Virginia Stormwater Management Program (VSMP) Permit No. VA0088579

Arlington County Chesapeake Bay TMDL Action Plan UPDATE

ARLINGTON
VIRGINIA

2021 – 2026 MS4 Permit Cycle
Updated June 2022

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Overview

This update of Arlington County's Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan is developed to meet the requirements of Part 1.E.1 of Arlington County's Municipal Separate Storm Sewer System (MS4) Permit, VA0088579, issued July 1, 2021. The permit requires this Action Plan to document a minimum cumulative 40% reduction of the Bay TMDL pollutants of concern (POC) to be achieved during the 2022-2026 ('2nd') permit cycle. The POCs are total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS).

DEQ approved the TMDL Action Plan for the 2013-2018 ('1st') permit cycle (minimum 5.0% POC reduction) on September 3, 2015. DEQ administratively continued the 1st permit cycle through June 30, 2021.

The numbered sections in this Action Plan correspond with the sections of Arlington's MS4 permit section: 1.E.1.j items 1) through 7).

In addition to responding specifically to the Bay TMDL POC reduction requirements, the projects and programs in this Action Plan reflect the goals and objectives of Arlington's adopted Stormwater Master Plan – which emphasizes local water quality, stream corridors, and mitigating development impacts – alongside a growing emphasis on creating resiliency to flooding and climate change. Projects are also strategically identified to align with infrastructure protection and integrity needs and address related public safety issues resulting from failed slopes, eroded trails, exposed and broken sanitary sewer lines and collapsed outfalls.

Glossary of Key Terms

Best Management Practice (BMP). A project or program recognized by the Virginia Department of Environmental Quality (DEQ) to provide TMDL POC reduction credits.

Land Disturbing Activity (LDA) Program. Arlington County's regulatory program for construction activity and post-construction stormwater management.

Municipal Separate Storm Sewer System (MS4) Permit. The Clean Water Act discharge permit for Arlington County's storm drain system, administered by Virginia DEQ.

Pollutant of Concern (POC). For the Chesapeake Bay TMDL, total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS). Each MS4 permit assigns a specific amount of POC load reductions to be achieved.

Chesapeake Bay Total Maximum Daily Load (TMDL). A pollution 'budget' for the Chesapeake Bay that sets the maximum amount of the TN, TP, and TSS POCs the Bay can receive and still meet water quality standards. Each MS4 permit in Virginia prorates a portion of this budget to the regulated localities. There are also other sources of pollution in this budget besides the contributions from MS4 permittees, including wastewater treatment plants, agriculture, air pollutants, and septic systems.

MS4 Permit Cycle. Typically, five (5) years in Virginia. Virginia established a three (3) permit cycle timeline for MS4 permittees to meet their Bay TMDL pollution budgets. Arlington entered its 2nd permit cycle in FY 2022, after DEQ extended the 1st permit cycle for three (3) years due to DEQ's workload and other factors. The end of Arlington's 3rd permit cycle, where full compliance with the pollution budget is required, is expected to be FY 2031.

New or modified legal authority (1)
Existing legal authorities are sufficient meet the Bay TMDL requirements of Part 1.E.1 of the permit.

Load and cumulative reduction calculations (2)
The table below contains the load reduction requirements calculated for Arlington County's MS4 Service Area, in the format of Table 2 from the permit document. The 1st permit cycle Action Plan document describes the methodologies for the MS4 Service Area delineation and estimated regulated pervious and impervious acreage.

Table 2
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the Potomac River Basin

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the regulated area (acres)[2]	Load (lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by TBD	40% cumulative reduction required by TBD (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	16.86	5,203.59	87,732.53	9%	40%	3,158.37	4,627.39
	Regulated urban pervious	10.07	6,078.36	61,209.09	6%	40%	1,469.02	
Phosphorus	Regulated Urban Impervious	1.62	5,203.59	8,429.82	16%	40%	539.51	611.78
	Regulated urban pervious	0.41	6,078.36	2,492.13	7%	40%	72.27	
Total suspended solids	Regulated urban impervious	1171.32	5,203.59	6,095,069.04	20%	40%	487,605.52	525,005.67
	Regulated urban pervious	175.8	6,078.36	1,068,575.69	9%	40%	37,400.15	

1Edge of stream loading rate based on the Chesapeake Bay Watershed Model 5.3.2
2To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated MS4 service area. Next,
3Column C = Column A x Column B
4Column F = Column C x Column D x Column E.
5Column G = The sum of the subsource cumulative reduction required by TBD (lbs/yr) as calculated in Column F.

Regarding 1.E.1.c (new sources) and 1.E.1.d (grandfathered projects), Arlington County's 1st permit cycle Action Plan (Section 2) documented the County's direct development accounting methodology that makes it unnecessary to calculate separate POC load offsets for either new sources or grandfathered projects.

