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

February 2, 2011

Mr. David S. Lazarus
Virginia Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218

Dear Mr. Lazarus:

The United States Environmental Protection Agency (EPA) has reviewed the Virginia Department of Environmental Quality's (DEQ's) request to amend the wasteload allocations (WLAs) for the bacteria Total Maximum Daily Loads (TMDLs) developed for Swift Creek (segments 2 and 3) and the Appomattox River (tidal Segment 3). The original bacteria TMDLs for these segments were approved by EPA on August 30, 2004 to address recreation use impairments.

As indicated in DEQ's submittal, the Addison Evans Water Production Laboratory Facility operates VPDES Permit VA0006254 – a potable water facility which discharges to Swift Creek Segments 2 and 3 as well as Appomattox River Tidal Segment 3 – was mistakenly assigned an E. coli WLA of 1.05E+10 cfu/year in the original TMDLs. The facility is a potable water treatment plant (not a sewage treatment plant, as assumed during the time of TMDL development) and does not discharge bacteria to Swift Creek or Appomattox River. To correct the error, DEQ had requested that the WLA for this facility be removed and placed into the future growth portion of the WLA.

The modifications requested by DEQ will not affect the TMDL values or overall WLAs that were originally established for Swift Creek Segments 2 and 3 and Appomattox River Tidal Segment 3. Based upon this information, EPA approves the requested modifications to these TMDLs. If you have any questions or comments concerning this letter, please do not hesitate to call me at (215) 814-5796.

Sincerely,

Helene Drago

Helene Drago, Manager
TMDL Program

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

January 26, 2011

Mr. Greg Voigt
US EPA Region III TMDL Coordinator
USEPA REGION 3 – 3WP12
1650 Arch Street
Philadelphia, PA 19103-2029

RE: Total Maximum Daily Load modifications for wasteload allocations in the bacteria TMDL for Swift Creek segments (2) and (3) and Appomattox River Basin segment (3)

Dear Mr. Voigt,

The purpose of this letter is to submit for EPA approval three modifications to the waste load allocations (WLA) in the bacteria TMDL developed for Swift Creek segments (2) and (3) and for the Appomattox River Basin segment (3) impairments. EPA Region III approved the bacteria TMDL addressing primary contact recreational use impairment for the Appomattox River Basin on 8/30/2004. The combined modification submittal provides continuity between affected TMDL equations in the original TMDL report.

Modification 1: The Addison Evans Water Production Laboratory Facility (WPFL) formerly named Swift Creek Water Treatment Facility operates VPDES Permit VA0006254 which is a potable water facility and discharges to segment 2 of Swift Creek. The facility was incorrectly assigned a waste load allocation (WLA) of 1.05E+10 cfu/year in the TMDL for the segment based on an oversight that the facility is a potable water treatment plant (not a sewage treatment plant). The sand filter backwash rinse from this drinking water treatment facility discharges to a sedimentation basin flowing down a 100 foot dry ditch to the Swift Creek. The effluent is not considered to contribute bacteria to the receiving stream and bacteria monitoring of the discharge is not required under the permit. Therefore, the TMDL will be modified so that the permittee's name and VPDES # are removed and the bacteria WLA (Waste Load Allocation) will be placed into the future growth portion of the WLA. Various pages throughout the text and tables have been changed. A list of these changes by page number follows the descriptions of changes below.

Modification 2: The Addison Evans Water Production Laboratory Facility (WPFL) formerly named Swift Creek Water Treatment Facility operates VPDES Permit VA0006254 which is a potable water facility which discharges to segment (3) of Swift Creek. The facility was assigned a waste load allocation (WLA) of 1.05E+10 cfu/year in the TMDL. The

TMDL equation for this segment will be modified so that the permittee's name and VPDES # are removed and the bacteria WLA (Waste Load Allocation) will be placed into the future growth portion of the WLA. Various pages throughout the text and tables have been changed. A list of these changes by page number follows the descriptions of changes below.

