Thumb Run, Carter Run, Great Run, and Deep Run Bacteria Total Maximum Daily Load Implementation Plan Technical Report

Submitted to:
Virginia Department of Conservation & Recreation and
Virginia Department of Environmental Quality

Prepared by:
Engineering Concepts, Inc.

April 2006

CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

TMDL is an acronym for Total Maximum Daily Load, which is the maximum amount of pollutant that a water body can assimilate without surpassing the state water quality standard. If the water body surpasses the water quality standard 10.5% of the time during an assessment period, the water body is placed on the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. Deep Run was initially placed on the 1996 Section 303(d) list based on violations of the fecal coliform bacteria water quality standard. Thumb Run, Carter Run, and Great Run were initially included on the 1998 Section 303(d) list because of violations of the fecal coliform bacteria water quality standard. After this listing, bacteria TMDL studies were comprised for each impairment. After the TMDL studies are complete, Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) 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". To comply with this state requirement, a two-staged TMDL implementation plan (IP) was formulated to reduce bacteria levels to attain water quality standards enabling delisting of streams from the Section 303(d) List of Impaired Waters (Stage I) and attainment of TMDL source load allocations required under WQMIRA and by United States Environmental Agency (USEPA) for eligibility to receive Section 319 grant funds to fund implementation (Stage II). Successful completion and local support of the implementation plan will enable restoration of the impaired waters while enhancing the value of this important resource for the Commonwealth. Opportunities for Fauquier County, Stafford County, local agencies, and watershed residents to obtain monetary assistance will improve with an approved implementation plan.

Review of TMDL Development

GKY and Associates, Inc. was contracted by the Virginia Department of Environmental Quality (VADEQ) to develop an approvable fecal coliform TMDL for Thumb Run. The TMDL was approved by USEPA in May 2002. Engineering Concepts, Inc. was contracted by the VADEQ to develop an approvable *E. coli* bacteria TMDL for Deep Run, which was approved by USEPA in May 2004. Virginia Department of Environmental Quality developed approvable *E. Coli* bacteria TMDLs for Carter Run and Great Run with subsequent approval by USEPA in March 2005. TMDL development documents can be obtained at the VADEQ office in Woodbridge, VA or via the Internet at www.deq.state.va.us. Watershed description, water quality assessment, public participation, water quality modeling, and allocated reductions were reviewed to determine the implications of TMDL and modeling procedures on implementation plan development.

Non-point bacteria sources from livestock, human, pets, and wildlife were considered in the four watersheds. Loads in the Thumb Run and Deep Run watersheds were represented as either land-based loads, where bacteria were deposited on land and available for wash-off during a rainfall event, or as direct loads, where bacteria were directly deposited to the stream. Loads that varied temporally were delivered at a constant rate throughout any given month, but varied on a monthly basis. In Thumb Run and Deep Run watersheds, all loads were spatially distributed based on land use types (e.g. land-based loads from beef cattle were applied to pasture). The nonpoint source load from cattle was modeled as delivering a direct load to the streams in the Thumb Run and Deep Run impairments. A portion of the failing septic systems (Thumb Run

only) and straight pipes were modeled as a direct load in the Thumb Run and Deep Run watersheds. Within the Thumb Run and Deep Run watersheds, the non-point source load from wildlife was modeled as a direct load to the stream. Since allocations in Carter Run and Great Run TMDLs were based on in-stream loads, delivery mechanisms and variability of bacteria sources throughout the year were not utilized during the TMDL development study.

Bacteria load reductions outlined in the TMDL development studies included:

- Exclusion of most/all livestock from streams is necessary within all impairments;
- Substantial land-based NPS load reductions are called for on pasture and cropland in Carter Run, Great Run, and Deep Run watersheds;
- All straight pipes and failing septic systems need to be identified and corrected in all impairments;
- Implicit in the requisite to correct straight pipes and failing septic systems is the requirement to maintain all properly functioning septic systems;
- Reductions of pet bacteria loads on residential land in Carter Run, Great Run, and Deep Run watersheds are necessitated; and
- Wildlife bacteria load reductions are necessary in Carter Run and Great Run watersheds based on bacterial source tracking data that was used to determine source reductions.

