total Maximum Daily Loads
Aquatic Life Use (Benthic) Impairment
Difficult Run Watershed
Fairfax County, Virginia

/Signed/

_____

Jon M. Capacasa, Director
Water Protection Division

Date: 11/7/2008

Decision Rationale
Total Maximum Daily Loads
Aquatic Life Use (Benthic) Impairment
Difficult Run Watershed, Fairfax County, Virginia

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those waterbodies identified as impaired by a State where technology based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS) that may be discharged to a water quality limited waterbody.

This document will set forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for the aquatic life use (benthic) impairment in the Difficult Run Watershed. EPA's rationale is based on the determination that the TMDLs meet the following seven regulatory conditions pursuant to 40 CFR Part 130.

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a MOS.
7. The TMDL has been subject to public participation.

In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met.

II. Background

The Difficult Run Watershed is located mainly within the borders of Fairfax County. The City of Fairfax and Town of Vienna are located within the watershed. Difficult Run (U.S. Geological Survey (USGS) Cataloging Unit 03070008) is a tributary to the Potomac River.

The Difficult Run Watershed is approximately 37,260 acres. Segment VAN-A11R-01 of Difficult Run was first listed as bacteria impaired on Virginia's 1998 Section 303(d) Total Maximum Daily Load Priority List and Reports due to poor health in the benthic biological community. The impaired segment of Difficult Run is 2.93 miles in length, beginning at the confluence of Captain Hickory Run with Difficult Run, approximately 0.6 river miles upstream from the Route 683 Bridge, and ending downstream at its confluence with the Potomac River. The land use in the watershed is 38% forested, 24% agriculture and 18% developed.

The TMDL represents the maximum amount of a pollutant that the stream can receive without exceeding the water quality standard. Based on the evidence and data discussed within the State submittal, sedimentation caused by higher runoff flows was identified as the primary stressor impacting the benthic community within Difficult Run. Sediment loadings from land erosion were determined using the Generalized Watershed Loading Functions (GWLF) model. GWLF model simulations were performed for 1994 to 2005 in order to account for seasonal variations and to reflect the period of biomonitoring assessments that resulted in the impairment listing of Difficult Run. Average annual sediment loads were computed for each land source based on the 11 year simulation period. In addition, average annual sediment loads from instream bank erosion, point sources, and MS4 permitted locations were determined. Point source loadings were computed based on the permitted discharge loading rate for total suspended solids. Instream erosion was estimated based on a stream bank lateral erosion rate equation. An area-weighted method was used to determine the land-based load attributed to MS4s present in the watershed.

Under the reference watershed approach, the TMDL endpoint is based on sediment loadings for the reference watershed. Sediment loadings computed for this area-adjusted watershed were used for TMDL allocations.

A summary of the sediment annual and daily loads for Difficult Run Watershed is presented in Table 1.

Table 1. Annual Sediment TMDL for Difficult Run

TMDL	Unit	Wasteload Allocation (Point Source + MS4s)	Load Allocation	Margin of Safety (10%)
6,075.8	Ton/year	3,663.2	1,805.0	607.6
16.65	Ton/day	1.67	10.04	4.95

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the seven basic requirements for establishing aquatic life use (benthic) impairment TMDLs for Difficult Run Watershed. Additionally, Virginia provided reasonable assurance that the bacteria TMDLs can be met. EPA is therefore approving the TMDL. EPA's approval is outlined according to the regulatory requirements listed below.

1. The TMDL is designed to meet the applicable water quality standards.

The TMDLs developed for the Difficult Run Watershed were based on the General Standard defined in Virginia Water Quality Standards (9 VAC 25-260-20) which provides general, narrative criteria for the protection of designated uses from substances that may interfere with attainment of such uses. The General Standard states:

> *"All state waters, including wetlands, shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or*

combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life."

Data including biological monitoring data, habitat assessments, ambient water quality monitoring data, toxicity testing and fish tissue sampling was used to identify the stressors to the benthic community. Based on the evidence, sedimentation caused by high runoff flow was identified as a primary stressor impacting Difficult Run. Currently, Virginia does not have numeric criteria for sediment. Therefore, a reference watershed approach was used to establish a numeric TMDL endpoint for Difficult Run. The Lower Catoctin Creek watershed was selected as the reference watershed. Sediment loadings were determined for both the reference and impaired watersheds in order to quantify sediment loading reductions necessary to achieve the designated aquatic life use for Difficult Run.

2. The TMDL includes a total allowable load as well as individual wasteload allocations and load allocations.

The objective of the benthic TMDL for Difficult Run was to determine what reductions in sediment from point and nonpoint sources are required to meet State water quality standards. The TMDL considers all significant sources contributing sediment to the impaired streams. The sources can be separated into nonpoint and point sources. The different sources in the TMDL are defined in the following equation:

TMDL = WLAs + LAs + MOS

Where:

WLA = wasteload allocation
LA = load allocation
MOS = margin of safety

Table 1 provides the daily and annual sediment loads that were developed for the impaired watershed.

<u>Wasteload Allocations</u>

EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR §122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA pursuant to 40 CFR §130.7." Furthermore, EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source. The following tables provide the annual and daily WLAs for each permit within the watershed. Tables 5 and 6 summarize the daily and annual wasteload allocations.

Table 2. Point Source Wasteload Allocations for Difficult Run

Permit No	Facility Name	TSS Load (kg/day)	Annual Sediment Loading (ton/year)	Percent Reduction
VA0024121	The Madeira School	5.6	2.25	-
Current Allocated Wasteload for the Point Source			2.25	-
Expansion for Future Growth (5X WLA)			11.3	-
Total Allocated Wasteload for the Point Source			**11.3**	-

Table 3. Total Wasteload Allocation by MS4 Location

Permit Number	MS4 Permit Holder	Existing Load (tons/year)	Allocated Load (tons/year)	Percent Reduction*
VAR040064	Fairfax City	**5,316.6**	**3,595**	**32**
VA0088587	Fairfax County			
VAR040066	Town of Vienna			
VAR040062	Total VDOT			
VAR040104	Fairfax County Public Schools			
VAR040111	George Washington Memorial Parkway			

* The percent load reduction for the MS4s accounts for loads from developed land and instream erosion

Table 4. Wasteload Allocation for Construction Permits

WLA Category	Existing Load (ton/yr)	Allocated Load (ton/yr)	Percent Reduction
Construction Permits	85.3	57.7	32

Table 5. Summary of Annual Existing and Allocated Sediment Loads

Source	Land Use Type	Existing Load (ton/year)	Allocated Load (ton/year)	Percent Reduction
Nonpoint Source	Deciduous Forest	31.1	31.1	0
	Evergreen Forest	3.3	3.3	0
	Mixed Forest	0.0	0.0	0
	Pasture/Hay	409.4	276.8	32
	Cultivated Crop	587.2	397.0	32
	Instream Erosion	1,622.5	1,096.9	32
MS4	Nonpoint Source**	1,868.7	1,263.3	32
	Instream Erosion	3,447.9	2,330.9	32

Source	Land Use Type	Existing Load (ton/year)	Allocated Load (ton/year)	Percent Reduction
Construction Permits	Barren Land	85.3	57.7	32
Permitted Facilities	Individual NPDES Permit	2.3	11.3*	0
Total		**8,057.7**	**5,468.2**	**32**

* An expansion for future growth factor of 5 was applied to the total WLA for the individual NPDES permit.
** Includes loads from developed land.

