UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
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Decision Rationale
Total Maximum Daily Loads
Recreation Use (Bacteriological) Impairments
James River – Lower Piedmont Region Watershed
Goochland and Fluvanna Counties, Virginia

Signed

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Decision Rationale
Total Maximum Daily Loads
Recreation Use (Bacteriological) Impairments on the James River – Lower Piedmont Region and its Tributaries, Byrd Creek, Big Lickinghole and Little Lickinghole Creeks Fine Creek, and Beaverdam Creek, located in Goochland and Fluvanna Counties, 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 primary contact use (bacteriological) impairments on nine tributaries of the James River. EPA's rationale is based on the determination that the TMDLs meet the following seven regulatory conditions pursuant to 40 CFR §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 (NPS) can be reasonably met.

II. Background

The James River – Lower Piedmont Region and its tributaries, Byrd Creek, Big Lickinghole and Little Lickinghole Creeks, Fine Creek, and Beaverdam Creek are located in Goochland and Fluvanna Counties in the James River Basin. Byrd Creek (VAP-H34R-01), Big Lickinghole Creek, and Little Lickinghole Creek (VAP-H37R-01) were placed on the *2002 Section 303(d) Report on Impaired Waters* for violations of the fecal coliform standard and are considered Consent Decree waters. Fine Creek (VAP-H38R-01), Beaverdam Creek (VAP-H38R-03) and the James River segments (VAP-H33R- 01 and VAP- H38R-04) were added to the *2004 Section 305(b)/303(d) Water Quality Assessment Integrated Report*. Elevated levels of fecal coliform bacteria recorded at the Virginia Department of Environmental Quality (VADEQ) ambient water quality monitoring stations showed that these James River basin stream segments do not support primary contact recreation use. Most of the land in the James River – Lower Piedmont watershed is forested and agricultural.

Virginia designates all of its waters for primary contact; therefore, all waters are required to meet the bacteriological criteria for this use. The criterion applies to all flows. The *E. coli* criteria requires a geometric mean concentration of 126 cfu/100 ml of water with no sample exceeding 235 cfu/100 ml of water.

The USGS Hydrologic Simulation Program - Fortran (HSPF) water quality model was selected as the modeling framework to simulate fecal coliform existing conditions and to perform fecal bacteria TMDL allocations. The HSPF model is a continuous simulation model that can account for nonpoint source pollutants in runoff, as well as pollutants entering the flow channel from point sources. The TMDL developed for the James River – Lower Piedmont Region was based on the Virginia State Standard for *E. coli*. The model was set up to estimate loads of fecal coliform, and then the model output was converted to concentrations of *E. coli.*

The TMDL allocations are summarized in allocation Tables 1 and 2. The U.S. Fish and Wildlife Service have been provided with a copy of the TMDL.

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the seven basic requirements for establishing primary contact (bacteriological) impairment TMDLs for the James River – Lower Piedmont Region. 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.

Virginia has indicated that potential sources of fecal coliform include both point and nonpoint source contributions. The water quality criterion for fecal coliform was a geometric mean 200 cfu/100 ml or an instantaneous standard of no more than 1,000 cfu/100 ml. Two or more samples over a 30-day period are required for the geometric mean standard. Since the state rarely collects more than one sample over a 30-day period, most of the samples were measured against the instantaneous standard.

The Commonwealth has changed its bacteriological criteria to include *E. coli*. The new *E. coli* criterion requires a geometric mean of 126 cfu/100 ml of water with no sample exceeding 235 cfu/100 ml. The new criterion is more stringent.

The HSPF water quality model was selected as the modeling framework to simulate fecal coliform existing conditions and to perform fecal coliform bacteria TMDL allocations. The HSPF model is a continuous simulation model that can account for NPS pollutants in runoff, as well as pollutants entering the flow channel from point sources. In establishing the existing and allocation conditions, seasonal variations in hydrology, climatic conditions, and watershed activities can be explicitly accounted for in the model. The use of HSPF allowed for consideration of seasonal aspects of precipitation patterns within the watershed. Existing conditions were adjusted until the water quality standards were attained. The TMDL developed for the James River – Lower Piedmont Region was based on the Virginia State Standard for

E. coli. The model was set up to estimate loads of fecal coliform, and then the model output was converted to concentrations of *E. coli*.

Since modeling provided simulated output of *E. Coli* concentrations at 1-hour intervals, assessment of TMDLs was made using both the geometric mean standard of 126 cfu/100 ml and the instantaneous standard of 235 cfu/100 ml. Therefore, the instream *E. coli* targets for these TMDLs were a monthly geometric mean not exceeding 126 cfu/100 ml and a single sample not exceeding 235 cfu/100 ml.