Public Participation

The actions and commitments compiled in this document are formulated through input from citizens of the watersheds, the Fauquier and Stafford County governments, Virginia Department of Conservation and Recreation (VADCR), VADEQ, Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Department of Health (VDH), Virginia Cooperative Extension (VCE), John Marshall Soil and Water Conservation District (JMSWCD), Tri-County City Soil and Water Conservation District (TCCSWCD), Natural Resources Conservation Service (NRCS), Rappahannock-Rapidan Regional Commission (RRRC), and Engineering Concepts, Inc. (ECI). Every citizen and interested party in the watersheds is encouraged to put the implementation plan into action and contribute what they are able to help restore the health of the streams.

Public participation took place during IP development on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more-targeted meetings (i.e. working groups and steering committee). Second, working groups were assembled from communities of people with common concerns regarding the implementation process and were the primary arena for seeking public input. The following working groups were formed: Agricultural, Residential, and Governmental. A representative from VADCR, RRRC, or ECI attended each working group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from the Agricultural, Residential, and Governmental Working Groups; VADCR; VADEQ; VDH; VDGIF; VCE; Fauquier County; Stafford County; JMSWCD; TCCSWCD; NRCS; RRRC; and ECI to guide the development of the IP. Over 600 man-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, environmental, and government interests on a local, state, and federal level. Throughout the public participation

process, major emphasis was placed on discussing best management practices (BMPs), locations of control measures, education, technical assistance, monitoring, and funding.

Implementation Actions

The quantity of control measures, required during implementation was determined through spatial analyses of land use, stream-network, and the Commonwealth of Virginia aerial maps along with regionally appropriate data archived in the Virginia Department of Conservation and Recreation Agricultural Best Management Practice Database and TMDL Development documents. The map layers and archived data were combined to establish average estimates of control measures required overall and in each watershed. Additionally, input from local agency representatives, citizens, and contractors were used to verify the analyses. Estimates of actions needed for full implementation in the four watersheds are as follows:

- 167 Livestock Exclusion Systems
- 16,270 Acres in Pasture Management Systems
- 3,200 Acres of Cropland converted to Vegetative Buffers
- 5,330 Acres of Cropland with Manure / Biosolids Incorporation into soil
- 16,270 Acres of Pasture Treated by Retention Ponds
- 44 Alternative Sewage Disposal Systems
- 146 New Septic Systems
- 102 Repaired Septic Systems
- 3 Pet Waste Control Programs
- 2 Confined Canine Unit Demonstration Projects
- 25 Confined Canine Unit Treatment Systems
- 2 Landscape BMP Demonstration Projects
- 797 Acres of Residential Land Use Treated by Retention Ponds
- 265 Acres of Residential Land Use Treated by Infiltration Trenches
- 265 Acres of Residential Land Use Treated by Rain Gardens
- 20 Agricultural Technical Assistance Full Time Equivalents
- 10 Agricultural Administrative Assistance Full Time Equivalents
- 15 Residential Technical Assistance Full Time Equivalents
- 8 Residential Administrative Assistance Full Time Equivalents

Associated cost estimations for each implementation action during Stages I and II were calculated by multiplying the average unit cost per the number of units in each impairment. The total average installation cost for full livestock exclusion systems in the four watersheds is $3.34 million. Cost to reduce pasture loadings during Stage I using pasture management system BMPs and Stage II utilizing retention ponds will be $3.25 million and $32.5 million, respectively. The total installation cost for control measures to obtain the cropland land-applied reductions in the four watersheds is estimated at $1.90 million. Estimated corrective action costs needed to replace straight pipes and fix failing septic systems totaled $2.48 million excluding technical assistance. The cost to implement the first three steps of the pet waste reduction process total cost an estimated $0.22 million excluding technical assistance. The cost to implement the fourth step of

the pet waste reduction process to meet the Stage II goal is $7.2 million. The total cost to provide assistance in the agricultural and residential programs during Stage I implementation is expected to be $0.83 million and $0.62 million, respectively. The total cost to provide assistance in the agricultural and residential programs during Stage II implementation is expected to be $0.83 million and $0.21 million, respectively. The total Stage I implementation cost including technical assistance is $12.63 million with the agricultural cost being $9.32 million and the residential cost $3.31 million. The total implementation cost (i.e., Stage I plus Stage II) including technical assistance is $53.37 million with the agricultural and residential cost at $42.68 million and $10.69 million, respectively.