Modification 3: The Addison Evans Water Production Laboratory Facility (WPFL) formerly named Swift Creek Water Treatment Facility operates VPDES Permit VA0006254 which is a potable water facility which discharges to the tidal segment (3) of the Appomattox River. The facility was assigned a waste load allocation (WLA) of 1.05E+10 cfu/year in the original TMDL. The TMDL equation for this segment will be modified so that the permittee's name and VPDES # are removed and the bacteria WLA (Waste Load Allocation) will be placed into the future growth portion of the WLA. Various pages throughout the text and tables have been changed. A list of these changes by page number follows the descriptions of changes below.

DEQ provided public notice and a 30-day comment period on the TMDL modifications which expired on January 25, 2011. No comments were received during the public comment period. DEQ is submitting this request of modification for the Appomattox River TMDL for EPA approval and have enclosed one printed copy of modified pages for this request.

Permit Details
The Addison Evans Water Production and Laboratory (VA0006254) is a VPDES permit which will expire on January 30, 2011. DEQ submits this TMDL modification for EPA approval in order for these permits to be re-issued as soon as possible.

TMDL Revisions
The following tables and text from the Appomattox Creek TMDL report were affected by the described changes, as follows:

P xxxii, *Sources of Fecal Coliform*, text updated to reflect permitted facilities.
P xxxvii, Table ES.1.1, Appomattox River (3)-tidal WLA for VA0006254 converted to "*Future Load*". New future load for segment is equal to 5.58E+12.
P xxxviii, Table ES.1.1, Swift Creek (2) WLA for VA0006254 converted to "*Future Load*". New future load for segment is equal to 1.05E+10.
P xxxviii, Table ES.1.1, Swift Creek (3) WLA for VA0006254 converted to "*Future Load*". New future load for segment is equal to 1.05E+10.
P 3-3, Table 3.1, "Swift Creek WTP" name updated to Addison/Evans Water Production and Laboratory Facility (VA0006254) and column for "Permitted for Fecal Control" response changed to "No". Design discharge updated to 0.5 MGD.
P 3-3, Table 3.1, DOC Pocahontas Correctional Unit 13 (VA0023426) was approved by EPA for an expansion from 0.055 to 0.65 MGD on 1/5/09. The table has been updated to reflect the earlier modification.
P 3-3, Table 3.1, Fighting Creek WWTF (VA089206) in an earlier modification approved by EPA in June 2006, the discharger was given a WLA in the TMDL. To reflect the earlier modification, the column for "Permitted for Fecal Control" response was changed to "Yes".
P 4-10, *4.3.1 Point Sources*, text updated to reflect correct number of dischargers.
P 5-2, *5.2.1 Wasteload Allocations*, text updated to reflect correct number of dischargers.
P 5-85, Table 5.44, Appomattox River (3)-tidal WLA for VA0006254 converted to "*Future Load*". New future load for segment is equal to 5.58E+12.

P 5-86, Table 5.44, Swift Creek (2) WLA for VA0006254 converted to "*Future Load*". New future load for segment is equal to 1.05E+10.

P 5-86, Table 5.44, Swift Creek (3) WLA for VA0006254 converted to "*Future Load*". New future load for segment is equal to 1.05E+10.

These changes are included in the attached modified Appomattox Creek TMDL report pages.

In accordance with EPA's August 2003 letter to VADEQ, VADEQ hereby requests EPA approval of the proposed modification. If you or your staff has any questions, please contact me at (804) 698-4299.

Sincerely,

David S. Lazarus

David S. Lazarus
Watershed Program Manager
Office of Water Quality Programs

Attachments
Replacement page(s)

cc: Charles Lunsford, VADCR
Sandra Mueller, VADEQ
Margaret Smigo, PRO TMDL coordinator
File CO