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

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of bacteria to the land surface or their availability to runoff are considered flux sources. The actual values for total loadings can be found in Tables 1 and 2.

Table 1. Average Annual *E. coli* (cfu/year) TMDL Allocations in the James River Tributaries – Lower Piedmont Region

Impairment	TMDL Standard	WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Byrd Creek (VAP-H34R-01)	*E. coli*	1.08E+11	9.51E+12	Implicit	9.62E+12
VAG404239		1.74E+09		Implicit	
VAG404240		1.74E+09		Implicit	
VAG406343		1.74E+09		Implicit	
VAG406344		1.74E+09		Implicit	
VAG406345		1.74E+09		Implicit	
VAG406346		1.74E+09		Implicit	
VAG406347		1.74E+09		Implicit	
Future Growth		*9.57E+10*		Implicit	
				Implicit	
Big & Little Lickinghole Creeks (VAP-H37R-01)	*E. coli*	7.94E+10	7.90E+12	Implicit	7.98E+12
Future Growth		*7.94E+10*		Implicit	
Beaverdam Creek (VAP-H38R-03)	*E. coli*	3.13E+12	5.01E+12	Implicit	8.14E+12
VA0020681		3.76E+11		Implicit	
VA0006149		1.04E+11		Implicit	
VA0023108		3.48E+10		Implicit	
VA0063037		6.96E+09		Implicit	
Future Growth		*2.61E+12*		Implicit	
				Implicit	

Impairment	TMDL Standard	WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Fine Creek (VAP-H38R-01)	*E. coli*	3.66E+10	3.63E+12	Implicit	3.67E+12
Future Growth		*3.66E+10*		Implicit	
				Implicit	
James River (Upper, VAP-H33R- 01)	*E. coli*	3.54E+11	3.92E+15	Implicit	3.92E+15
VA0062731		2.17E+10		Implicit	
VA0088382		3.48E+10		Implicit	
VAG404239		1.74E+09		Implicit	
VAG404240		1.74E+09		Implicit	
VAG406343		1.74E+09		Implicit	
VAG406344		1.74E+09		Implicit	
VAG406345		1.74E+09		Implicit	
VAG406346		1.74E+09		Implicit	
Future Growth		*2.83E+11*		Implicit	
				Implicit	
James River (Lower, VAP- H38R-04)	*E. coli*	7.92E+12	3.91E+15	Implicit	3.91E+15
VA0062731		2.17E+10		Implicit	
VA0088382		3.48E+10		Implicit	
VA0020656		1.57E+11		Implicit	
VA0020699		8.09E+11		Implicit	
VA0020702		3.41E+11		Implicit	
VAG404239		1.74E+09		Implicit	
VAG404240		1.74E+09		Implicit	
VAG406343		1.74E+09		Implicit	
VAG406344		1.74E+09		Implicit	
VAG406345		1.74E+09		Implicit	
VAG406346		1.74E+09		Implicit	
VAG406347		1.74E+09		Implicit	
VAG404226		1.74E+09		Implicit	
Future Growth		*6.54E+12*		Implicit	

Table 2. Daily *E. coli* (cfu/day) in the James River Tributaries Lower Piedmont Region

Impairment	TMDL (daily)[1]	WLA (daily)[2]	MOS	LA (daily)
	(cfu/day)	(cfu/day)		(cfu/day)
Byrd Creek	2.54E+12	2.96E+08	*Implicit*	2.53E+12
Big & Little Lickinghole Creeks	1.46E+12	2.18E+08		1.46E+12
Beaverdam Creek	9.59E+11	8.59E+09		9.50E+11
Fine Creek	4.88E+11	1.00E+08		4.88E+11
James River (upper, H33R-01)	1.14E+14	9.69E+08		1.14E+14
James River (lower, H38R-04)	1.28E+14	2.17E+10		1.28E+14

[1]The TMDL is presented for the 99th percentile daily flow condition at the numeric water quality criterion of 235 cfu/100 ml. The TMDL is variable depending on flow conditions. The numeric water quality criterion will be used to assess progress toward TMDL goals.
[2]The WLA reflects existing, as well as an allocation for potential future permits issued for bacteria control. Any issued permit will include bacteria effluent limits in accordance with applicable permit guidance and will ensure that the discharge meets the applicable numeric water quality criteria for bacteria at the end-of-pipe.

Wasteload Allocations

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.