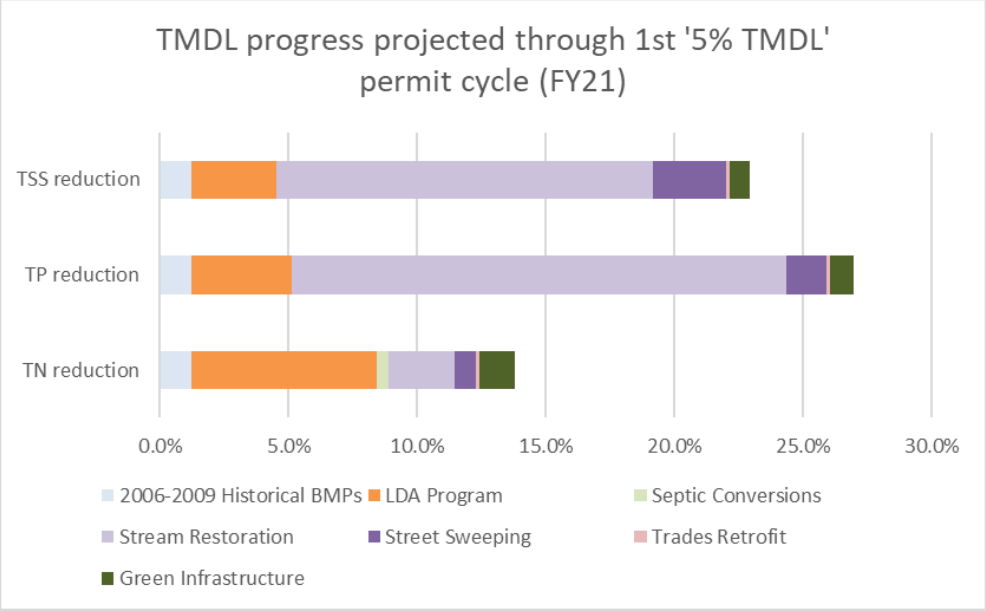
Arlington County regulates development through its Land Disturbing Activities (LDA) program. For all regulated land development activity that disturbs at least 2,500 square feet of land (the regulatory threshold set for Chesapeake Bay Preservation Act localities) within Arlington County's MS4 Service Area, the County accounts for the associated POC load changes from land use changes alongside the POC reductions from BMPs. This methodology captures the net POC loads for all regulated development activity whether new development or redevelopment or grandfathered. Most regulated land development activity in Arlington County is redevelopment and as a result generates a net POC reduction credit. Overall, the POC credits from redevelopment significantly exceed the increased POC loads associated with new sources and grandfathered projects.

Example of accounting from the FY2021 MS4 Annual Report.

104.986899.76	Pollutant	Existing Development Conditions for Projects from 7/1/2020 to 6/30/2021 Acres	2009 EOSLoading Rate (lbs/ac)	Load	Post Development Conditions for Projects from 7/1/2020 to 6/30/2021 Acres	2009 EOSLoading Rate (lbs/ac)	Load	Load Increase	Total Load Increase	Reduction from SWMF drain to MS4 in FY21	Reduction from SWMF that do not Drain to MS4in FY20	Difference
Regulated Urban Impervious		38.98	16.86	657.15	48.58	16.86	819.06	161.91	65.24	191.8355	3.76	-130.36
Regulated Urban Pervious	Nitrogen	-38.98	10.07	-392.53	-48.58	10.07	-489.20	-96.67				
Regulated Urban Impervious		38.98	1.62	63.14	48.58	1.62	78.70	15.56	11.62	22.05	1.16	-11.58
Regulated Urban Pervious	Phosphorus	-38.98	0.41	-15.98	-48.58	0.41	-19.92	-3.94				
Regulated Urban Impervious		38.98	1171.32	45654.42	48.58	1171.32	56902.73	11248.30	9560.62	14569.99	493.29	-5502.66
Regulated Urban Pervious	Total Suspended Solids	-38.98	175.80	-6852.68	-48.58	175.80	-8540.36	-1687.68				

Development Load Changes and Load Reductions from SWMF for FY21

Load reductions achieved to date (3)
Through the end of the 1st permit cycle, Arlington exceeded the 5% POC reduction requirement through the project and program categories shown in the chart and table below. Collectively, in the terminology of the permit, these projects and programs are referred to as 'best management practices,' or 'BMPs.'



Project/program	TN reduction	TP reduction	TSS reduction
2006-2009 Historical BMPs	1.2%	1.2%	1.2%
LDA Program	7.2%	3.9%	3.3%
Septic Conversions	0.5%	0.0%	0.0%
Stream Restoration	2.5%	19.2%	14.6%
Street Sweeping	0.8%	1.5%	2.8%
Trades Retrofit	0.1%	0.1%	0.2%
Green Infrastructure	1.4%	0.9%	0.8%
	13.8%	**27.0%**	**22.9%**

Cumulative POC reductions through 1st permit cycle by project/program category

Stream restoration has provided the most POC credits to date because of the significant reduction in erosion and increase in stream stability and overall resiliency that result from these projects. The LDA program also generates substantial POC credits because most regulated development activity is redevelopment, and the stormwater regulatory program requires a 10%-20% net pollutant reduction for redevelopment projects.

List of BMPs implemented to date to achieve reductions (4)
Appendix A provides a summary of the projects and programs that provide the POC reductions summarized in the previous section.

BMPs to be implemented prior to the expiration of this permit to meet the cumulative reductions (5)
The table below provides the projected BMPs and estimated POC reductions to be reported for credit during the 2nd permit cycle, conservatively for projects recently completed (but yet reported for credit), under construction, or in active design. The table also includes projected POC reductions from the LDA program[1].

