



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
9/20/2007

Dr. Ellen Gilinsky, Director
Division of Water Quality Programs
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 23219

Dear Dr. Gilinsky:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the bacteria Total Maximum Daily Loads (TMDLs) to address the recreation impairment on nine tributaries, Austin Creek, Ballinger Creek, Frisby Branch, North River, Rock Island Creek, two Slate River segments, Totier Creek and Troublesome Creek, located in Albemarle and Buckingham Counties in the James River Basin. The TMDLs were submitted to EPA for review on June 28, 2007. The TMDLs were established and submitted in accordance with Section 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) lists.

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 (WLA) 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 bacteria TMDLs for James River Tributaries satisfy each of these requirements. In addition, the 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 has been included with this letter.

As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL WLA 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 October 1, 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 for the
Total Maximum Daily Loads for the
Recreation Use (Bacteriological) Impairments on
Nine Tributaries in the James River Watershed,
Albemarle and Buckingham Counties, Virginia**

Signed

**Jon M. Capacasa, Director
Water Protection Division**

Date: 9/20/2007

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**Decision Rationale for the
Total Maximum Daily Loads for the
Recreation Use (Bacteriological) Impairments on Nine Tributaries
of the James River, Albemarle and Buckingham 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 can be reasonably met.

II. Background

The nine tributaries to the James River are located in Albemarle and Buckingham Counties. The impaired segments include Ballinger Creek and Totier Creek (both in southern Albemarle County) and Austin Creek, Frisby Branch, North River, Rock Island Creek, 2 segments in Slate River and Troublesome Creek (each in Buckingham County).

Austin Creek (VAC-H21R-01) was first listed for fecal coliform violations on the *2004 305(b)/303(d) Water Quality Assessment Integrated Report*. The impaired segment begins at the headwaters at river mile 6.14 and extends to the mouth at North River (river mile 0.00).

Ballinger Creek (VAV-H17R-03) was first listed on the *2004 305(b)/303(d) Water Quality Assessment Integrated Report* for not supporting the recreation use. The impairment begins at the headwaters at river mile 9.82 and ends at the James River confluence (river mile 0.00)

Frisby Branch (VAC-H21R-02) appeared on the *2002 303(d) Report on Impaired Waters* as partially supporting the recreational use due to high fecal coliform counts. At that time, the impaired segment was designated as beginning at the headwaters at river mile 3.74 and extending to an unnamed tributary at river mile 2.40. The segment size was adjusted to beginning at river mile 3.93 and ending at the mouth at Grease Creek (river mile 0.00) as a result of the National Hydrographs Dataset used during the 2004 cycle.

North River (VAC-H21R-03) was first listed in the *2002 303(d) Report on Impaired Waters* for not supporting the recreation use due to excessive counts of fecal coliform bacteria. The impairment begins at the confluence with Meadow Creek at river mile 8.44 and ends at the mouth at the Slate River (river mile 0.00).

Rock Island Creek in Buckingham County (VAV-H17R-04) appeared on the *2004 305(b)/303(d) Water Quality Assessment Integrated Report* for fecal coliform. The impairment begins at the headwaters at river mile 8.84 and ends at the James River confluence at river mile 0.00.

Two Slate River impairments are listed. The Slate River (VAC-H21R-04) impairment was first noted on the *2002 303(d) Report on Impaired Waters*. In that listing, the impaired segment was designated as beginning at the confluence with Bryant Creek (river mile 24.25) and ending at the confluence with Ripley Creek (river mile 11.37), a 12.88-mile segment. This impairment was adjusted as a result of the National Hydrographs Dataset used during the *2004 305(b)/303(d) Water Quality Assessment Integrated Report*. The segment is now 13.28 miles long, beginning at the confluence with Grease Creek (river mile 34.93) and ending at the confluence with Walton Fork (river mile 21.65).

The second Slate River segment (VAC-H22R-01) was also listed for the first time on the *2002 303(d) Report on Impaired Waters*. The segment began at river mile 3.64 and ended at the mouth of the James River (river mile 0.00). This segment was partially supporting for recreation use due to fecal coliform bacteria violations. This Slate River segment was reconfigured as beginning at the confluence with Sharps Creek at river mile 7.12 and extending to the mouth of the James River (river mile 0.00.)

The Totier Creek impairment (VAV-H17R-01) begins at the headwaters (river mile 11.29) and ends at the James River confluence (river mile 0.00). Totier Creek was first listed on the *2002 303(d) Report on Impaired Waters* as only partially supporting the recreational use due to fecal coliform.