There are seventeen point sources currently permitted to discharge fecal coliform into the James River Tributaries – Lower Piedmont Region (Table 3). The allocation for the permitted sources is equivalent to their current permit levels (design discharge and 126 cfu/100 ml). Future growth in each watershed was accounted for by assuming a 500% growth in permitted discharges. For watersheds with no existing point sources such as Fine Creek and Big and Little Lickinghole Creeks, future growth was accounted for as a 1% of the current TMDL in the watershed. Table 1 provides the wasteload allocations for each point source.

Table 3. Summary of Point Sources Permitted for Fecal Coliform in the James River Tributaries – Lower Piedmont Region

Facility Name	Permit No	Stream
Elk Hill Farm WWTP	VA0062731	Little River/UT
Covenance Research Products Inc.	VA0088382	Maxey Mill Creek
DJJ Beaumont Juvenile Correction Center	VA0020656	Mohawk Creek
James River Correction Center	VA0020681	James River
James River Correction Center	VA0006149	Beaverdam Creek
DOC Powhatan Correctional Center	VA0020699	UT to James River
Virginia Correctional Center for Women	VA0020702	James River
VDOT Interstate 64 Goochland Rest Area	VA0023108	Horsepen Creek
Huguenot Academy Incorporated	VA0063037	UT to Branch Creek
Domestic Sewage Discharge	VAG404239	UT Mill Creek

Facility Name	Permit No	Stream
Domestic Sewage Discharge	VAG404240	UT Mill Creek
Domestic Sewage Discharge	VAG406343	Venable Creek UT
Domestic Sewage Discharge	VAG406344	Venable Creek UT
Domestic Sewage Discharge	VAG406345	Venable UT
Domestic Sewage Discharge	VAG406346	Venable Creek UT
Domestic Sewage Discharge	VAG406347	Venable Creek UT
Domestic Sewage Discharge	VAG404226	UT Maple Swamp Creek

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 nonpoint source loads should be distinguished.

Load allocations to nonpoint sources are divided into land based loadings from land uses and directly applied loads in the stream (*e.g.*, livestock, sewer overflows, and wildlife). Source reductions include those that are affected by both high and low flow conditions. Land based NPS loads had their most significant impact during high flow conditions, while direct deposition NPS had their most significant impact on low flow concentrations. Bacterial Source Tracking (BST) results for 2005-2006 confirmed the presence of human, livestock, pet, and wildlife contamination. Load reductions were performed by land use, as opposed to reducing sources, as it is considered that the majority of Best Management Practices (BMPs) will be implemented by land use.

Allocation scenarios were run sequentially, beginning with headwater impairments, and then continuing with downstream impairments until all impairments were allocated to 0% exceedances of the standards. Tables 4 through 9 break down the load allocations for each nonpoint sources categories in each watershed.

Table 4. Estimated Existing and Allocated *E. coli* Loads in the Byrd Creek

Source		Total Annual Loading for Existing Run[1]	Total Annual Loading for Allocation Run[1]	Percent Reduction
		(cfu/yr)	(cfu/yr)	
Land Based				
	Barren	1.32E+10	3.84E+09	71.0%
	Commercial	3.72E+12	3.72E+10	99.0%
	Cropland	2.30E+12	2.30E+10	99.0%
	Forest	2.59E+13	7.50E+12	71.0%
	Livestock Access	3.72E+12	3.72E+10	99.0%
	Low Density Residential	4.90E+12	4.90E+10	99.0%
	Pasture	1.10E+14	1.10E+12	99.0%
	Wetland	1.69E+12	4.91E+11	71.0%
Direct				
	Human	1.68E+13	0.00E+00	100.0%
	Livestock	2.25E+13	0.00E+00	100.0%
	Wildlife	9.37E+11	2.72E+11	71.0%
	Permitted Sources	1.08E+11	1.08E+11	0%
Total Loads		**1.92E+14**	**9.62E+12**	**99.3%**

[1]Permitted sources were set equal to the WLA, which includes a value for future growth.

Table 5. Estimated Existing and Allocated *E. coli* Loads in the Big & Little Lickinghole Creeks

Source		Total Annual Loading for Existing Run[1]	Total Annual Loading for Allocation Run[1]	Percent Reduction
		(cfu/yr)	(cfu/yr)	
Land Based				
	Barren	7.37E+10	3.43E+10	53.5%
	Commercial	9.42E+11	9.42E+09	99.0%
	Cropland	6.55E+13	6.55E+11	99.0%
	Forest	1.24E+13	5.78E+12	53.5%
	Livestock Access	9.42E+11	9.42E+09	99.0%
	Low Density Residential	5.08E+12	5.08E+10	99.0%
	Pasture	4.08E+13	4.08E+11	99.0%
	Wetland	1.18E+12	5.47E+11	53.5%
Direct				
	Human	2.07E+13	0.00E+00	100.0%
	Livestock	1.44E+13	0.00E+00	100.0%
	Wildlife	8.64E+11	4.02E+11	53.5%
	Permitted Sources	7.94E+10	7.94E+10	0%
Total Loads		**1.63E+14**	**7.98E+12**	**99.5%**

[1]Permitted sources were set equal to the WLA, which includes a value for future growth.