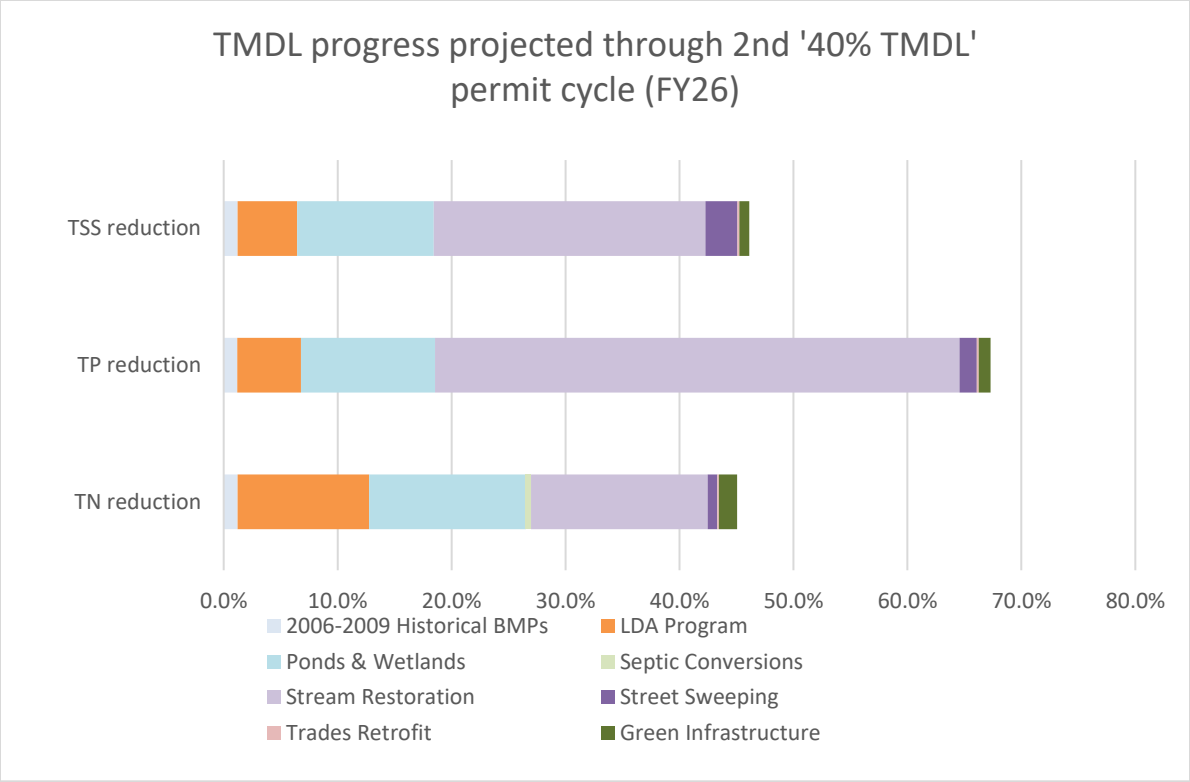
Projects and Programs	TN Reduction	TP Reduction	TSS Reduction
Washington Golf & Country Club stream restoration	980	290	21400
Ballston Pond restoration	1270	150	126660
Donaldson Run Tributary B stream restoration	320	70	66390
Gulf Branch stream restoration	200	50	33070
Sparrow Pond restoration	320	30	30780
Walter Reed - 5th St S green infrastructure	9.3	0.8	560
N Oakland Street – Park green infrastructure	9.4	0.6	380
N Larrimore St and 9th St N green infrastructure	5.8	0.5	310
LDA Program	500	20	25000
	3610	**610**	**304550**

Estimated POC reductions for 2nd permit cycle (lbs)

The capital costs for these projects are estimated at $17.7 million. Actual credits (including final calculated removal efficiencies) and costs will be updated as reported with each annual report. Note that cost accounting to date has included only capital costs and not operating costs (e.g., for the LDA program, plan review, inspections, maintenance, etc.). These operating costs are part of the total cost of Chesapeake Bay TMDL compliance and may be reported in the future.

The chart and table on the following page estimate cumulative POC reductions through the end of the 2nd permit cycle to reach the 40% POC reduction requirement. Actual projects/programs and amounts and proportions of POC reduction may vary at the County's discretion. The total POC reduction achieved will meet the 40% minimum POC reduction requirement but may be less than or more than estimated below. Updates and project/program details and documentation will be provided in each annual report as well as with the draft 3rd MS4 permit cycle Chesapeake Bay TMDL Action Plan. Any POC reductions from these projects and programs that exceed the cumulative 40% POC reduction requirement will be applied to the cumulative 100% POC reduction requirement for the 3rd MS4 permit cycle.

[1] Note that street sweeping is not included in this table because it is an annual rather than cumulative credit that is re-calculated each year. Similarly, septic tank conversion is also not included because it is a one-time credit. Both are included in the estimated projections below.



Project/Program	TN reduction	TP reduction	TSS reduction
2006-2009 Historical BMPs	1.2%	1.2%	1.2%
LDA Program	11.6%	5.6%	5.2%
Ponds & Wetlands	13.7%	11.8%	12.0%
Septic Conversions	0.5%	0.0%	0.0%
Stream Restoration	15.5%	46.0%	23.8%
Street Sweeping	0.8%	1.5%	2.8%
Trades Center Retrofits	0.1%	0.1%	0.2%
Green Infrastructure	1.6%	1.0%	0.9%
	45.0%	**67.3%**	**46.1%**

Cumulative POC reductions estimated through 2nd permit cycle by project/program category

An estimate of the expected cost to implement the necessary reductions (6)
See previous section for this information.

Public Comments on Draft Action Plan (7)
Per the requirements of its MS4 permit, Arlington County solicited public comment on this updated 2nd permit cycle Chesapeake Bay TMDL Action Plan. The draft Action Plan was available online from April 15-30, 2022 for public comment. Invitation to review the plan and provide comment or feedback was advertised through announcements on the website and distribution via email announcement to various stakeholders, including commissions, local environmental organizations, and the public. A summary of comments received and the County's response (including any changes to the action plan document) is included in Appendix B.