The primary benefit of implementation is the reduction of bacteria concentrations in Thumb Run, Carter Run, Great Run, and Deep Run watersheds. Due to reductions required, the incidence of infection from fecal sources, through contact with surface waters, should be reduced considerably. Stream bank protection provided through exclusion of livestock from streams will improve the aquatic habitat in these streams. Vegetated buffers that are established will also help reduce sediment and nutrient transport to the stream from upslope locations. The installation of improved pasture management systems should also reduce soil and nutrient losses, increase infiltration of precipitation thereby decreasing peak flows downstream. The agricultural and residential practices recommended in this document will provide economic benefits to the landowner, along with the expected environmental benefits. Specifically, improved pasture management and private sewage system maintenance will improve the profitability of farms, while private sewage system maintenance will save homeowners money in the long run by delaying or avoiding expensive repairs. Additionally, money spent by landowners, government agencies, and non-profit organizations in the process of implementing the IP will stimulate the local economy.

Measurable Goals and Milestones

The end goals of implementation are restored water quality in the impaired waters and subsequent de-listing of streams from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. Progress toward end goals will be assessed during implementation through tracking of control measure installations by JMSWCD, TCCSWCD, VADCR, VDH, Fauquier County, and Stafford County. The VADEQ will continue to assess water quality through its monitoring program. Other monitoring project activities in the watersheds (e.g., Thumb Run *E. coli* Coliscan Monitoring Project) will be coordinated with VADEQ to augment the VADEQ monitoring program.

Implementation will occur over 10 years and be assessed in two stages. Stage I is based on meeting source allocations that translate to an instantaneous standard violation rate of 10.5% or less resulting in removal of Thumb Run, Carter Run, Great Run and Deep Run from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. The Stage II goal is based on implementing source allocations to meet the specified TMDL goal, 0% violation of water quality standards. Implementation of control measures is scheduled for nine years beginning in June 2006 lasting to June 2015. After implementation inception, five milestones will be met in Stage I, one milestone at the end of Stage I in the fifth year, three milestones in Stage II, and a final milestone in year 10.

Implementation in years one through five for agricultural source reductions focuses on livestock exclusion, pasture management systems, vegetative buffers on cropland, and manure incorporation on cropland. Best management practices (BMPs) installed in years six through nine are based on additional treatment of runoff from pasture land using storm water BMPs to remove remaining bacteria load not treated with the pasture management systems installed during Stage I. These storm water BMPs (*i.e.*, retention ponds) are more costly and are logistically more difficult to design and locate on individual farms. Implementation in years one through five for residential bacteria loads focuses on identification and removal of straight pipes, repairing or replacing failed septic systems, a pet waste control program, installation of storage and treatment systems for waste from confined canine units, and a storm water management landscape demonstration. BMPs to be installed in years six through nine are based on treating runoff from residential areas where pet waste is still considered a source contributing to the bacteria standard violations. The storm water runoff would be treated with retention ponds, infiltration trenches, and rain gardens.

An instantaneous water quality standard violation rate from 8% to 12% is anticipated, based on water quality modeling projections when the fifth year implementation milestone equaling 100% installation of agricultural BMPs (excluding retention ponds), residential on-site sewage disposal systems, and a pet waste control program that includes storage and treatment of waste from confined canine units. The four impaired streams would be in a probable position to be de-listed upon attainment of the Stage I goal. Milestone six occurring in the fifth year is attainment of the Stage I goal. If the water quality has not improved to the point that the streams can be de-listed upon attaining the Stage I implementation goal a process could be initiated (*i.e.*, use attainability analysis) to change the designated use of Thumb Run, Carter Run, Great Run, and Deep Run. The current designated use is full contact recreation, which includes swimming. Virginia allows the adoption of a secondary contact designated use in the case that human, livestock, and pet sources are addressed to the maximum extent practicable and water quality goals are not being obtained.