Table 6. Estimated Existing and Allocated *E. coli* Loads in the Beaverdam Creek

Source		Total Annual Loading for Existing Run[1] (cfu/yr)	Total Annual Loading for Allocation Run[1] (cfu/yr)	Percent Reduction
Land Based				
	Barren	4.01E+10	9.23E+09	77.0%
	Commercial	2.67E+12	2.67E+10	99.0%
	Cropland	4.04E+13	4.04E+11	99.0%
	Forest	1.43E+13	3.29E+12	77.0%
	Livestock Access	2.67E+12	2.67E+10	99.0%
	Low Density Residential	7.30E+12	7.30E+10	99.0%
	Pasture	7.47E+13	7.47E+11	99.0%
	Wetland	1.38E+12	3.18E+11	77.0%
Direct				
	Human	5.57E+13	0.00E+00	100.0%
	Livestock	3.69E+13	0.00E+00	100.0%
	Wildlife	5.09E+11	1.17E+11	77.0%
	Permitted Sources	3.13E+12	3.13E+12	0%
Total Loads		**2.40E+14**	**8.14E+12**	**99.7%**

[1]Permitted sources were set equal to the WLA, which includes a value for future growth.

Table 7. Estimated existing and allocated *E. coli* loads in the Fine Creek

Source		Total Annual Loading for Existing Run[1] (cfu/yr)	Total Annual Loading for Allocation Run[1] (cfu/yr)	Percent Reduction
Land Based				
	Barren	3.57E+10	1.68E+10	53.0%
	Commercial	4.68E+11	4.68E+09	99.0%
	Cropland	8.94E+10	8.94E+08	99.0%
	Forest	6.50E+12	3.05E+12	53.0%
	Livestock Access	4.68E+11	4.68E+09	99.0%
	Low Density Residential	3.27E+12	3.27E+10	99.0%
	Pasture	1.86E+13	1.86E+11	99.0%
	Wetland	5.18E+11	2.43E+11	53.0%
Direct				
	Human	1.01E+13	0.00E+00	100.0%
	Livestock	8.11E+12	0.00E+00	100.0%
	Wildlife	1.93E+11	9.08E+10	53.0%
	Permitted Sources	3.66E+10	3.66E+10	0%
Total Loads		**4.84E+13**	**3.67E+12**	**99.3%**

[1]Permitted sources were set equal to the WLA, which includes a value for future growth.

Table 8. Estimated Existing and Allocated *E. coli* Loads in the Upper James River (VAP-H33R- 01)

Source		Total Annual Loading for Existing Run[1]	Total Annual Loading for Allocation Run[1]	Percent Reduction
		(cfu/yr)	(cfu/yr)	
Land Based				
	Barren	1.84E+12	1.84E+12	0.0%
	Commercial	4.37E+14	4.37E+13	90.0%
	Cropland	1.36E+16	1.36E+15	90.0%
	Forest	7.70E+14	7.70E+14	0.0%
	Livestock Access	4.37E+14	4.37E+13	90.0%
	Low Density Residential	8.05E+14	8.05E+13	90.0%
	Pasture	1.44E+16	1.44E+15	90.0%
	Wetland	4.86E+13	4.86E+13	0.0%
Direct				
	Human	3.18E+14	0.00E+00	100.0%
	Livestock	1.75E+14	7.36E+13	57.9%
	Wildlife	5.84E+13	5.84E+13	0.0%
	Permitted Sources	3.54E+11	3.54E+11	0%
Total Loads		**3.10E+16**	**3.92E+15**	**53.5%**

[1]Permitted sources were set equal to the WLA, which includes a value for future growth.