Appendix A. List of BMPs through end of 1st permit cycle (through FY21)

Project Type	Plan Name	SWMF Installation Date	TN Reduction	TP Reduction	TSS Reduction
Stream Restoration	Donaldson Run Tributary A 1 & 2	9/1/2006	118.37	112.39	73972.78
Stream Restoration	Donaldson Run Tributary A 3 & 4	9/1/2006	79.17	81.67	53103.46
Stream Restoration	Donaldson Run Tributary B Headwater	9/1/2007	29.64	32.11	20969.92
Watershed Retrofit	Patrick Henry Drive & 9th Road N - North	6/1/2011	1.64	0.15	113.28
Watershed Retrofit	Patrick Henry Drive & 9th Road N - South	6/1/2011	5.37	0.53	396.87
Trades Retrofit	4200 28th Street S -Manufactured - Ultra Urban Inserts (6)	7/1/2011	0.35	0.05	49.31
Trades Retrofit	4250 29th Street S - Manufactured - Ultra Urban Inserts (6)	7/1/2011	0.21	0.03	29.28
Trades Retrofit	2881 S Taylor Street - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.28	0.04	38.53
Trades Retrofit	4200 28th Street S - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.06	0.01	7.71
Trades Retrofit	4200 28th Street S - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.03	0.01	4.63
Trades Retrofit	4200 28th Street S - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.01	0.00	1.54
Trades Retrofit	4200 28th Street S - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.19	0.03	26.20
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (12)	7/1/2011	0.18	0.03	24.66
Trades Retrofit	2701 S Taylor Street -Manufactured - Ultra Urban Inserts (6)	7/1/2011	1.87	0.28	260.43
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (6)	7/1/2011	0.14	0.02	20.03
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.34	0.05	47.77
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (12)	7/1/2011	0.90	0.14	124.82
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (6)	7/1/2011	0.42	0.06	58.56
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (6)	7/1/2011	0.09	0.01	12.33
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (12)	7/1/2011	0.71	0.11	98.62
Trades Retrofit	2701 S Taylor Street - Manufactured - Ultra Urban Inserts (1)	7/1/2011	0.11	0.02	15.41
Trades Retrofit	2701 S Taylor St - Manufactured - Ultra Urban Inserts (6)	7/1/2011	0.11	0.02	15.41
Trades Retrofit	4300 29th Street S - Earth Product Recycling – StormFilter®	8/1/2011	8.81	1.33	1224.42
Watershed Retrofit	Albemarle Bioretention	12/1/2011	5.90	0.47	319.65
Watershed Retrofit	Weenie Beenie Bioswale	12/1/2011	0.72	0.08	62.96
Watershed Retrofit	Pentagon City Median - North	4/1/2014	10.07	1.04	787.78
Watershed Retrofit	Gulf Branch Nature Center - Stormwater Planters	4/1/2014	0.17	0.02	14.84
Watershed Retrofit	Gulf Branch Nature Center - Stormwater Planters	4/1/2014	0.17	0.02	14.84
Watershed Retrofit	Pentagon City - Stormwater Planters A-E	4/1/2014	3.40	0.38	292.57
Watershed Retrofit	Pentagon City - Stormwater Planters F-K	4/1/2014	4.64	0.51	396.97

Project Type	Plan Name	SWMF Installation Date	TN Reduction	TP Reduction	TSS Reduction
Watershed Retrofit	8th Street S Curbside	12/1/2014	5.36	0.50	366.06
Watershed Retrofit	11th Street Park - Bioretention 1	10/15/2016	4.93	0.28	152.60
Watershed Retrofit	Northside Leaf/Mulch Storage Facility	11/1/2016	9.38	0.93	690.82
Watershed Retrofit	11th Street Park - Bioretention 2	11/7/2016	1.55	0.08	41.34
Watershed Retrofit	Patrick Henry Drive & 20th Street N	5/1/2017	14.71	1.25	873.44
Living Shore	Four Mile Run	10/13/2017	29.64	32.11	20969.92
Watershed Retrofit	Kensington Street - B	12/22/2017	11.55	0.88	590.22
Watershed Retrofit	Kensington Street - A (32nd St)	12/22/2017	10.15	0.81	549.51
Watershed Retrofit	John Marshall Drive - B	12/22/2017	5.53	0.40	262.39
Watershed Retrofit	John Marshall Drive - A	12/22/2017	15.63	1.40	999.10
Watershed Retrofit	Kirkwood Road @13th Street N	8/16/2018	3.31	0.31	226.64
Watershed Retrofit	Williamsburg Blvd Medians 2 - D	11/1/2018	3.88	0.39	287.32
Watershed Retrofit	Williamsburg Blvd Medians 2 - A-C	11/1/2018	4.31	0.43	317.07
Watershed Retrofit	Williamsburg Blvd Medians 1 - North	11/1/2018	5.61	0.58	441.16
Watershed Retrofit	Williamsburg Blvd Medians 1 - South	11/1/2018	9.49	0.84	597.68
Stream Restoration	Windy Run	3/18/2019	38.09	35.56	22982.13
Watershed Retrofit	N Kentucky Street @ 22nd St N	10/18/2019	2.79	0.24	169.72
Watershed Retrofit	2nd Street S - Bioretention 2	11/25/2019	2.46	0.20	135.53
Watershed Retrofit	2nd Street S - Bioretention 1	11/25/2019	3.08	0.26	182.91
Watershed Retrofit	N 11th Street @ George Mason Drive (B)	7/1/2020	3.93	0.33	226.66
Watershed Retrofit	N 11th Street @ Evergreen Street (A)	7/1/2020	7.57	0.66	463.00
Watershed Retrofit	N Oakland Street @ Pershing Drive	5/25/2021	2.10	0.18	125.01
Development	**Time Period**	**Fiscal Year (FY) credits taken**			
2006-2009 Historical BMPs	2006 - 2009 Historical BMP's	FY14	140.30	18.40	16101.30
Development	Redevelopment July 15 -Jun 16	FY16	100.57	6.32	5787.93
Development	Redevelopment July 18 -June 19	FY19	124.58	10.04	8287.26
Development	Redevelopment July 09 - June 14	FY14	122.08	7.05	6337.05
Development	Redevelopment July 19 -June 20	FY20	82.12	7.28	4506.78
Development	Redevelopment July 14 -June 15	FY15	46.29	3.27	2497.94
Development	Redevelopment July 16 -June 17	FY17	110.02	4.29	3968.19
Development	Redevelopment July 17 -June 18	FY18	111.02	9.18	5517.35
Development	Redevelopment July 20 -June 21	FY21	130.36	11.58	5502.66
Development	Additional July 09 – June 14	FY15	9.72	1.18	999.46
Other	**Type**				
Septic Conversions	Septic tank conversions	On-going	52.92	0.00	0.00
Street Sweeping	County Roadways	Annual	97.30	23.50	37090.10

Appendix B. Chesapeake Bay TMDL Action Plan Public Comment and Response

The County received eight public comments on the TMDL Action Plan from April 15-30, 2022. A comprehensive response covering the concerns noted in the comments is included below the comments.