The process of a staged implementation implies targeting of control measures, ensuring optimum utilization of resources. In quantifying agricultural BMPs through the use of aerial, land use, farm tracts, and stream network geographic information system (GIS) layers, maps were formulated showing potential livestock access, crop fields, and pastures per farm tract. These maps identify farm tracts that the districts should concentrate efforts in. Owners will be contacted and progression through best management practice installation will be tracked. Known problem areas, clusters of older homes, or houses in close proximity to streams known by the VDH will be targeted for onsite treatment system control measures. Steps outlined in pet waste best management practice stages results in targeting of source type and resources.

Stakeholders' Roles and Responsibilities

Successful implementation depends on stakeholders taking responsibility for their role in the process, the primary role falls on the local groups that are most affected; that is, businesses, community watershed groups, and citizens. However, local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. Stakeholder participation and support is essential for achieving the goals of this TMDL effort (*i.e.*, improving water quality and removing streams from the impaired waters list). It must

first be acknowledged that there is a water quality problem, and changes must be made as needed in operations, programs, and legislation to address these pollutants. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. The agencies regulating activities that impact water quality in Virginia include: VADEQ, VADRC, VADACS, and VDH.

The John Marshall Soil and Water Conservation District and Tri-County / City Soil and Water Conservation District are local units of government responsible for the soil and water conservation work within Fauquier and Stafford counties, respectively. The district's overall role is to increase voluntary conservation practices among farmers, ranchers and other land users Specific to the TMDL implementation, the districts will lead education and technical assistance efforts and track best management practice implementation for the agricultural program. The Fauquier County Department of Health has accepted the responsibility of working with landowners to implement the corrective actions to remove straight pipes and failing on-site sewage disposal systems and provide educational information and coordinate programs/events. The VCE has agreed to promote education and provide outreach to citizens, businesses, and developers regarding necessary pet waste reductions.

Integration with Other Watershed Plans

Each watershed within the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographical boundaries and goals. These include but are not limited to, the Chesapeake Bay 2000 agreement, Tributary Nutrient Reduction Plans, TMDLs, roundtables, Water Quality Management Plans, sediment and erosion control regulations, stormwater management, Source Water Assessment Program, and local comprehensive plans. The Fauquier County Riparian Easement Program and Fauquier County Water Resources Management Plan are recent initiatives within Fauquier County. The progress of these projects or programs needs continuous evaluation to determine possible effects on implementation goals. For example, financial and technical resources may be maximized for implementation by coordinating and expanding the planning and implementation activities of these on-going watershed projects or programs.

Potential Funding Sources

Potential funding sources available during implementation were identified during plan development. Detailed description of each source (i.e., eligibility requirements, specifications, incentive payments) can be obtained from the JMSWCD, TCCSWCD, VADEQ, VADCR, VCE, NRCS, and VDH. It was noted that Great Run is designated as potential spawning habitat for Blue Back Herring and could be eligible for additional funding from U.S. Fish and Wildlife Service or VDGIF.

ACKNOWLEDGEMENTS

Charles Lunsford, Virginia Department of Conservation and Recreation

Jeffrey Walker, Rappahannock-Rapidan Regional Commission

Jeffrey Sturnam, Rappahannock-Rapidan Regional Commission

Steering Committee Members

Agricultural, Residential, and Governmental Working Groups Members

Development of the implementation plan by the Rappahannock-Rapidan Regional Commission and Engineering Concepts, Inc. was funded by United States Environmental Protection Agency Section 319 grant funds awarded by the Virginia Department of Conservation and Recreation.

1. INTRODUCTION

1.1 Background

TMDL is an acronym for Total Maximum Daily Load, which is the maximum amount of pollutant that a water body can assimilate without surpassing the state water quality standard. If the water body surpasses the water quality standard 10.5% of the time during an assessment period, the water body is placed on the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. Deep Run was initially placed on the 1996 Section 303(d) list based on violations of the fecal coliform bacteria water quality standard. Thumb Run, Carter Run, and Great Run were initially included on the 1998 Section 303(d) list because of violations of the fecal coliform bacteria water quality standard. After this listing, bacteria TMDL studies were comprised for each impairment. After the TMDL studies are complete, Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) 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". To comply with this state requirement, a two-staged TMDL implementation plan (IP) was formulated to reduce bacteria levels to attain water quality standards enabling delisting of streams from the Section 303(d) List of Impaired Waters (Stage I) and attainment of TMDL source load allocations required under WQMIRA and by United States Environmental Protection Agency (USEPA) for eligibility to receive Section 319 grant funds to fund implementation (Stage II). Successful completion and local support of the implementation plan will enable restoration of the impaired waters while enhancing the value of this important resource for the Commonwealth. Opportunities for Fauquier County, Stafford County, local agencies, and watershed residents to obtain monetary assistance will improve with an approved implementation plan.