EXECUTIVE SUMMARY

Fecal Coliform Impairment

The Appomattox River and Deep Creek were initially placed on the Virginia 1996 303(d) TMDL Priority List based on monitoring performed. Additional stream segments within the basin were progressively placed on the 1996 303(d) TMDL Priority List, the 1998 303(d) Total Maximum Daily Load Priority List and Report, and the 2002 303(d) Report on Impaired Waters (see Table 1.1). All segments remained on the 2002 Section 303(d) Report on Impaired Waters. These listings are referenced in this document as the 'Appomattox River watershed' and have resulted in the development of 19 Total Maximum Daily Loads (TMDLs). These TMDLs focus on fecal coliform impairments. Based on exceedances of the standard recorded at Virginia Department of Environmental Quality (VADEQ) monitoring stations, the stream does not support primary contact recreation (*e.g.,* swimming). In January 2003, Virginia adopted two new criteria to protect the primary contact recreational use. The new applicable fecal coliform state standard (Virginia Water Quality Standard 9 VAC 25-260-170) specifies that no more than 10% of the total samples taken during any calendar month exceed 400 colony forming units (cfu) per 100 milliliters (ml). Alternatively, if data is available, the geometric mean of two or more observations taken in a calendar month should not exceed 200 cfu/100 ml. A review of available monitoring data for the watershed indicated that fecal coliform bacteria were consistently elevated above the 400 cfu/100 ml standard.

Sources of Fecal Coliform

Potential sources of fecal coliform include both point source and nonpoint source contributions. Nonpoint sources include: wildlife; grazing livestock; pets; land application of manure; land application of biosolids; urban/suburban runoff; failed, malfunctioning, and operational septic systems; and uncontrolled discharges (straight pipes, dairy parlor waste, etc.). There are 37 permitted facilities in the Appomattox River watershed, 25 of these facilities are permitted for fecal discharges as well as four locations covered by VPDES Stormwater Permits. The list of permitted facilities is found in Table ES.1.1.

Table ES.1.1 Average annual E. coli loads (cfu/year) modeled after TMDL allocation in the Appomattox River watershed impairments. (Part 2 of 3)

Impairment		WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Appomattox River (3)-tidal		7.47E+13	7.16E+14		7.91 E+14
Chesterfield --VA0088609		1.14E+13			
Colonial Heights –VAR040009		2.49E+12			
Hopewell – VAR040015		1.44E+12			
Petersburg –VAR040013		1.76E+12			
VAG402047		1.75E+09			
VAG404002		1.75E+09			
VAG404107		1.75E+09			
VAG404129		1.75E+09			
VAG404140		1.75E+09			
VAG404161		1.75E+09			
VA0083135		4.18E+12			
VAG407199		1.75E+09			
VAG407198		1.75E+09			
VAG404092		1.75E+09			
VA0057088		0.00E+00			
VA0089206		1.74E+11			
VA0086681		5.24E+11			
VA0020222		2.79E+10			
VA0089931		0.00E+00			
VA0020303		8.71E+11			
VA0090131		0.00E+00			
VA0023540		2.62E+10			
VA0059099		0.00E+00			
VA0089516		0.00E+00			
VA0025437		4.01E+13		Implicit	
VA0028258		6.81E+10			
VA0023426		1.13E+11			
VA0020206		1.67E+10			
VA0027561		1.75E+10			
VA0090344		6.99E+10			
VA0091707		5.23E+12			
VA0020257		5.22E+11			
VAG407294		1.74E+09			
VAG407299		1.74E+09			
Future Load		5.58E+12			
Briery Creek		3.50E+09	3.84E+13		
	VAG407198	1.75E+09			3.84E+13
	VAG404092	1.75E+09			
Bush River (1)		6.98E+09	9.03E+13		
	VAG407198	1.75E+09			9.03E+13
	VAG404092	1.75E+09			
	VAG407294	1.74E+09			
	VAG407299	1.74E+09			
Bush River (2)		5.24E+09	1.10E+14		
	VAG407198	1.75E+09			1.10E+14
	VAG404092	1.75E+09			
	VAG407294	1.74E+09			
	VAG407299	1.74E+09			

Table ES.1.1 Average annual E. coli loads (cfu/year) modeled after TMDL allocation in the Appomattox River watershed impairments. (Part 3 of 3)