Table 6. Summary of Daily Existing and Allocated Sediment Loads

Source	Land Use Type	Existing Load (ton/day)	Allocated Load (ton/day)	Percent Reduction
Nonpoint Source	Deciduous Forest	0.085	0.085	0
	Evergreen Forest	0.009	0.009	0
	Mixed Forest	0.000	0.000	0
	Pasture/Hay	1.122	0.758	32
	Cultivated Crop	1.609	1.088	32
	Instream Erosion	4.445	3.005	32
MS4	Nonpoint Source**	5.120	3.461	32
	Instream Erosion	9.446	6.386	32
Construction Permits	Barren Land	0.234	0.158	32
Permitted Facilities	Individual NPDES Permit	0.006	0.031*	0
Total		22.076	14.981	**32**

* An expansion for future growth factor of 5 was applied to the total WLA for the individual NPDES permit.
** Includes loads from developed land.

Load Allocations

According to Federal regulations at 40 CFR §130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and NPS loads should be distinguished. Load Allocations are presented in Tables 1, 5 and 6.

3. The TMDL considers the impacts of background pollution.

Background pollutant contributions were considered in the TMDL development process by quantifying the loads from forests and other natural areas in the watershed.

4. The TMDL considers critical environmental conditions.

The critical condition refers to the “worst case scenario” of environmental conditions in the Difficult Run segment. Developing a TMDL to meet the water quality targets under the critical condition will ensure that the targets would also be met under all other conditions.

EPA regulations, 40 CFR §130.7 (c)(1), require TMDLs to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of Difficult Run is protected during times when it is most vulnerable. Critical conditions are important because they describe the combination of factors that cause an exceedance of water quality criteria. They will help in identifying the actions that may have to be undertaken to meet water quality standards.

In the case of the Difficult Run, the primary stressor resulting in the benthic impairment in the river is excessive sediment loading, which has led to siltation and the loss of benthic habitat. On an average annual basis, land-based sources and instream erosion account for 99.9 percent of the total sediment load to the stream; this includes nonpoint source loading, and loading attributed to the MS4s present in the watershed. Point source facilities contribute a marginal sediment load, based on the permitted total suspended solids (TSS) load for one permitted facilities. Therefore, most of the sediment load is delivered under high flow conditions associated with stormwater runoff. The GWLF model is a time variable model that simulates hydrology and sediment loadings on a watershed basis. Simulations were performed from
April 1994 through March 2005, and account for seasonal and annual variations in hydrology and sediment.

5. The TMDL considers seasonal environmental variations.

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods.

Seasonal variations were explicitly incorporated in the modeling approach for this TMDL. GWLF is a continuous simulation model that incorporates seasonal variations in hydrology and sediment loading. In addition, the use of an 11 year simulation period accounts for seasonal variations in loadings.

6. The TMDL includes a Margin of Safety.

An MOS is used to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL.

An explicit MOS of 10 percent was used for Difficult Run to account for uncertainties in the methodologies used to determine sediment loadings.

7. The TMDL has been subject to public participation.

The development of the Difficult Run bacteria TMDL would not have been possible without public participation. Four technical advisory committee (TAC) meetings and two public meetings were held. The first public meeting was held on August 14, 2007, at the Fairfax

County Government Center in Fairfax, Virginia, The second public meeting was held on March 5, 2008, also at the Fairfax County Government Center in Fairfax, Virginia. The meeting was noticed in *The Virginia Register of Regulations.* Three people attended these meetings.

IV. Discussion of Reasonable Assurance

EPA requires that there be a reasonable assurance that a TMDL can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR §122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. Furthermore, EPA has authority to object to the issuance of an NPDES permit that is inconsistent with WLAs established for that point source. Virginia will utilize its State NPDES program to ensure that WLAs will be incorporated into permits for each source.

NPS controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program. Additional funding sources for implementation include the U.S. Department of Agriculture's Conservation Reserve Enhancement and Environmental Quality Incentive Programs, the Virginia State Revolving Loan Program, and the Virginia Water Quality Improvement Fund.

In general, Virginia intends for the required reductions to be implemented in an iterative process that first addresses those sources with the largest impact on water quality. The MS4 permittees will need to address their WLAs with the iterative implementation of Best Management Practices.

Additional TMDL implementation information can be found in Chapter 8 of the State's TMDL document. Watershed stakeholders will have opportunity to participate in the development of the TMDL implementation plan.

DIFFICULT RUN DRAINAGE AREA = 37,179 AC

TOWN OF VIENNA CONTRIBUTING DIFFICULT RUN DRAINAGE AREA = 1,691.93 AC

CITY OF FAIRFAX CONTRIBUTING DIFFICULT RUN DRAINAGE AREA = 113.16 AC

Legend

- City of Fairfax Limits
- Difficult Run Watershed
- Stormwater Outfalls
- Storm Pipes
- Inlets

Land Cover Type

- IMPERVIOUS
- PERVIOUS

N

0 400 800 US Feet

City of Fairfax - Drainage Area to Difficult Run Land Cover Analysis		
Land Cover	Acres	% of Drainage Area
Urban Impervious	62.64	55.36%
Urban Pervious	50.52	44.64%

Legend

- Difficult Run Watershed
- City of Fairfax Limits
- Town of Vienna Limits
- City of Fairfax - Contributing Drainage Area to Difficult Run
- Town of Vienna - Contributing Drainage Area to Difficult Run

N

0 3,000 6,000 12,000 US Feet

KIMLEY-HORN - NORTHERN VIRGINIA OFFICE
11400 COMMERCE PARK DRIVE, SUITE 400
RESTON, VA 20191

Kimley»Horn

DATE: 2/14/2024

DRAWN BY: CDC

CHECKED BY: JLH

CITY OF FAIRFAX
DIFFICULT RUN SEDIMENT TMDL ANALYSIS

DIFFICULT RUN
BENTHIC (SEDIMENT) LOCAL TMDL CREDIT REDUCTION ESTIMATE
SUMMARY EXHIBIT
CITY OF FAIRFAX, VIRGINIA

SCALE: AS NOTED

PROJECT NUMBER: 110557045

SHEET NUMBER: APPENDIX B1

PRELIMINARY POLLUTANT OF CONCERN (POC)
CREDIT ANALYSIS
SNUGHAVEN LANE OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 57 1 02 002
3718 JERMANTOWN RD
CITY OF FAIRFAX, VIRGINIA