The second Slate River segment and the Totier Creek segment were listed in Attachment B of the 1998 consent decree as “Plaintiff’s Waters”; this signifies that, when they were found to be impaired in the 2002 assessment, TMDLs would be due by 2010.

Troublesome Creek (VAC-H21R-05) was listed for the first time on the *2004 305(b)/303(d) Water Quality Assessment Integrated Report*. The impaired segment is 0.95 miles

long, from the Troublesome Creek reservoir dam to the mouth at the Slate River. This segment did not support the recreational use due to fecal coliform violations.

Table 1. Provides the Drainage Area in Acres for the Dominant Land Use Type of each Watershed.

Impaired Segment	Water ID	Barren (acres)	Forest (acres)	Pasture (acres)	Water/Wetland (acres)
Austin Creek	VAC-H21R-01	544	3,976	56	138
Ballinger Creek	VAV-H17R-03	68	8,077	2,494	140
Frisby Branch	VAC- H21R-02	181	2,718	199	55
North River	VAC-H21R-03	1,248	17,974	2,058	637
Rock Island Creek	VAV-H17R-04	552	11,410	683	238
Slate River Lower	VAC-H21R-04	7,596	129,311	14,163	3,529
Slate River Upper	VAC-H22R-01	3,218	57,198	5,945	1,856
Totier Creek	VAV-H17R-01	321	10,794	6,804	461
Troublesome Creek	VAC-H21R-05	224	3,286	470	134
Total		13,952	244,744	32,872	7,188

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 (NPS) pollutants in runoff, as well as pollutants entering the flow channel from point sources. The TMDL developed for the nine tributaries to James River 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 2 and 3. The United States Fish and Wildlife Service have been provided with a copy of the TMDL.

Table 2. Average Annual *E. coli* (cfu/year) Modeled after TMDL Allocation at the Outlets of the James River Tributaries in Albemarle and Buckingham Counties Study Area Impairments.

Tributary/Impairment	TMDL Standard	WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)	
Frisby Branch <i>Future Growth</i>	<i>E. coli</i>	2.15E+10 <i>2.15E+10</i>	2.15E+12		2.17E+12	
Austin Creek <i>Future Growth</i>	<i>E. coli</i>	1.62E+10 <i>1.62E+10</i>	1.63E+12		1.65E+12	
Slate River (upper) VA0063291 VA0087563 <i>Future Growth</i>	<i>E. coli</i>	4.22E+10 <i>8.70E+09</i> <i>5.57E+09</i> <i>2.79E+10</i>	1.41E+13		1.41E+13	
North River <i>Future Growth</i>	<i>E. coli</i>	5.52E+10 <i>5.52E+10</i>	5.57E+12		5.63E+12	
Troublesome Creek VA0063291 <i>Future Growth</i>	<i>E. coli</i>	5.23E+10 <i>8.70E+09</i> <i>4.36E+10</i>	2.69E+12		2.74E+12	
Slate River (lower) VA0063291 VA0066460 VA0087563 VAG404041 VAG404116 VAG404166 VAG407204 VAG407237 VAG407251 <i>Future Growth</i>	<i>E. coli</i>	3.19E+12 <i>8.70E+09</i> <i>5.22E+11</i> <i>5.57E+09</i> <i>6.96E+08</i> <i>1.74E+09</i> <i>1.74E+09</i> <i>8.70E+08</i> <i>1.57E+09</i> <i>7.83E+08</i> <i>2.65E+12</i>	5.38E+13	<i>Implicit</i>	5.70E+13	
Rock Island Creek <i>Future Growth</i>	<i>E. coli</i>	3.38E+10 <i>3.38E+10</i>	3.38E+12			3.41E+12
Ballinger Creek <i>Future Growth</i>	<i>E. coli</i>	5.75E+10 <i>5.75E+10</i>	5.76E+12			5.82E+12
Totier Creek <i>Future Growth</i>	<i>E. coli</i>	1.62E+11 <i>1.62E+11</i>	1.75E+13			1.77E+13

Table 3. Daily Maximum *E. coli* Loads (cfu/day) for the James River Tributaries in

Albemarle and Buckingham Counties Study Area Impairments.