Impairment		WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Deep Creek (FC)		8.71E+11	1.06E+14		1.06E+14
	VA0020303	8.71E+11			
	VA0090131	0.00E+00			
Flat Creek		5.24E+11	8.75E+13		8.80E+13
	VA0086681	5.24E+11			
Horsepen Creek		0.00E+00	4.44E+12		4.44E+12
Little Sandy Creek		0.00E+00	1.62E+12		1.62E+12
Nibbs Creek		5.24E+11	1.23E+13		1.29E+13
	VA0086681	5.24E+11			
Saylers Creek		0.00E+00	1.40E+13		1.40E+13
Spring Creek		0.00E+00	2.08E+13		2.08E+13
Swift Creek (1)		8.37E+09	2.01E+13		2.01E+13
	Chesterfield --VA0088609	8.37E+09		*Implicit*	
Swift Creek (2)		3.24E+11	8.39E+13		8.42E+13
	Chesterfield --VA0088609	1.84E+11			
	VA0023426	1.13E+11			
	VA0020206	1.67E+10			
	Future Load	1.05E+10			
Swift Creek (3)		4.76E+11			
	Chesterfield --VA0088609	2.38E+11	1.29E+14		1.29E+14
	Colonial Heights --VAR040009	1.03E+10			
	VA0023426	1.13E+11			
	VA0020206	1.67E+10			
	VA0027561	1.75E+10			
	VA0090344	6.99E+10			
	Future Load	1.05E+10			
West Creek		0.00E+00			
	VA0090131	0.00E+00			
			3.91E+13		3.91E+13

Recommendations for TMDL Implementation

The goal of this TMDL is to establish a three-step path that will lead to attainment of water quality standards. The first step in this process is to develop TMDLs that will result in meeting water quality standards. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act states in section 62.1-44.19.7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters".

Table 3.1 Summary of VPDES permitted point discharges in the Appomattox River watershed.

Facility	VPDES #	Design Discharge (MGD)	Permitted For Fecal Control	Data Availability
Farmville WWTP	VA0083135	2.4	Yes	May 1999 – March 2003
Crewe WWTP	VA0020303	0.5	Yes	Feb 1999-Feb 2003
App. River Water Authority	VA0005819	2.7	No	N/A
Addison/Evans Water Production and Laboratory Facility	VA0006254	0.5	No	N/A
Thomas Dale West STP	VA0020206	0.0096	Yes	May 1999-July 2002
Chesterfield Co. Grange Elementary WWTP	VA0020222	0.0066	Yes	May 1999-June 2003
DOC Pocahontas Correctional Unit 13	VA0023426	0.65	Yes	May 1999-June 2003
DOC Dinwiddie Field Unit 27 WWTP	VA0023540	0.015	Yes	May 1999-June 2003
So. Central Wastewater Authority WWTF	VA0025437	23	Yes	May 1999-June 2003
Children's Home of VA Baptists Lagoon	VA0027561	0.01	Yes	N/A
Red Hill Mobile Home Park WWTP	VA0028258	0.039	Yes	May 1999-March 2003
US Army Fort Lee - Aerial Delivery Site	VA0059161	0.5	No	Nov 2000-Oct 2001
Amelia Co Sanitary District	VA0086681	0.3	Yes	May 1999-June 2003
Amelia Co Sanitary District "Amelia Court House" STP	VA0091707	3.0	Yes	N/A, New facility 2008
New Matoaca High School	VA0090344	0.04	Yes	Oct 2002-May 2003
Colonial Pipeline Powhatan	VA0057088	3	No	N/A
Southside VA Training Center	VA0059099	0.159	No	N/A
Fighting Creek WWTF	VA0089206	0.1	Yes	N/A
Tidewater Materials Inc – Dinwiddie	VA0089516	0.012	No	N/A
Taylor Road Landfill	VA0089931	0.018	No	N/A
Tyson Foods Inc - Feed Mill	VA0090131	0.0012	No	N/A
Residence	VAG402047	0.001	Yes	ND
Residence	VAG404002*	0.001	Yes	ND
PRJ Land Trust	VAG404092*	0.001	Yes	ND
Appomattox Water Reclamation Facility	VA0020257	0.3	Yes	February 2000-Present
Residence	VAG404107*	0.001	Yes	ND
Landing View Golf Club	VAG404129*	0.001	Yes	ND
Residence	VAG404140*	0.001	Yes	ND
Residence	VAG404161*	0.001	Yes	ND
Residence	VAG407198	0.001	Yes	ND
Residence	VAG407199	0.001	Yes	ND
Residence	VAG407294	0.001	Yes	ND
Rock-N-Sams Grill STP	VAG407299	0.001	Yes	ND