PROJECT NARRATIVE

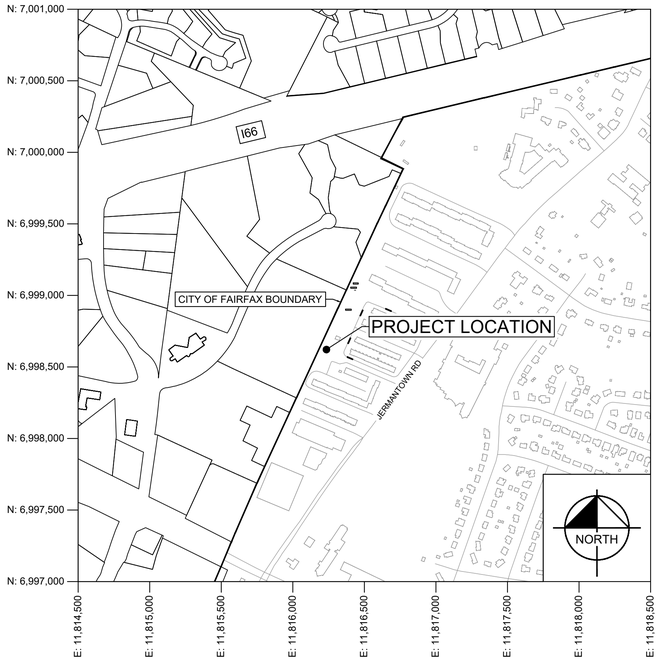
THIS PROJECT CONSISTS OF A PRELIMINARY POLLUTANT OF CONCERN CREDIT ANALYSIS OF AN ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 42" RCP AND END AT THE CITY BORDER WITH FAIRFAX COUNTY. THIS PROJECT IS LOCATED WITHIN THE CITY OF FAIRFAX'S CONTRIBUTING DRAINAGE AREA TO THE DIFFICULT RUN WATERSHED. THE PROJECT IS LOCATED ON PRIVATE PROPERTY IN THE OXFORD ROW NEIGHBORHOOD IN THE CITY OF FAIRFAX, VIRGINIA.

THE PRELIMINARY POLLUTANT OF CONCERN (POC) CREDITING FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE UNIFIED GUIDE FOR CREDITING STREAM AND FLOODPLAIN RESTORATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED (SEPTEMBER 17, 2021, REVISED JANUARY 12, 2024).

BECAUSE THE CREDITING IS PRELIMINARY IN NATURE, SOIL BULK DENSITIES WERE ASSUMED BASED ON USDA NRCS WEB SOIL SURVEY DATA. THE PRELIMINARY POLLUTANT OF CONCERN REDUCTIONS ANTICIPATED AS PART OF THIS PROJECT ARE 45,420.13 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 51.78 LBS/YR OF NITROGEN, 23.85 LBS/YR OF PHOSPHORUS.

GENERAL NOTES:

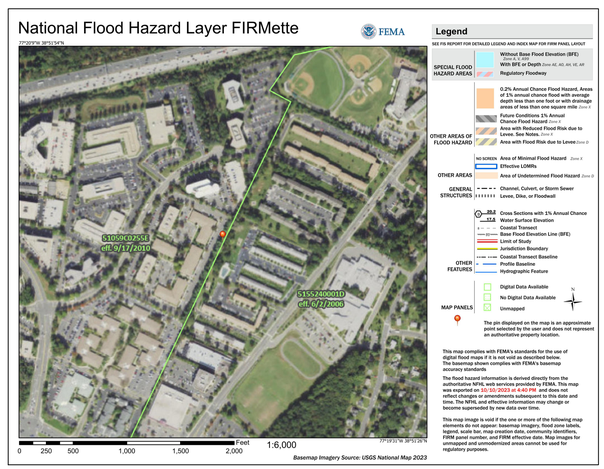
1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 57 1 02 002
   PARCEL AREA: 4.57 ACRES (199,000 SF)
   DEED BOOK AND NUMBER: N/A & N/A
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON THE READILY AVAILABLE GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR THE PROJECT AREA.
3. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240002D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).



	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Sheet List Table	
Sheet Number	Sheet Title
01	COVER SHEET
02	PHOTO STATION
03	PHOTO STATION
04	EXISTING CONDITIONS
05	EXISTING HYDROLOGY
06	PRELIMINARY POC CREDITING SUMMARY

DOCUMENTATION OF FLOODPLAIN PRESENCE



No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY C.D.C
DRAWN BY C.D.C
CHECKED BY J.J.D

COVER SHEET
OGSP PRELIMINARY CREDIT ANALYSIS
SNUGHAVEN LANE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

LOCATION OF TWO (2) LARGE CORRUGATED METAL PIPES. SOURCE OF PIPES/FUNCTION UNKNOWN.

CITY OF FAIRFAX BOUNDARY

FAIRFAX COUNTY

CITY OF FAIRFAX

ESTIMATED 42" RCP

ADDRESS: 11100 CAVALIER CT
FAIRFAX, VA 22030
TAX MAP:47 3 04 024

ADDRESS: 11100 LITTLE BROOK LN
FAIRFAX, VA 22030
TAX MAP:57 1 02 002 B

ADDRESS: 3716 JERMANTOWN RD
FAIRFAX, VA 22030
TAX MAP:57 1 02 002 B

LITTLEBROOK LANE

SNUG HAVEN LANE

ROCK GARDEN DRIVE

#1 #2 #3 #4 #5 #6 #7 #8 #9 #10 #11 #12

SANITARY SEWER AND STORMWATER INFRASTRUCTURE LOCATIONS SHOWN ARE FROM BEST AVAILABLE CITY OF FAIRFAX GIS DATA. INFRASTRUCTURE LOCATIONS DENOTED IN THIS PLAN ARE APPROXIMATE IN NATURE AND WILL NEED TO BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION ACTIVITIES.

LEGEND:

- MANHOLE / FITTING / INLET
- STORMWATER LINES
- SANITARY LINES
- #1 PHOTO LOCATION & DIRECTION

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY C.D.C
DRAWN BY C.D.C
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PHOTO STATION MAP

OGSP PRELIMINARY CREDIT ANALYSIS
SNUGHAVEN LANE

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
02

PHOTO LOCATION 1
OVERALL PROJECT AREA

PHOTO LOCATION 2
ON-SITE DITCH/POOL LOCATION

PHOTO LOCATION 3
STORMWATER OUTFALL DISCHARGE POINT

PHOTO LOCATION 4
STORMWATER OUTFALL RECEIVING CHANNEL

PHOTO LOCATION 5
STORMWATER OUTFALL RECEIVING CHANNEL

PHOTO LOCATION 6
STORMWATER OUTFALL RECEIVING CHANNEL (TYPICAL SECTION)