	Commenter	Comment
1	Freda Kjolhede	Do what it takes to fix all the flooding spots on residential land (remember July about 2019 or 2020) within one year. It is taking too long to remedy this problem. Get more money from Amazon.
2	Paul Guttridge	We should be addressing the source of the pollutants. Stormwater and nutrient laden runoff should be a primary focus. Street sweeping is important but what about fertilizer use and pet feces? Also changing the development rules to limit impervious areas should be implemented.
3	Stephen Hughes	I believe that the plan needs to not only focus on all the ways we can limit and reduce Arlington's impact within the county, it needs to think about its ability within the commonwealth to get more bang for $. If we implement a (insert project) does that achieve more for the bay then say purchasing x acres of natural area for sale (timber in say Northumberland or Shenandoah Co) and placing it in a conservation easement. I would like us to explore alternatives that recognize the extraordinary costs of doing things in Arlington that may reduce the 10PPM when spending the same cash within the watershed and in the commonwealth could help achieve 1000x reduction for the same price in communities that aren't as wealthy as Arlington.
4	Diana Wahl	This is a meaningless document! You never say what you are going to do in each of the targeted areas, so how are we supposed to comment? Also does not address what you are doing on land disturbance by developers cutting down trees and building mega-houses.
5	Glenn Tobin	I strongly object to the portions of the plan that rely on stream restorations to achieve the targeted reductions. These projects are expensive and destroy natural habitat in order to supposedly improve natural habitat functions. A much better way to spend money would be to invest in reducing runoff from impervious surfaces throughout the county. The chief culprit in the sediment that flows into our streams and rivers is excess runoff and the resulting flash flooding in our streams. I live downstream of the Windy Run stream restoration site and spend considerable amounts of time around the Windy Run stream channel. My observation is that erosion downstream of the stream restoration has worsened since the stream project. More trees have fallen in the last 3 years than in the previous 10 on the borders of the stream. Because the stream bed upstream was raised during the stream restoration project, the gradient downstream increased. The same volume of water is flowing, the problem was transferred to the area below the stream restoration. Again, I would like to repeat that I strongly object to the reliance upon stream restoration in the upcoming plan. We would be much better off to use the money to solve the problems of excessive runoff before the water enters the streams.
6	William G. Gillespie	1. Arlington County's Draft 2021 – 2026 Chesapeake Bay TMDL Action Plan relies far too much on "stream restorations." A. "Stream restorations" do not achieve the pollution reductions project proposers claim. Citizen science work on Taylor Run in Alexandria, VA showed that a proposed stream restoration on the stream would not reduce Total Nitrogen (TN) and Total Phosphorous (TP) and Total Suspended Sediment (TSS) concentrations. Taylor Run is an upland, incised stream very similar to the streams found in Arlington County. For the Taylor Run stream restoration, the City of Alexandria initially relied on pollution reduction values based on engineering estimates. At the urging of Alexandria residents, the City took soil samples in Taylor Run and discovered, that the original engineering estimates hopelessly overestimated the pollution reduction potential of the stream restoration. Total Nitrogen and Total Phosphorous reductions were 20 percent and 30 percent of original estimates, respectively. More importantly, even the pollution reduction estimates based on soil samples were inflated. A year-long water quality monitoring project on Taylor Run showed that about 75% of the TN and almost all the TP and TSS arrived in the stream from the stormwater sewer system. B. Arlington County should base stream restoration decisions on good, reliable measurements

		and sound science. The County should not rely on pollution reduction estimates when contemplating a stream restoration project. Making good, reliable stream bank measurements is inexpensive. Bulk density samples for Total Nitrogen and Total Phosphorous at four locations along a stream costs about $500 to $1,000. Water quality sampling is also inexpensive. Here are some recent costs from a certified laboratory. o Total Nitrogen: $89 per sample. o Total Phosphorous: $45 per sample. o Total Suspended Sediment: $18 per sample. C. Stream restorations do not "restore" streams, they damage them. Here is a short list of the problems associated with these invasive and destructive construction projects. o They reduce tree canopy, o They damage and/or destroy plant and animal communities – the ecology – of a stream. o They open natural areas to non-native, invasive species. o They often fail with unpleasant and unintended consequences. 2. Streams are not the problem. Pollution generated in the watershed and conveyed by the stormwater sewer system to the stream is the problem. Fix that. Best Management Practices (BMPs) installed upstream of Arlington County's streams will improve water quality. The County should focus its efforts on stormwater mitigation in the upstream watershed. This involves creative thinking and work on public lands and work with private landholders. BMPs that slow down, filter and capture stormwater will make real, substantial improvements in water quality. While not exhaustive, the Chesapeake Stormwater Network provides an excellent list of the types of BMPs that can be installed. Please see: https://chesapeakestormwater.net/training-library/stormwater-bmps/ The volunteers who performed the water quality monitoring on Taylor Run would be happy to present their detailed findings to Arlington County staff and the Arlington County Board. Thank you for the opportunity to comment.
7	Audrey Clement	I am disturbed that Appendix A of Arlington's Chesapeake Bay TMDL Action Plan Update lists stream restoration as a BMP and its principal means of reducing pollutants in Donaldson Run, Tributary A and B. https://www.arlingtonva.us/files/sharedassets/public/environment/documents/bay-tmdl-action-plan-2nd-permit-cycle-for-public-comment.pdf So-called Natural Channel Design (NCD) stream restoration (SR) is both unworkable and destructive of native habitat. Dr. John Field, a nationally recognized geomorphologist, and Rod Simmons, a respected Northern Virginia environmental consultant, have weighed in against NCD. According to Field, natural channel design is premised on the existence of a natural floodplain into which flood waters can disperse, as well as alluvial soil into which meanders can be incised. https://acrobat.adobe.com/link/review?uri=urn%3Aaaid%3Ascds%3AUS%3A7e0b1d70-711f-40b5-a737-e60f608435bd#pa Neither of these conditions obtain in the upper reaches of Donaldson Run, where the surface soil is packed clay; the stream bed is bedrock; and no floodplain ever existed. According to Simmons, natural channel design is intended to restore the banks of low lying rivers, not upper head water streams like Donaldson Run. Implementing NCD in the wrong setting not only exacerbates erosion, it also causes streams to divert around the boulders placed on the stream bed to curtail its flow. Regarding the unintended consequence of NCD on Tributary A, Rod Simmons reported: "Many boulders and tons of imported soil/sediment have been blown out and are far downstream. The