* Location of permits unknown.
ND – no data, facility not required to submit monitoring data

3.2 Assessment of Nonpoint Sources

In the Appomattox River watershed, both urban and rural nonpoint sources of fecal coliform bacteria were considered. Sources include residential sewage treatment systems, land application of waste (livestock and biosolids), livestock, wildlife, and pets. Sources were identified and enumerated. MapTech collected samples of fecal coliform sources (i.e. wildlife, livestock, pet, and human waste) and enumerated the density of fecal coliform bacteria to support the modeling process, and to expand the database of known fecal coliform sources for purposes of bacterial source tracking (Section 2.2.2.2). Where appropriate, spatial distribution of sources was also determined.

3.2.1 Private Residential Sewage Treatment

In the U.S. Census questionnaires, housing occupants were asked which type of sewage disposal existed. Houses can be connected to a public sanitary sewer, to a septic tank or cesspool, or the sewage is disposed of in some other way. The Census category "Other Means" includes the houses that dispose of sewage other than by public sanitary sewer or a private septic system. The houses included in this category are assumed to be disposing sewage via straight pipes. Population, housing units, and type of sewage treatment from U.S. Census Bureau (USCB 2000) were calculated using GIS (Table 3.2).

Sanitary sewers are piping systems designed to collect wastewater from individual homes and businesses and carry it to a wastewater treatment plant. Sewer systems are designed to carry a specific "peak flow" volume of wastewater to the treatment plant. Within this design parameter, sanitary collection systems are not expected to overflow, surcharge or otherwise release sewage before their waste load is successfully delivered to the wastewater treatment plant.

When the flow of wastewater exceeds the design capacity, the collection system will "back up" and sewage discharges through the nearest escape location. These discharges into the environment are called overflows. Wastewater can also enter the environment through exfiltration caused by line cracks, joint gaps, or breaks in the piping system.

Die-off of fecal coliform can be handled implicitly or explicitly. For land-applied fecal matter (mechanically applied and deposited directly), die-off was addressed implicitly through monitoring and modeling. Samples of collected waste prior to land application (*i.e.,* dairy waste from loafing areas) were collected and analyzed by MapTech. Therefore, die-off is implicitly accounted for through the sample analysis. Die-off occurring in the field was represented implicitly through model parameters such as the maximum accumulation and the 90% wash off rate, which were adjusted during the calibration of the model. These parameters were assumed to represent not only the delivery mechanisms, but the bacteria die-off as well. Once the fecal coliform entered the stream, the general decay module of HSPF was incorporated, thereby explicitly addressing the die-off rate. The general decay module uses a first order decay function to simulate die-off.

4.3 Source Representation

Both point and nonpoint sources can be represented in the model. In general, point sources are added to the model as a time-series of pollutant and flow inputs to the stream. Land-based nonpoint sources are represented as an accumulation of pollutants on land, where some portion is available for transport in runoff. The amount of accumulation and availability for transport vary with landuse type and season. The model allows for a maximum accumulation to be specified. The maximum accumulation was adjusted seasonally to account for changes in die-off rates, which are dependent on temperature and moisture conditions. Some nonpoint sources, rather than being land-based, are represented as being deposited directly to the stream (*e.g.,* animal defecation in stream). These sources are modeled similarly to point sources, as they do not require a runoff event for delivery to the stream. These sources are primarily due to animal activity, which varies with the time of day. Direct depositions by nocturnal animals were modeled as being deposited from 6:00 PM to 6:00 AM, and direct depositions by diurnal animals were modeled as being deposited from 6:00 AM to 6:00 PM. Once in stream, die-off is represented by a first-order exponential equation.