PHOTO LOCATION 7
UNKNOWN STORMWATER OUTFALL PIPE

PHOTO LOCATION 8
SANITARY SEWER PRESENCE IN PROJECT CORRIDOR

PHOTO LOCATION 9
DOWNSTREAM END OF OUTFALL CHANNEL

PHOTO LOCATION 10
CORRUGATED PIPE PRESENCE AT D.S. END OF CHANNEL

PHOTO LOCATION 11
LEGACY SANITARY SEWER INFRASTRUCTURE

PHOTO LOCATION 12
INTERCONNECTIVITY TO FAIRFAX COUNTY

No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
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DESIGNED BY C.D.C
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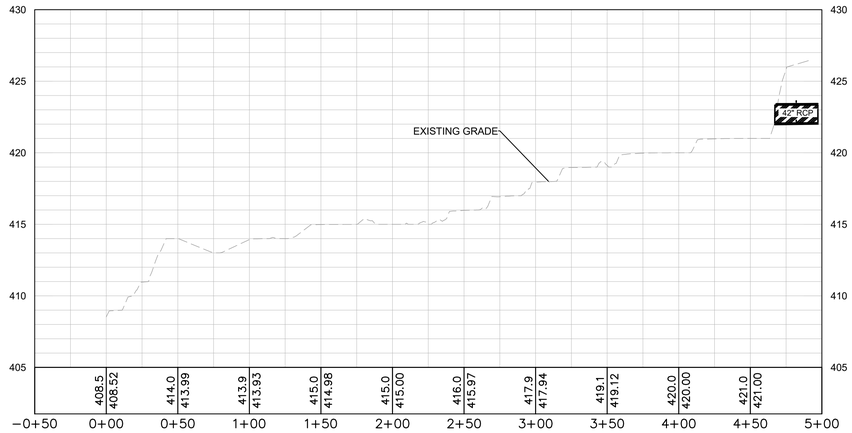
CHECKED BY J.J.D

PHOTO STATION MAP
OGSP PRELIMINARY CREDIT ANALYSIS
SNUGHAVEN LANE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
03

SANITARY SEWER AND STORMWATER INFRASTRUCTURE LOCATIONS SHOWN ARE FROM BEST AVAILABLE CITY OF FAIRFAX GIS DATA. INFRASTRUCTURE LOCATIONS DENOTED IN THIS PLAN ARE APPROXIMATE IN NATURE AND WILL NEED TO BE FIELD VERIFIED PRIOR TO ANY CONSTRUCTION ACTIVITIES.



OUTFALL CHANNEL LONGITUDINAL PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

OUTFALL NARRATIVE:

THE OUTFALL STARTS AT THE DISCHARGE OF THE 42" RCP PIPE AND FLOWS FOR ~480 FEET BEFORE DISCHARGING INTO FAIRFAX COUNTY. THE 3 REPRESENTATIVE CROSS SECTIONS WERE TAKEN AT STATION 0+81.4, 2+80.0, AND 3+375.0, THEIR RESPECTIVE THALWEG ELEVATIONS ARE 413.06', 416.95' AND 419.97', AND THEIR RESPECTIVE SLOPES ARE 5.6%, 2.0%, AND 3.2%. A MANNINGS N-VALUE (0.050) REPRESENTATIVE OF "NATURAL STREAM, STONY NOTES" WAS UTILIZED FOR ALL CROSS SECTIONAL ANALYSIS.

Existing Cross Sectional Geometry			
XS-1	XS-2	XS-3	Average
(FD) - Flow Depth (ft.)			
1.15	1.89	2.23	1.76
(BH) - Bank Height (ft.)			
0.90	3.3	5	3.07
(BW) - Bottom Width (ft.)			
3.7	5.50	4.60	4.60
(TW) - Top Width (ft.)			
29.7	34.70	30.7	31.70

OUTFALL PROFILE
(X-SECTION 1)
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

Hydraulic Computation Summary		
Cross Section 1		
Flow Area:	22.3	ft^2
Wetted Perimeter:	37.3	ft
Hydraulic Radius:	0.6	ft
Slope:	0.056	ft/ft
Velocity:	4.98	ft/s

OUTFALL PROFILE
(X-SECTION 2)
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

Hydraulic Computation Summary		
Cross Section 2		
Flow Area:	18.3	ft^2
Wetted Perimeter:	15	ft
Hydraulic Radius:	1.225	ft
Slope:	0.032	ft/ft
Velocity:	6.06	ft/s

OUTFALL PROFILE
(X-SECTION 3)
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

Hydraulic Computation Summary		
Cross Section 3		
Flow Area:	21.5	ft^2
Wetted Perimeter:	15.8	ft
Hydraulic Radius:	1.358	ft
Slope:	0.02	ft/ft
Velocity:	5.16	ft/s

No.	REVISIONS	DATE	BY

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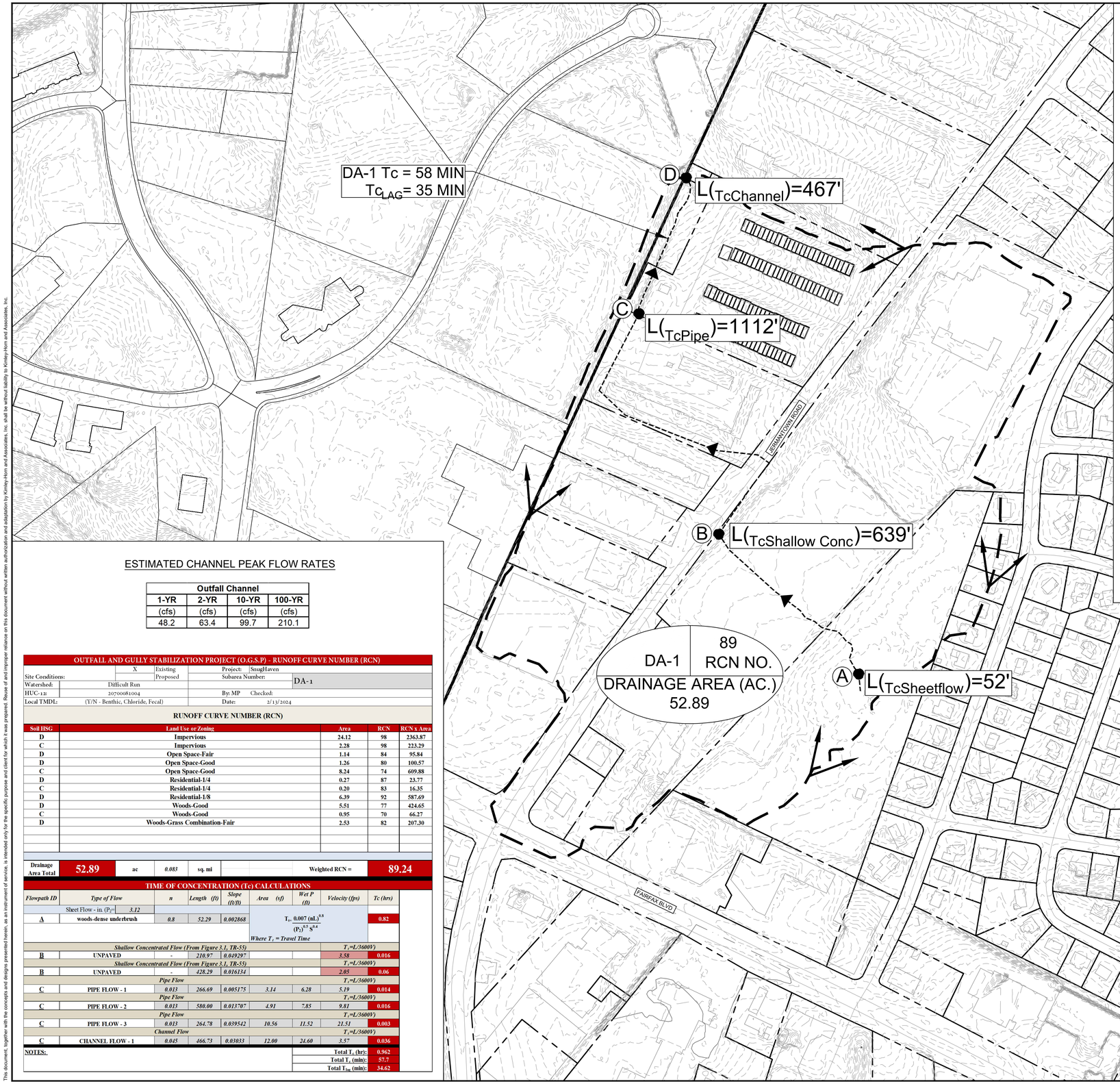
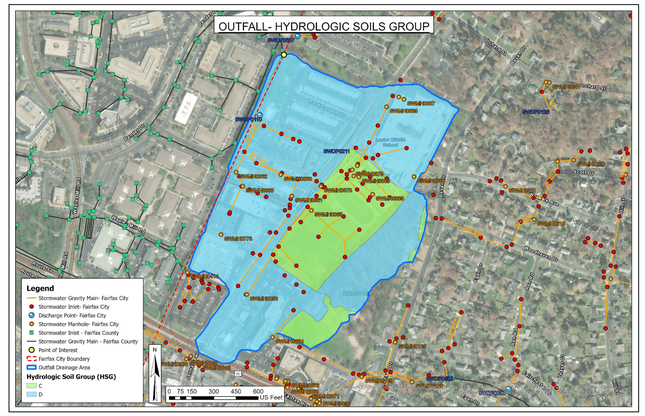
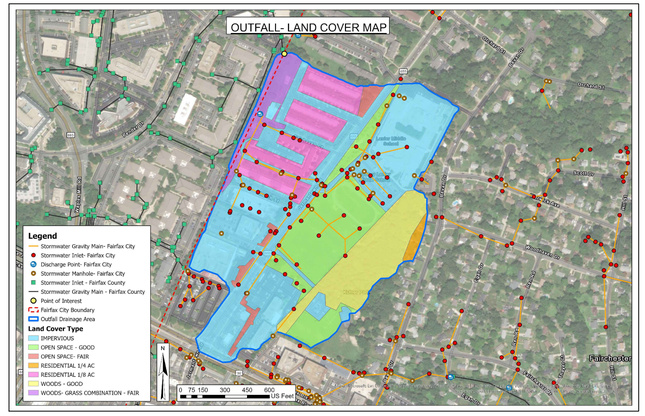
KHA PROJECT 110057041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY C.D.C
DRAWN BY C.D.C
CHECKED BY J.J.D