Tributary	TMDL Standard	WLA ¹ (cfu/day)	LA (cfu/day)	MOS	TMDL ² (cfu/day)
Frisby Branch	E. coli	5.89E+07	2.15E+11	<i>Implicit</i>	2.15E+11
Austin Creek	E. coli	4.44E+07	3.23E+11		3.23E+11
Slate River (upper)	E. coli	1.16E+08	5.88E+12		5.88E+12
North River	E. coli	<i>1.51E+08</i>	1.71E+12		1.71E+12
Troublesome Creek	E. coli	1.43E+08	3.08E+11		3.08E+11
Slate River (lower)	E. coli	<i>8.75E+09</i>	1.17E+13		1.17E+13
Rock Island Creek	E. coli	9.26E+07	1.12E+12		1.12E+12
Ballinger Creek	E. coli	1.58E+08	7.73E+11		7.73E+11
Totier Creek	E. coli	4.44E+08	1.90E+12		1.90E+12

¹ The WLA reflects 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.

² The TMDL is presented for the 99th percentile daily flow condition at the numeric water quality criterion of 235 cfu/100ml. The TMDL is variable depending on flow conditions. The numeric water quality criterion will be used to assess progress toward TMDL goals.

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 nine water segments leading to the James River. 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/100ml or an instantaneous standard of no more than 1,000 cfu/100ml. 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/100ml 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 nine water segments of the James River 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* through the use of the following equation (developed from a data set containing n=493 paired data points):

$$\log_2(C_{ec}) = -0.0172 + 0.91905 \cdot \log_2(C_{fc})$$

where C_{ec} is the concentration of *E. coli* in cfu/100 ml, and C_{fc} is the concentration of fecal coliform in cfu/100 ml.

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 in-stream *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 2 and 3 of this document. Table 3 provides the total allowable loads calculated on a daily basis.

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 eleven point sources currently permitted to discharge into the James River tributaries in Albemarle and Buckingham Counties Study Area. Eight are permitted for *E. coli* control. The allocation for the sources permitted for *E. coli* control 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 permit discharge for those watersheds with permitted discharge. For watersheds with no existing point sources such as Frisby Branch,

Austin Creek, North River, Rock Island Creek, Ballinger Creek and Totier Creek, future growth in permitted point sources was accounted for as a 1% of the current TMDL in the watershed.

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.

In these TMDLs, load allocations to nonpoint sources are divided into land-based loadings from land uses and directly applied loads in the stream (*e.g.*, livestock 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 loads had their most significant impact on low flow concentrations. The Bacteria 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. Reductions on agricultural land uses (pasture and cropland) include reductions required for biosolids and imported poultry litter. Model results indicate that human, livestock and wildlife contributions are significant in all areas of the watershed.

Allocation scenarios were run sequentially, beginning with headwater impairments, and then continuing with downstream impairments until all impairments were allocated to 0% exceedances of both standards.

The TMDL documents provided the existing and allocated loads for each of the nine tributaries to the James River, reported the total annual cfu's per year from both direct and land-based sources, and provided the percent reduction needed to meet zero percent violations of water quality standards from each source.

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 standards¹. 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. A Seasonal Kendall Test was used to examine long-term trends. A seasonal analysis of precipitation and fecal coliform concentration data were conducted using the Mood Median Test. This test was used to compare median values of precipitation, discharge, and fecal coliform concentrations in each month. No trends were found for flow, precipitation and/or fecal coliform concentrations.

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.
- Modeling biosolid applications at the maximum allowable rate and fecal coliform concentration in all permitted fields.

7) *The TMDL has been subject to public participation.*

Table 4 details the public participation throughout the TMDL development. The meetings were publicized by placing notices in the Virginia Register, the Farmville newspaper, mailing notices to all agencies and placing signs on the road right-of-way in the impaired watersheds.

Table 4. Public Participation during TMDL Development for the James River Tributaries in Albemarle and Buckingham Counties Watersheds.

Date	Location	Attendance¹	Type	Format
6/21/2006	Scottsville Town Council Chambers Scottsville, VA	18	Local Steering Committee	Publicized to government agencies
8/10/2006	Buckingham County Administration Building Buckingham, VA	20	1 st public	Open to public at large
4/30/2007	Peter Francisco Soil and Water District Office Buckingham, VA	10	Local Steering Committee	Publicized to government agencies
5/10/2007	Scottsville Town Council Chambers Scottsville, VA	16	2 nd public	Open to public at large

¹The number of attendants is estimated from sign up sheets provided at each meeting. These numbers are known to underestimate the actual attendance.

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.