Much of the data used to develop the model inputs for modeling water quality is time-dependent (*e.g.,* population). Depending on the timeframe of the simulation being run,

different numbers should be used. Data representing 1995 were used for the water quality calibration and validation period (1993-2003). Data representing 2003 were used for the allocation runs in order to represent current conditions. Additionally, data projected to 2008 were analyzed to assess the impact of changing populations.

4.3.1 Point Sources

There are 33 permitted point discharges in the Appomattox River drainage area. Twenty five of these facilities are permitted for fecal control, with design discharges ranging from 0.001-23 MGD (see Table 3.1). The design flow capacity was used for allocation runs. This flow rate was combined with a fecal coliform concentration of 200 cfu/100 ml, where discharges were permitted for fecal control, to ensure that compliance with state water quality standards could be met even if permitted loads were at maximum levels. For calibration and current condition runs, a lower value of fecal coliform concentration was used, based upon a regression analysis relating Total Residual Chlorine (TRC) levels and fecal coliform concentrations. Nonpoint sources of pollution that were not driven by runoff (*e.g.*, direct deposition of fecal matter to the the stream by wildlife) were modeled similarly to point sources. These sources, as well as land-based sources, are identified in the following sections.

4.3.2 Private Residential Sewage Treatment

The number of septic systems in the 149 subwatersheds modeled for the Appomattox River watershed was calculated by overlaying U.S. Census Bureau data (USCB, 1990; USCB, 2000) with the watershed to enumerate the septic systems. Each residential landuse area was assigned a number of septic systems based on census data. A total of 27,088 septic systems were estimated in the Appomattox River watershed in 1995. During allocation runs, the number of households was projected to 2003, based on current growth rates (USCB, 2000) resulting in 33,934 septic systems (Table 4.4). The number of septic systems was projected to increase to 38,213 by 2008.

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

5.2 Scenario Development

Allocation scenarios were modeled using HSPF. Existing conditions were adjusted until the water quality standard was attained. The TMDLs developed for the Appomattox River watershed were based on the Virginia State Standard for *E. coli*. As detailed in Section 1.2, the *E. coli* standard states that the calendar month geometric-mean concentration shall not exceed 126 cfu/100 ml, and that a maximum single sample concentration of *E. coli* shall not exceed 235 cfu/100 ml. According to the guidelines put forth by the VADEQ (VADEQ, 2003) for modeling *E. coli* with HSPF, the model was set up to estimate loads of fecal coliform, 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 datapoints):

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

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.

Pollutant concentrations were modeled over the entire duration of a representative modeling period, and pollutant loads were adjusted until the standard was met (Figures 5.9 through 5.52). The development of the allocation scenario was an iterative process that required numerous runs with each followed by an assessment of source reduction against the water quality target.

5.2.1 Wasteload Allocations

There are thirty-three point sources currently permitted to discharge into the Appomattox River watershed (Figure 3.1 and Table 3.1). Of these sources, twenty-five are permitted for fecal control. For allocation runs, sources without fecal control permits were modeled as discharging the average recorded value of water, with no E. coli. The allocation for these sources is zero cfu/100 ml. The allocation for the sources permitted for fecal control is equivalent to their current permit levels (design discharge and 126 cfu/100 ml).

Within the Appomattox River basin there are four Municipal Separate Storm Sewer System (MS4) permits requiring TMDL allocations. Table 5.1 lists municipalities and receiving streams for these MS4 discharges. In allocating their TMDL, loads were based on each municipality's share of the contributing urbanized area of the impairment.

Table 5.1 Regulated small MS4 discharges in the Appomattox River watershed.

Municipality	Receiving Stream
Chesterfield County – VA0088609 (Phase I)	Skinquarter Creek Winterpock Creek Horsepen Creek Turkey Creek Swift Creek
Colonial Heights City – VAR040009 (Phase II)	Swift Creek Appomattox River Oldtown Creek
Hopewell City – VAR040015 (Phase II)	Appomattox River
Petersburg City – VAR040013 (Phase II)	Appomattox River

5.2.2 Load Allocations

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. Within this framework, however, initial criteria that influenced developing load allocations included how sources were linked for representing existing conditions, and results from BST in the area. 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. BST during 2002-2003 sampling periods confirmed the presence of human, livestock, pet, and wildlife contamination.