EXISTING CONDITIONS
OGSP PRELIMINARY CREDIT ANALYSIS
SNUGHAVEN LANE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
04







ESTIMATED CHANNEL PEAK FLOW RATES

Outfall Channel			
1-YR	2-YR	10-YR	100-YR
(cfs)	(cfs)	(cfs)	(cfs)
48.2	63.4	99.7	210.1

OUTFALL AND GULLY STABILIZATION PROJECT (O.G.S.P) RUNOFF CURVE NUMBER (RCN)

	X	Existing	Project:	SnugHaven	
Site Conditions:		Proposed	Subarea Number:		DA-1
Watershed:	Difficult Run				
HUC-12:	20700081004		By: MP	Checked:	
Local TMDL:	(Y/N - Benthic, Chloride, Fecal)		Date:	2/13/2024	

RUNOFF CURVE NUMBER (RCN)

Soil HSG	Land Use or Zoning	Area	RCN	RCN x Area
D	Impervious	24.12	98	2363.87
C	Impervious	2.28	98	223.29
D	Open Space-Fair	1.14	84	95.84
D	Open Space-Good	1.26	80	100.57
C	Open Space-Good	8.24	74	609.88
D	Residential-1/4	0.27	87	23.77
C	Residential-1/4	0.20	83	16.35
D	Residential-1/8	6.39	92	587.69
D	Woods-Good	5.51	77	424.65
C	Woods-Good	0.95	70	66.27
D	Woods-Grass Combination-Fair	2.53	82	207.30

Drainage Area Total	52.89	ac	0.083	sq. mi	Weighted RCN =	89.24

TIME OF CONCENTRATION (Tc) CALCULATIONS

Flowpath ID	Type of Flow	n	Length (ft)	Slope (ft/ft)	Area (sf)	Wet P (ft)	Velocity (fps)	Tc (hrs)
	Sheet Flow - in. (P_2= 3.12)							
A	woods-dense underbrush	0.8	52.29	0.002868	$T_t = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$			0.82
	Where T_t = Travel Time							
	Shallow Concentrated Flow (From Figure 3.1, TR-55)						T_t=L/3600V)	
B	UNPAVED	-	210.97	0.049297			3.58	0.016
	Shallow Concentrated Flow (From Figure 3.1, TR-55)						T_t=L/3600V)	
B	UNPAVED	-	428.29	0.016134			2.05	0.06
	Pipe Flow						T_t=L/3600V)	
C	PIPE FLOW - 1	0.013	266.69	0.005175	3.14	6.28	5.19	0.014
	Pipe Flow						T_t=L/3600V)	
C	PIPE FLOW - 2	0.013	580.00	0.013707	4.91	7.85	9.81	0.016
	Pipe Flow						T_t=L/3600V)	
C	PIPE FLOW - 3	0.013	264.78	0.039542	10.56	11.52	21.51	0.003
	Channel Flow						T_t=L/3600V)	
C	CHANNEL FLOW - 1	0.045	466.73	0.03033	12.00	24.60	3.57	0.036

NOTES:

Total T_c (hr):	0.962
Total T_c (min):	57.7
Total T_{lag} (min):	34.62

LEGEND:

- DRAINAGE DIVIDES
- TIME OF CONCENTRATION (TC) FLOWPATH
- (A) TC FLOWPATH SECTION IDENTIFIER

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY C.D.C
DRAWN BY C.D.C
CHECKED BY J.J.D