		roots of planted trees are exposed along the stream banks as a result of this misapplied, artificial engineering of nature. When crossing the bridge, note that it is almost buried in sediment (silt, sand, gravel, and boulders) and that nothing green or that was planted (as in photo on website) exists in this artificial floodplain (where none existed naturally) because of the too-frequent scouring and deposition regime - again, an artificiality unknown to nature. "But no matter. The county's shameless propaganda attempts to sell this debacle as an American success story as it connects the miserably misapplied Tributary B project to Tributary A right through private property, no less." In a recent Power Point presentation to the Maryland Native Plant Society, Maryland Sierra Club member Ken Bawer described "stream restorations" as an example par excellence of "Greenwashing: the process of conveying a false impression or providing misleading information about how products or practices are environmentally sound." https://drive.google.com/file/d/19qfVKL9L7HB-BdE0M5HXCpIjbWUrZ1D7/view Among the inconvenient truths about SR Bawer cited are: Stream restorations don't address root cause of erosion – stormwater from impervious surfaces. Stream construction projects are major vectors for the growth and spread of non-native invasive plants that completely engulf sites following major soil disturbance. SRs are only temporary since stormwater is not controlled at its source. Trying to replant a forest [denuded by stream restoration] is like trying to put Humpty Dumpty back together again. Cutting Forests Promotes Global Warming, including: • Lost carbon sequestration • Additional lost ecosystem services: • Lost oxygen production • Lost stormwater absorption • Lost water quality protection • Lost biodiversity • Lost native plants that insects eat • Lost insects that birds eat • Lost wildlife habitat The results of "stream restorations" rarely, if ever, show evidence for biological improvement for aquatic organisms. For alternatives to SR, Bawer recommends a Maryland Department of Environment publication: Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated (2020) ("Accounting Guidance") https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/2020%20MS4%20Accounting%20Guidance.pdf I recommend that Arlington DPR digest this document before proceeding with its latest TMDL action plan.
8	Suzanne Smith Sundburg	Having reviewed Arlington's Chesapeake Bay TMDL Action Plan updated draft, dated April 2022, for the 2021–2026 permit cycle, I was highly disappointed to see that the county continues to rely so heavily on so-called stream "restoration" as the main method for reduction of pollutants of concern (POC). Unfortunately, Arlington continues to use default values to represent local riparian phosphorus and nitrogen levels for its stream-restoration projects, even though they are based on averages from out-of-state soil samples. These imprecise defaults frequently overestimate the