Table 9. Estimated Existing and Allocated *E. coli* Loads in the Lower James River (VAP- H38R-04)

Source		Total Annual Loading for Existing Run[1]	Total Annual Loading for Allocation Run[1]	Percent Reduction
		(cfu/yr)	(cfu/yr)	
Land Based				
	Barren	3.07E+12	3.07E+12	0.0%
	Commercial	5.31E+14	3.72E+13	93.0%
	Cropland	1.54E+16	1.08E+15	93.0%
	Forest	1.06E+15	1.06E+15	0.0%
	Livestock Access	5.31E+14	3.72E+13	93.0%
	Low Density Residential	1.25E+15	8.77E+13	93.0%
	Pasture	1.89E+16	1.32E+15	93.0%
	Wetland	8.91E+13	8.91E+13	0.0%
Direct				
	Human	4.25E+14	0.00E+00	100.0%
	Livestock	3.11E+14	7.71E+13	75.2%
	Wildlife	1.10E+14	1.10E+14	0.0%
	Permitted Sources	7.92E+12	7.92E+12	0%
Total Loads		**3.86E+16**	**3.91E+15**	**68.3%**

[1]Permitted sources were set equal to the WLA, which includes a value for future growth.

3) The TMDL considers the impacts of background pollution.

The TMDL considers the impact of background pollutants by considering the bacterial load from natural sources such as wildlife.

4) The TMDL considers critical environmental conditions.

According to EPA's regulation 40 CFR §130.7 (c)(1), TMDLs are required 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 the impaired creek is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[1]. Critical conditions for waters impacted by land based nonpoint sources generally occur during periods of wet weather and high surface runoff. In contrast, critical conditions for point source-dominated systems generally occur during low flow and low dilution conditions. Point sources, in this context also include nonpoint sources that are not precipitation driven (e.g., fecal deposition to stream).

Virginia provided a graphical analysis of fecal coliform concentrations and flow duration intervals that showed that there was no obvious critical flow level. That is, the analysis showed no obvious dominance of either nonpoint sources or point sources. High concentrations were recorded in all flow regimes at monitoring stations where data were collected during all flow regimes. Based on this analysis, a time period for calibration and validation of the model was chosen based on the overall distribution of wet and dry seasons in order to capture a wide range of hydrologic circumstances for all impaired streams in this study area.

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 order to improve TMDL allocation scenarios and, therefore, the success of implementation strategies, trend and seasonal analyses were performed on precipitation, discharge, and fecal coliform concentrations. The HSPF water quality model was used to develop this TMDL which accounts for NPS pollutants in runoff, as well as pollutants entering the flow channel from point sources. In establishing the existing and allocation conditions, seasonal variations in hydrology, climatic conditions, and watershed activities can be explicitly accounted for in the model. The use of HSPF allowed for consideration of seasonal aspects of precipitation patterns within the watershed. Existing conditions were adjusted until the water quality standards were attained.

6) The TMDL includes a Margin of Safety.

This requirement is intended 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. Virginia included an implicit MOS in the TMDLs through the use of conservative modeling assumptions. By adopting an implicit MOS in estimating the loads in the watershed, it is ensured that the recommended reductions will in fact succeed in meeting the water quality standard. Examples of the implicit MOS used in the development of this TMDL are:

- Allocating permitted point sources at the maximum allowable fecal coliform concentration.
- Selecting a modeling period that represented the critical hydrologic conditions in the watershed.

7) The TMDL has been subject to public participation.

Public participation during TMDL development for the James River and Tributaries – Lower Piedmont Region was encouraged. Two public meetings were held at the Goochland County Administration Building in Goochland, Virginia, on July 19, 2006, and on January 31, 2008. The meeting was publicized by placing notices in the Virginia Register, and electronic mail advertisement to all agencies. Two Technical Advisory Committee (TAC) meetings also took place on July 19, 2006, and also on January 31, 2008, in the Goochland County Administration Building in Goochland, Virginia.

IV. Discussion of Reasonable Assurance

EPA requires that there be a reasonable assurance that a TMDL can be implemented. As discussed earlier, Virginia intends to develop a phased TMDL implementation plan to address the primary contact use impairments.

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 issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source 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. For example, in agricultural areas of the watershed, the most promising management practice is livestock exclusion from waterbodies. This has been shown to be very effective in lowering fecal coliform concentrations in waterbodies, both by reducing the cattle deposits themselves and by providing additional riparian buffers.

Additionally, reducing the human fecal loading from failing septic systems should be a primary implementation focus because of its health implications. This component could be implemented through education on septic tank pump-outs as well as a septic system repair/replacement program and the use of alternative waste treatment systems.

VADEQ will work closely with the public during the implementation plan development process and will include the formation of a stakeholders' committee as well as open public meetings. Stakeholders will assist in formulating the TMDL Implementation Plan. This committee will have the responsibility for identifying corrective actions that are founded in practicality, establishing a timeline to ensure expeditious implementation, and setting measurable goals and milestones for attaining water quality standards.