EXISTING HYDROLOGY
OGSP PRELIMINARY CREDIT ANALYSIS
SNUGHAVEN LANE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

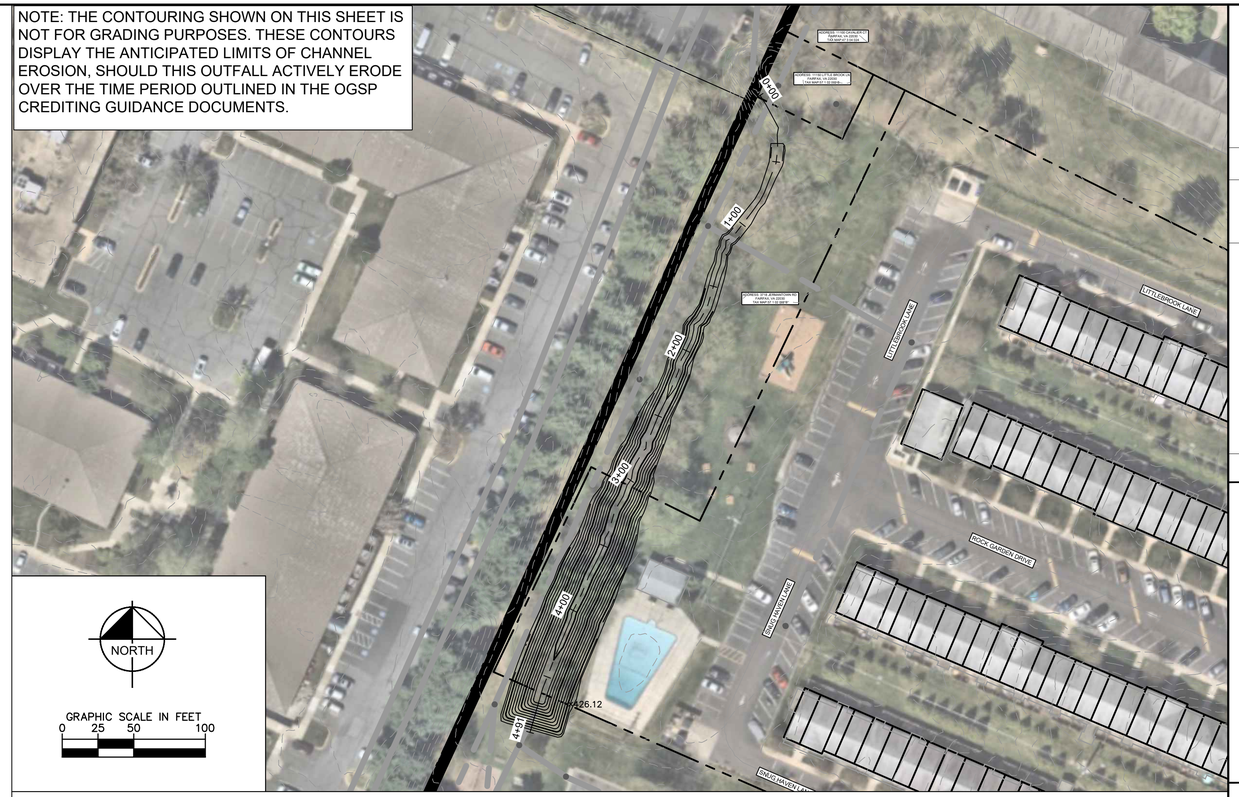
SHEET NUMBER
05

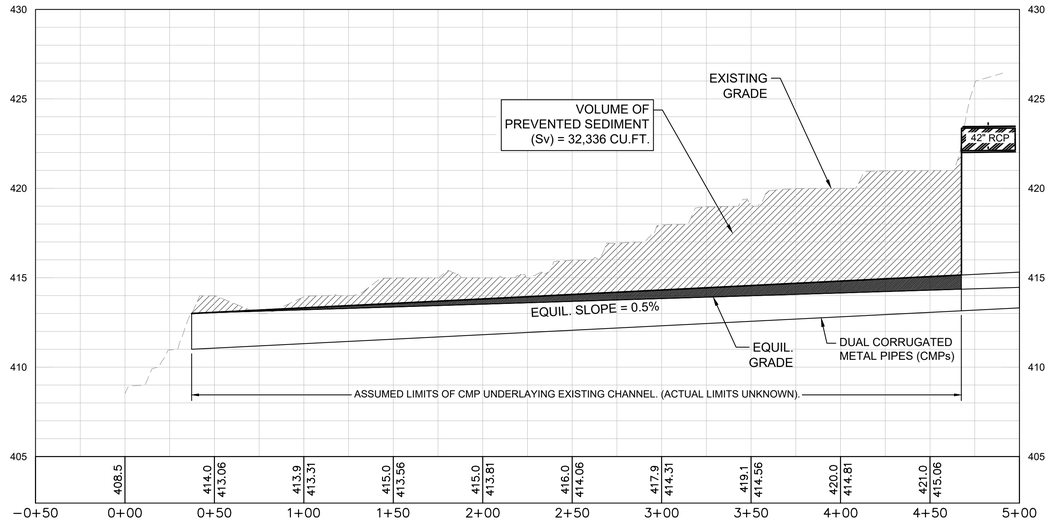
POC CREDITING NARRATIVE

THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED USING PROTOCOL 5 IN ACCORDANCE WITH THE UNIFIED GUIDE FOR CREDITING STREAM AND FLOODPLAIN RESTORATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED (SEPTEMBER 17, 2021, REVISED JANUARY 12, 2024). THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.5%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENTED SEDIMENT VOLUME (SV) OF 32,336.01 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 45,420.13 LBS/YR OF SEDIMENT, 23.85 LBS/YR OF PHOSPHORUS, AND 51.78 LBS/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.

Existing Outfall Channel Condition Parameters		
Area (A_d)=	52.89	*ac*
Area (A_d)=	0.2141	*km^2*
Mean Flow Depth =	1.756	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	439.22	*ft*
Channel Slope =	0.02	*ft/ft*
Bank Height =	3.07	*ft*
Bottom Width =	4.60	*ft*
Top Width =	31.70	*ft*
Bulk Density (Estimate) =	84.28	*lb./ft^3*
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
L_{max}= $153A_d^{0.6}$		
n Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
ım Slope (S_{eq})=	0.0047	*ft/ft*
Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
ım Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Coarser than Sand		
ım Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	5.2	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
of Prevented Sediment (S_v)=	1,197.63	*Cu. Yd.*
of Prevented Sediment (S_v)=	32,336.01	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
olume of Prevented Sediment (S_p)=	538.93	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	45,420.13	lb./year
Annual Prevented Sediment Load (Field Verified) =	Missing Field Samples	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	23.85	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	51.78	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	Missing Field Samples	*lb./ft^3*
1 ton of sediment =	Missing Field Samples	*lb. of (P)*
1 ton of sediment =	Missing Field Samples	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	Missing Field Samples	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	Missing Field Samples	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	Missing Field Samples	*lbs./year*
Pollutant of Concern (POC) Crediting Summary		
Total Suspended Solids (TSS) Removal Rate =	45,420.13	*lbs./year*
Phosphorus (P) Removal Rate =	23.85	*lbs./year*
Nitrogen (N) Removal Rate =	51.78	*lbs./year*

NOTE: THE CONTOURING SHOWN ON THIS SHEET IS NOT FOR GRADING PURPOSES. THESE CONTOURS DISPLAY THE ANTICIPATED LIMITS OF CHANNEL EROSION, SHOULD THIS OUTFALL ACTIVELY ERODE OVER THE TIME PERIOD OUTLINED IN THE OGSP CREDITING GUIDANCE DOCUMENTS.