		"bioavailable" phosphorus and nitrogen—the portion of these compounds that actually impact water quality—actually present in local riparian soils, making these "restoration" projects appear to remove far more pollutants that they actually do. In 2021, local scientist Rod Simmons collected riparian soil samples from Donaldson Run Tributary B and sent them to a respected lab that used Mehlich-3 soil tests to confirm the bioavailable phosphorus and nitrogen levels in the stream's soil samples. Then, the bioavailable test results were compared to the default values Arlington used to justify the Tributary B "restoration" project. The Mehlich-3 tests results proved that the default metric (the one Arlington uses) is flawed, resulting in the project's justification relying on far higher levels of pollutant removal than is possible, as is the case for Donaldson Run. "Stream bank soil samples expertly taken and analyzed show the actual cost per pound of phosphorus (and nitrogen) removed along the stream banks of Donaldson Run Tributary B project footprint to be more than 4-and-a-half times less than the county's purported nutrient reduction and cost analyses figures. The average of the 4 equidistant samples of exposed saprolite soil along the stream banks of Donaldson Run Tributary B is 0.23 lb. phosphorus per ton of soil/sediment. The 'Expert Panel's' 1.05 lbs. phosphorus per ton figure, the default figure used by the county to justify and sell the projects, is 457% higher than the actual phosphorus values sampled at Donaldson Run." (For reference, see R.H. Simmons, Summer 2021, River Management Systems (RMS) Journal, pp. 30–31: https://www.river-management.org/assets/Journals-Newsletters/2021%20Summer.pdf) Mr. Simmons provided this analysis to Arlington County staff, so staff is aware of the discrepancy and yet continues to push scientifically invalid data rather than correct data. The results of his independent sampling, showing very low actual phosphorus and nitrogen levels from the saprolite soils of Donaldson Run's stream banks, means that most phosphorus and nitrogen pollution is washing into the stream from upland deposits of animal waste or fertilizer applied to lawns and not from streambank erosion. Due to the unreliability of the use of default metrics, the Virginia Department of Environmental Quality (VA DEQ) banned default phosphorus calculations from being used in pollution-reduction crediting for stream restoration projects in late 2019. Since early 2020, DEQ has required local governments to base their pollutant load reduction credits calculation on the total nitrogen (TN) and total phosphorus (TP) values in local soil samples collected in the stream to be "restored." See VA DEQ's improved protocols as outlined in the VA DEQ Guidance Memo No. 20-2003 – Chesapeake Bay TMDL Special Condition Guidance, dated February 6, 2021: https://www.townhall.virginia.gov/L/GetFile.cfm?File=C:\TownHall\docroot\GuidanceDocs\440\GDoc_DEQ_6960_v1.pdf. Why Arlington staff has not yet complied with this guidance is unknown. But as one of the wealthiest and best educated localities in the State of Virginia, I know we can do better. We have an obligation to set the right example instead of exploiting technicalities that that misrepresent Arlington's actual pollution reduction and lead Arlington to spend far more to remove less pollution than if it had selected more effective, less destructive methods to reduce the stormwater volume and stress on Arlington's overtaxed streams. Likewise, Dr. John Field of Field Geology Services, an expert in fluvial geomorphology and stream restoration, reviewed Arlington's design for Donaldson Run Tributary B in December 2020. See "Analysis of the Stream Restoration Design of Donaldson Run Tributary B in Arlington, VA": https://media.alexandriava.gov/docs-archives/tes/oeq/info/dr.field---analysis-of-the-stream-restoration-design-of-donaldson-run-tributary-b-in-arlington-va=2=.pdf. Dr. Field concludes the following: "The proposed design channel for Donaldson Run Tributary B, when functioning as designed, will more efficiently transport sediment downstream towards Chesapeake Bay counter to the

		project's intent due to an increase in the design channel's slope and narrowing of its width (see Section 4.1 and 4.2 above). By misunderstanding the setting within which the idealized channel form is being constructed, the project design intends to frequently inundate a surface that has never regularly flooded before (see Section 4.2 above), causing undo stress to the natural ecosystem not adapted to regular floodwater inundation. Note that both of these negative outcomes will result when the project is functioning as designed and represent a further destabilization of the local environment and, more broadly, Chesapeake Bay itself…." Increasing the slope and narrowing the width of the channel will make the design channel unstable relative to the urbanized watershed experiencing increased runoff. Over time (more than likely within the first 10 years of construction based on the design parameters – see Section 4.3 above), the design channel will begin to unravel during a large flood or unexpected event that clogs the channel (e.g., sediment from the valley side slopes, tree falling into stream). Once the armor layer of rock and boulders in the design channel is weakened, outflanked, or bypassed entirely, the channel will adjust relatively rapidly to reestablish a channel more closely approximating the existing condition that is already nearing an equilibrium condition in balance with the urbanized watershed (see Section 3.0 above). Consequently, any short-term improvements in bank stability, water quality, and aquatic habitat will prove unsustainable. Again, we can do far better than this to reduce total suspended solids (TSS) or the amount of sediment in our streams. The question is why Arlington County continues to cling to a method that guarantees more sediment, not less, will flow into the Chesapeake Bay. Moreover, in creating a floodplain where none existed before—engineering that is designed to slow the water down and reduce the stream channel's capacity—Arlington has reduced the stream's throughput and thus has INCREASED the risk of flooding during heavy rain and runoff events. This is basic physics. Urban stream restoration, as utilized in Arlington County, fails to address the primary cause of urban stream syndrome and the resulting downcutting of streambanks and erosion: the excessive volume and speed of runoff coming from upland areas of the watershed, where imperviousness is the key driver of runoff volume which transports the lion's share of pollutants into our streams and ultimately into the Chesapeake Bay. Reducing stormwater runoff volume is key to reducing pollutants entering our streams. I ask Arlington County staff, the County Manager and the Arlington County Board to further revise this updated "action plan" to adopt more proactive, scientifically valid and less environmentally damaging methods to reduce the level of pollutants of concern in this updated action plan. Thank you for your time and attention.

The topics covered in the comments included:

1. Concerns about development and runoff from increasing impervious surfaces
2. Concerns about stream projects
3. Concerns about costs
4. Concern about pollutants outside of nitrogen, phosphorus, and sediments
5. Concerns about the plan

As there is overlap between the comments received, the County has prepared an overall response:

1. Concerns about development and runoff from increasing impervious surfaces. These concerns included both concerns about lot-to-lot runoff impacts, flooding in critical watersheds, as well as broader watershed-scale impacts on streams.

Individual lot runoff impacts. The County has several tools in place to reduce stormwater flows from new development. Since 2014, the County has required stormwater management for new construction and large additions, including permeable paver driveways and planter box rain gardens paired with underground dry wells.
In 2021, the County increased these stormwater management requirements for new development. The new requirements, known as LDA 2.0, include detaining up to three inches of rainfall, capturing runoff with aboveground tanks, de-compacting and amending soils and providing additional incentives for maintaining tree cover.

Flooding in critical watersheds. As part of the Flood Resilient Arlington initiative, the County is also working to address flooding in critical watersheds, including the construction of a large stormwater vault to address capacity issues and help protect the Westover shopping district. To learn more, please visit the Stormwater Capacity Improvements page.

Controlling runoff at the source. Stormwater capacity projects and controls on development both help to reduce runoff. Additionally, our award-winning green street projects each capture and absorb thousands of gallons of runoff. Over 30 green streets have been installed in the County, and more are in planning.
All these measures are helping capture rain closer to the source. However, given Arlington's extensive existing development, there is limited space to treat runoff at the source. Arlington's watersheds range from 30 to 50% imperviousness or more. In a watershed with 30% imperviousness, Arlington would have to neutralize runoff from two-thirds of the roofs, streets, and other paved areas to prevent downstream impacts.