Allocation scenarios were run sequentially, beginning with headwater impairments, then continuing with downstream impairments until all impairments were allocated to have 0% exceedances of the instantaneous standard. Since part of the TMDL development is the identification of phased implementation strategies, typical management scenarios are

Table 5.44 Average annual *E. coli* loads (cfu/year) modeled after TMDL allocation in the Appomattox River watershed impairments (Part 1 of 3).

Impairment		WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Angola Creek (1)		0.00E+00	6.76E+12		6.76E+12
		0.00E+00			
Angola Creek (2)		0.00E+00	1.80E+13		1.80E+13
		0.00E+00			
Appomattox River (1)		1.07E+13	6.79E+14		6.90E+14
	Chesterfield --VA0088609	6.64E+09			
	VAG402047	1.75E+09			
	VAG404002	1.75E+09			
	VAG404107	1.75E+09			
	VAG404129	1.75E+09			
	VAG404140	1.75E+09			
	VAG404161	1.75E+09			
	VA0083135	4.18E+12			
	VAG407199	1.75E+09			
	VAG407198	1.75E+09			
	VAG404092	1.75E+09			
	VA0057088	0.00E+00			
	VA0089206	1.74E+11			
	VA0086681	5.24E+11			
	VA0020222	2.79E+10			
	VA0089931	0.00E+00			
	VA0091707	5.23E+12			
	VA0020257	5.22E+11			
	VAG407294	1.74E+09			
	VAG407299	1.74E+09			
Appomattox River (2)		1.66E+13	5.84E+14	*Implicit*	6.01E+14
	Chesterfield --VA0088609	2.07E+11			
	Colonial Heights –VAR040009	1.74E+10			
	Petersburg –VAR040013	1.31E+11			
	VAG402047	1.75E+09			
	VAG404002	1.75E+09			
	VAG404107	1.75E+09			
	VAG404129	1.75E+09			
	VAG404140	1.75E+09			
	VAG404161	1.75E+09			
	VA0083135	4.18E+12			
	VAG407199	1.75E+09			
	VAG407198	1.75E+09			
	VAG404092	1.75E+09			
	VA0057088	0.00E+00			
	VA0089206	1.74E+11			
	VA0086681	5.24E+11			
	VA0020222	2.79E+10			
	VA0089931	0.00E+00			
	VA0020303	8.71E+11			
	VA0090131	0.00E+00			
	VA0023540	2.62E+10			
	VA0059099	0.00E+00			
	VA0089516	0.00E+00			
	VA0091707	5.23E+12			
	VA0020257	5.22E+11			
	VAG407294	1.74E+09			
	VAG407299	1.74E+09			
	Future Load	4.70E+12			

Table 5.44 Average annual E. coli loads (cfu/year) modeled after TMDL allocation in the Appomattox River watershed impairments. (Part 2 of 3)

Impairment	WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Appomattox River (3)-tidal	7.47E+13	7.16E+14		7.91 E+14
Chesterfield --VA0088609	1.14E+13			
Colonial Heights –VAR040009	2.49E+12			
Hopewell – VAR040015	1.44E+12			
Petersburg –VAR040013	1.76E+12			
VAG402047	1.75E+09			
VAG404002	1.75E+09			
VAG404107	1.75E+09			
VAG404129	1.75E+09			
VAG404140	1.75E+09			
VAG404161	1.75E+09			
VA0083135	4.18E+12			
VAG407199	1.75E+09			
VAG407198	1.75E+09			
VAG404092	1.75E+09			
VA0057088	0.00E+00			
VA0089206	1.74E+11			
VA0086681	5.24E+11			
VA0020222	2.79E+10			
VA0089931	0.00E+00			
VA0020303	8.71E+11			
VA0090131	0.00E+00			
VA0023540	2.62E+10			
VA0059099	0.00E+00			
VA0089516	0.00E+00			
VA0025437	4.01E+13		*implicit*	
VA0028258	6.81E+10			
VA0023426	1.13E+11			
VA0020206	1.67E+10			
VA0027561	1.75E+10			
VA0090344	6.99E+10			
VA0091707	5.23E+12			
VA0020257	5.22E+11			
VAG407294	1.74E+09			
VAG407299	1.74E+09			
Future Load	5.58E+12			
Briery Creek	3.50E+09			
VAG407198	1.75E+09	3.84E+13		3.84E+13
VAG404092	1.75E+09			
Bush River (1)	6.98E+09			
VAG407198	1.75E+09	9.03E+13		9.03E+13
VAG404092	1.75E+09			
VAG407294	1.74E+09			
VAG407299	1.74E+09			
Bush River (2)	6.98E+09			
VAG407198	1.75E+09	1.10E+14		1.10E+14
VAG404092	1.75E+09			
VAG407294	1.74E+09			
VAG407299	1.74E+09			