No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY C.D.C
DRAWN BY C.D.C
CHECKED BY J.J.D

PRELIMINARY POC CREDITING SUMMARY
OGSP PRELIMINARY CREDIT ANALYSIS
SNUGHAVEN LANE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
06

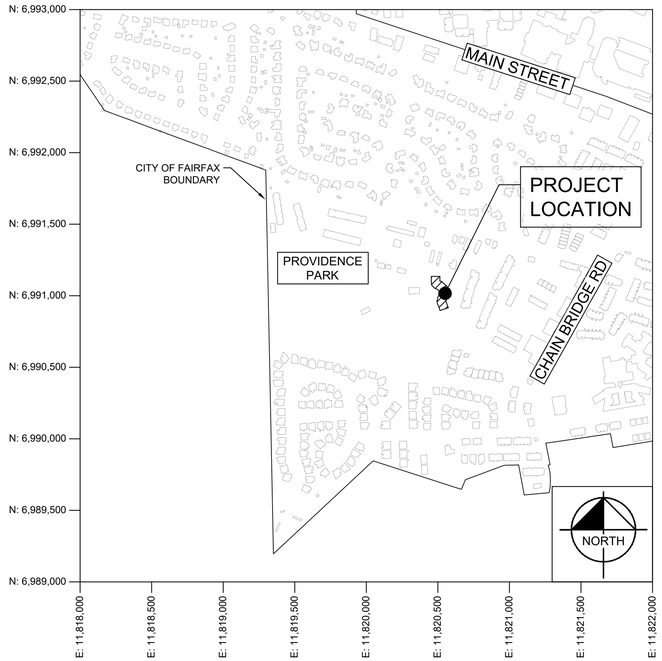
Appendix L. Providence Park Outfall and Gully Stabilization Sediment Reduction Calculations

30% CONSTRUCTION PLANS
PROVIDENCE PARK
OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 57 3 01 007
10715 WEST DR
CITY OF FAIRFAX, VIRGINIA

VICINITY MAP

1" = 500'



PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY AN ACTIVELY ERODING OUTFALL CHANNEL.

THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 15" RCP PIPE AND END AT THE CONFLUENCE OF LOWER BULL RUN. THE PROJECT IS LOCATED IN PROVIDENCE PARK IN THE CITY OF FAIRFAX, VIRGINIA.

THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION.

THE SOIL SAMPLE BULK DENSITY WAS 60.56 LB/FT^3 AND THE CONCENTRATIONS WERE 0.60 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.34 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 36,054.40 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 24.16 LBS/YR OF NITROGEN, AND 10.89 LBS/YR OF PHOSPHORUS.

GENERAL NOTES:

1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 57 3 01 007
   PARCEL AREA: 17 ACRES (740,520 SF)
   DEED BOOK AND NUMBER: UNKNOWN
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON THE READILY AVAILABLE GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR THE PROJECT AREA. THE SITE IS INTENDED TO BE SURVEYED AS PART OF THE NEXT STAGE OF THE DESIGN PROCESS.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240004D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240004D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).

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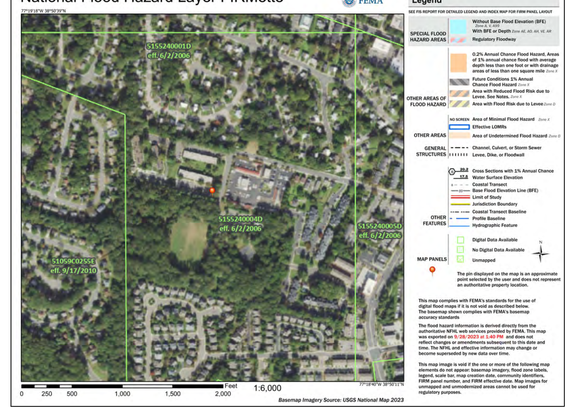
Sheet Number	Sheet Title
01	COVER SHEET
02	GENERAL NOTES & DETAILS
03	GENERAL NOTES & DETAILS
04	PHOTO LOCATION MAP
05	EXISTING CONDITIONS
06	EXISTING HYDROLOGY
07	POC CREDITING SUMMARY

National Flood Hazard Layer FIRMette



	OWNER	CLIENT	ENGINEER
NAME	CITY OF FAIRFAX	CITY OF FAIRFAX	KIMLEY-HORN
ADDRESS	10455 ARMSTRONG STREET FAIRFAX, VA	10455 ARMSTRONG STREET FAIRFAX, VA	11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA
CONTACT	SATOSHI ETO	SATOSHI ETO	JON D'ALESSANDRO
PHONE	(703) 385-7810	(703) 385-7810	(703) 752-0589

Kimley»Horn

Know what's **below.** **Call** before you dig.

No.	REVISIONS	DATE	BY

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY M.N.P
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY STABILIZATION PROJECT
PROVIDENCE PARK
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

Pollution Reduction Calculation Methodology narrative

Crediting for the Providence Park Outfall Restoration Project was performed utilizing the methodologies outlined in Protocol 5 of the *"Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed"* (*Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed*). Calculation methodologies and crediting for the outfall restoration can be found in the Plan Set Assembly located in the Section F Appendix. Table 1 outlines the Pollutant of Concern (POC) Reduction summary for the restoration of the outfall.

Table 1. City of Fairfax – Providence Park Outfall Restoration Project - Pollutant of Concern Reduction Summary

Outfall-ID	Approximate Outfall Length (ft.)	Outfall Drainage Area (Ac.)	Estimated Phosphorous Reduction Provided (lbs./yr.)	Estimated Nitrogen Reduction Provided (lbs./yr.)	Estimated TSS Reduction Provided (lbs./yr.)
Providence Park Outfall	**200**	**2.08**	**10.89**	**24.16**	**36,054.00**

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0

○ 2011 BMP Standards and Specification | ◉ 2013 Draft BMP Standards and Specification

Project Name: Providence Park OTFL #1
Date: 9/20/2023

BMP Design Specifications List: 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed	0.00	0.25	0.00	0.23	0.48
Impervious Cover (acres)	0.00	0.06	0.00	1.52	1.57
					2.05