2. Concerns about stream projects. These included concerns about whether stream projects sufficiently protect downstream sections, if there could be negative impacts to ecological systems from stream projects, and if the crediting system might have sources of error.

Protection of downstream stream sections. This comment was concerned particularly with the Windy Run stream project, stating that over the last three years (2019-2022) since the stream project was completed, many trees have fallen in the downstream section. The commenter was concerned that the gradient downstream might have been increased.

The project was designed to tie into the existing stream grade, and the gradient downstream was not changed.
The major storm in July 2019 put the County's stream resilience to the test. Despite the extreme rainfall intensity, stream projects performed well. In the stream project area, step pool and other embedded stone structures stabilized the stream channel, directing the water out onto the floodplain to help dissipate the water's energy. Given the naturally steep stream valleys along Windy Run and extreme nature of the storms in recent years, it is not surprising that there were some impacts and that trees fell in downstream sections. We are seeing this damage occur in other streams across the County. As climate change amplifies storms, the County will have to blend and balance stream stability, community uses and habitat as we seek to ensure resilience in Arlington's stream corridors.

Stream projects and trees. Unfortunately, trees do have to be removed to re-shape the channel to be in balance with stormwater flows. However, severe stream erosion kills the trees along the stream as it widens.
Although some trees are removed to complete the stream resilience project, more than twice as many trees are replanted, and the new trees have a better chance of survival. High-value trees are prioritized for protection during design planning based on size, ecological value, and condition.
While there is a near term impact to trees when a stream project is installed, there are longer term benefits to overall forest health.

- Stable streambanks and floodplain connection help prevent future erosion and losses.
- Cleared trees can be incorporated as in-stream habitat.
- The canopy closes as nearby large trees react to increased sunlight, growing to fill in openings.
- A robust replanting plan adds biodiversity to the tree corridor.
- Once established, new trees will provide shade for the stream and forest.

Benthic macroinvertebrates. One commenter was concerned about aquatic insects and other stream life. Arlington monitoring has found that communities of benthic macroinvertebrates in stream project areas are among the best in the County. Stream projects help prevent erosion and sedimentation, which helps provide good riffle habitat where the most sensitive macroinvertebrates can be found.

Crediting for stream projects. There were also concerns raised that the crediting system for stream projects might not be accurate. For Arlington's Donaldson Run Tributary B stream project, even though Virginia Department of Environmental Quality (DEQ) guidance allows the use of default soil nutrient values, Arlington County chose to take on-site samples because it is the most rigorous option to estimate credits, finding a Total Phosphorus (TP) mean of 0.43 lbs/ton and a Total Nitrogen (TN) mean of 1.0 lbs/ton. This information is posted on the Donaldson Run Tributary B project page.

There are also concerns about whether total phosphorus or bioavailable phosphorus is more appropriate to use. According to DEQ guidance, the EPA Chesapeake Bay Program stream restoration protocol, and the MS4 TMDL framework, TP is the correct parameter (see p. 26 of A Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed). For the purposes of the Chesapeake Bay TMDL goals and crediting, the permit load reduction targets are also defined in terms of TP. The crediting and load reduction methods are consistent with each other.

Regardless of the mechanics of the crediting system, it is widely accepted that most of the sediment carried in stream systems (60-80% or more) comes from the stream banks themselves, particularly in urban streams. Streambanks with active, severe erosion can send tons of sediment – carrying nutrients –downstream, clogging fish gills and smothering valuable habitat. By reshaping the stream channel and using structures to hold the grade, stream projects help keep sediment out of Arlington streams, the Potomac River and Chesapeake Bay.

3. Concerns about costs. Several comments mentioned costs regarding money spent to achieve nutrient and sediment reductions. While it may be true that projects that focus only on nutrients and sediment impacts to the Chesapeake Bay could be less expensive elsewhere in Virginia, there are local stream, water quality, and infrastructure problems to address here in Arlington. Cost per TMDL credit is not the only criterion used to prioritize projects and spending. The County has worked to identify and prioritize pond restoration and stream projects with local co-benefits to Arlington's residents and local environment, including protecting sanitary sewer infrastructure, protecting trails, reconnecting floodplains, preventing erosion, and providing habitat, for a more holistic and resilient approach.

4. Concerns about pollutants outside of nitrogen, phosphorus, and sediment. This comment emphasized the importance of pet waste and fertilizer as potential sources of nitrogen and phosphorus and questioned why they were not included in the Chesapeake Bay TMDL Action Plan.

Every year, the County provides significant education and outreach about pet waste and fertilizer, as required by the MS4 Stormwater Permit. Partners such as EcoAction Arlington, Virginia Cooperative Extension Master Gardeners, and Arlington Parks and Recreation also provide education on these topics. These education and outreach activities are reported in the MS4 Annual Report but are not included in the Chesapeake Bay TMDL Action Plan since they cannot be quantified.

5. Concerns about the action plan. The comment in question emphasized that the plan was hard to follow and that it was difficult to understand what Arlington would do. It is true that stormwater is subject to many different yet overlapping laws, regulations, permits and ordinances. The Chesapeake Bay TMDL Action Plan is a regulatory document and also a small but important slice of the stormwater program, and it can sometimes be difficult to understand how it fits into the broader program.

- For a broader look at stormwater goals and the programs, please see the 2014 Stormwater Master Plan.
- For more information about the actions Arlington is required to take by the Virginia Department of Environmental Quality, please see the MS4 Stormwater Permit and Report.
- For the most recent look at funding and planning for large projects, please see the most recent Capital Improvement Plan.