Table 5.44 Average annual E. coli loads (cfu/year) modeled after TMDL allocation in the Appomattox River watershed impairments. (Part 3 of 3)

Impairment		WLA (cfu/year)	LA (cfu/year)	MOS	TMDL (cfu/year)
Deep Creek (FC)		8.71E+11	1.06E+14		1.06E+14
	VA0020303	8.71E+11			
	VA0090131	0.00E+00			
Flat Creek		5.24E+11	8.75E+13		8.80E+13
	VA0086681	5.24E+11			
Horsepen Creek		0.00E+00	4.44E+12		4.44E+12
Little Sandy Creek		0.00E+00	1.62E+12		1.62E+12
Nibbs Creek		5.24E+11	1.23E+13		1.29E+13
	VA0086681	5.24E+11			
Saylers Creek		0.00E+00	1.40E+13		1.40E+13
Spring Creek		0.00E+00	2.08E+13		2.08E+13
Swift Creek (1)		8.37E+09	2.01E+13		2.01E+13
	Chesterfield --VA0088609	8.37E+09		*Implicit*	
Swift Creek (2)		3.24E+11	8.39E+13		8.42E+13
	Chesterfield --VA0088609	1.84E+11			
	VA0023426	1.13E+11			
	VA0020206	1.67E+10			
	Future Load	1.05E+10			
Swift Creek (3)		4.76E+11			
	Chesterfield --VA0088609	2.38E+11	1.29E+14		1.29E+14
	Colonial Heights –VAR040009	1.03E+10			
	VA0023426	1.13E+11			
	VA0020206	1.67E+10			
	VA0027561	1.75E+10			
	VA0090344	6.99E+10			
	Future Load	1.05E+10			
West Creek		0.00E+00	3.91E+13		3.91E+13
	VA0090131	0.00E+00			

6. IMPLEMENTATION

The goal of this TMDL is to establish a three-step path that will lead to attainment of water quality standards. The first step in this process is to develop TMDLs that will result in meeting water quality standards. This report represents the culmination of that effort for the bacteria impairments on the Appomattox River. The second step is to develop a TMDL implementation plan. The final step is to implement the TMDL implementation plan, and to monitor stream water quality to determine if water quality standards are being attained.

Once a TMDL has been approved by EPA and the civilian State Water Control Board, measures must be taken to reduce pollution levels in the stream. These measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), are implemented in an iterative process that is described along with specific BMPs in the implementation plan. The process for developing an implementation plan has been described in the recent *Guidance Manual for Total Maximum Daily Load Implementation Plans,* published in July 2003 and available upon request from the VADEQ and VADCR TMDL project staff or at http://www.deq.state.va.us/tmdl/implans/ipguide.pdf. With successful completion of implementation plans, Virginia will be well on the way to restoring impaired waters and enhancing the value of this important resource. Additionally, development of an approved implementation plan will improve a locality's chances for obtaining financial and technical assistance during implementation.

6.1 Staged Implementation

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 streams. This has been shown to be very effective in lowering bacteria concentrations in streams, both by reducing the cattle deposits themselves and by providing additional riparian buffers.