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	2.81

LAND COVER SUMMARY -- POST DEVELOPMENT

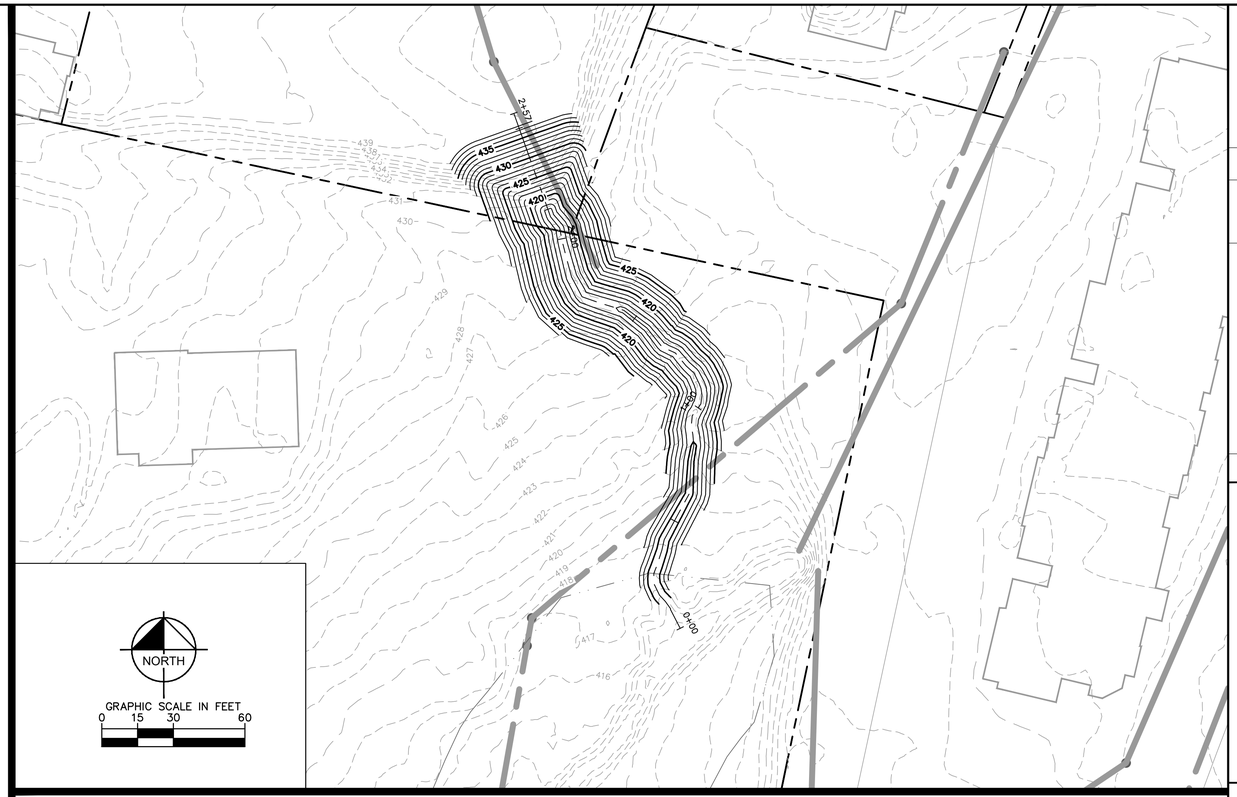
Land Cover Summary

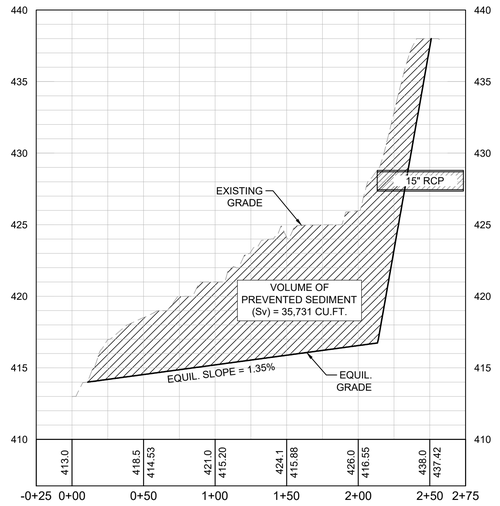
Forest/Open Space Cover (acres)	0.00
Weighted Rv (forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	0.48
Weighted Rv (turf)	0.22
% Managed Turf	23%
Impervious Cover (acres)	1.57
Rv (impervious)	0.95
% Impervious	77%
Site Area (acres)	2.05
Site Rv	0.78

Treatment Volume and Nutrient Loads

Treatment Volume (acre-ft)	0.1335
Treatment Volume (cubic feet)	5,817
TP Load (lb/yr)	3.65
TN Load (lb/yr) (Informational Purposes Only)	26.15

Existing Outfall Channel Condition Parameters		
Drainage Area (A_d)=	2.08	*ac*
Drainage Area (A_d)=	0.0084	km^2
Mean Flow Depth =	0.683	*ft*
Step 1 - Define the Existing Channel Conditions		
Length of Proposed Reach =	211.990	*ft*
Channel Slope =	0.066	*ft/ft*
Bank Height =	14.53	*ft*
Bottom Width =	2.20	*ft*
Top Width =	16.93	*ft*
Bulk Density (Estimate) =	70.00	$lb./ft^3$
Step 2 - Define the Equilibrium Channel Conditions		
Is there a pipe outfall or other defining infrastructure present upstream of the restoration site?		Yes
Upstream Limit		
$L_{max}= 153A_d^{0.6}$		
Maximum Upstream Channel Length (L_{max}) =	Not Applicable	*ft*
Equilibrium Bed Slope		
Choose Bed Condition =	Bed Condition 1	
Bed Condition 1 =	Cohesive Bed	
Bed Condition 2 =	Sand and Fine Grave (0.1-5mm particle size)	
Bed Condition 3 =	Beds Coarser than Sand (>5mm particle size)	
Bed Condition 1: Cohesive Bed		
$S_{eq} = 0.0028A^{-0.33}$		
Equilibrium Slope (S_{eq})=	0.0135	*ft/ft*
Bed Condition 2: Sand and Fine Gravel		
$S_{eq} = 0.06 / (y * 62.43)$		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Bed Condition 3: Bed Coarser than Sand		
Equilibrium Slope (S_{eq})=	Not Applicable	*ft/ft*
Equilibrium Bank Slopes		
Bank Slopes =		-
Future Bottom Width (est)		
Bottom Width =	2.2	ft
Step 3: Calculate the Total Prevented Sediment		
Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition		
Volume of Prevented Sediment (S_v)=	1,323.00	*Cu. Yd.*
Volume of Prevented Sediment (S_v)=	35,721.00	*Cu. ft.*
Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load		
Adjust for Reduction in Efficiency and Timescale		
$S_p = 0.5 (S_v / 30)$		
Annual Volume of Prevented Sediment (S_p)=	595.35	*Cu. ft. / year*
Adjust for Soils Bulk Density		
*Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density*		
Annual Prevented Sediment Load (Estimate) =	Not Applicable	lb./year
Annual Prevented Sediment Load (Field Verified) =	36,054.40	lb./year
Step 5: Determine the Annual Prevented Nutrients		
Estimated Conversion Factors		
1.05 lb. of Phosphorus (P) =	1 ton of sediment	
2.28 lb. of Nitrogen (N) =	1 ton of sediment	
Estimated Phosphorus (P) Removal Rate =	Not Applicable	*lbs./year*
Estimated Nitrogen (N) Removal Rate =	Not Applicable	*lbs./year*
Site Specific Adjusted Results		
Bulk Density =	60.56	$lb./ft^3$
1 ton of sediment =	0.60	*lb. of (P)*
1 ton of sediment =	1.34	*lb. of (N)*
Site Adjusted Total Suspended Solids (TSS) Removal Rate =	36,054.40	*lbs./year*
Site Adjusted Phosphorus (P) Removal Rate =	10.89	*lbs./year*
Site Adjusted Nitrogen (N) Removal Rate =	24.16	*lbs./year*
Pollutant of Concern (POC) Crediting Summary		
Total Suspended Solids (TSS) Removal Rate =	36,054.40	*lbs./year*
Phosphorus (P) Removal Rate =	10.89	*lbs./year*
Nitrogen (N) Removal Rate =	24.16	*lbs./year*





PROVIDENCE CREDITING PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

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07