1.2 State and Federal Requirements for Implementation Plans

In developing this implementation plan, both state and federal requirements and recommendations were followed.

Virginia's 1997 WQMIRA directs the State Water Control Board (SWCB) to "develop and implement a plan to achieve fully supporting status for impaired waters" (§62.1-44.19:4 through 19:8 of the Code of Virginia). WQMIRA establishes that the implementation plan shall include the date of expected achievement of water quality objectives, measurable goals, corrective actions necessary and the associated costs, benefits and environmental impacts of addressing the impairments.

Section 303(d) of the Clean Water Act (CWA) and current USEPA regulations do not require the development of implementation strategies. USEPA does, however, outline the minimum elements of an approvable IP in its 1999 "Guidance for Water Quality-Based Decisions: The TMDL Process". The listed elements include description of the implementation actions and management measures, timeline for implementing these measures, legal or regulatory controls, time required to attain water quality standards, and monitoring plan and milestones for attaining water quality standards.

USEPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 nonpoint source grants to States. The guidance is subject to revision and the most recent version should be considered during implementation. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the Section 319 requirements:

1. Identify the causes and sources of groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan;
2. Estimate the load reductions expected to achieve water quality standards;
3. Describe the NPS management measures that will need to be implemented to achieve the identified load reductions;
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan;
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures;
6. Provide a schedule for implementing the NPS management measures identified in the watershed-based plan;
7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
8. Identify a set of criteria for determining if loading reductions are being achieved and progress is being made towards attaining water quality standards, and if not, the criteria for determining if the watershed-based plan needs to be revised; and
9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

The process of incorporating these state and federal guidelines into an implementation plan consisted of three major components: 1) public participation, 2) implementation actions, and 3) measurable goals and milestones.

Once developed, Virginia Department of Environmental Quality (VADEQ) will present the implementation plan to the SWCB for approval as the plan for implementing pollutant allocations and reductions contained in the TMDLs. In addition, VADEQ will request the plan be included in the appropriate Water Quality Management Plan (WQMP), in accordance with the CWA's Section 303(e) and Virginia's Public Participation Guidelines for Water Quality Management Planning. In response to a Memorandum of Understanding (MOU) between USEPA and VADEQ, VADEQ also submitted a draft Continuous Planning Process to USEPA in which VADEQ commits to regularly updating the WQMPs. Thus, the WQMPs will be, among other things, the repository for all TMDLs and TMDL implementation plans developed within a river basin.

1.3 Applicable Water Quality Standards

USEPA has recommended that all states adopt an *E. coli* or enterococci standard for fresh water and enterococci criteria for marine waters, because there is a stronger correlation between the concentration of these organisms (*E. coli* and enterococci) and the incidence of gastrointestinal illness than there is with fecal coliform. *E. coli* and enterococci are both bacteriological organisms that can be found in the intestinal tract of warm-blooded animals and are subsets of the fecal coliform and fecal streptococcus groups, respectively. In line with this recommendation, Virginia adopted and published revised bacteria criteria on June 17, 2002. The revised criteria became effective on January 15, 2003. As of that date, the *E. coli* standard described below applies to all freshwater streams in Virginia. Additionally, prior to June 30, 2008, the interim fecal coliform standard must be applied at any sampling station that has fewer than 12 samples of *E. coli*.

For a non-shellfish water body to be in compliance with Virginia's revised bacteria standards (as published in the Virginia Register Volume 18, Issue 20) the following criteria shall apply to protect primary contact recreational uses (VADEQ, 2000):

Interim Fecal Coliform Standard: Fecal coliform bacteria shall not exceed a geometric mean of 200 fecal coliform bacteria per 100 mL of water for two or more samples over a calendar month nor shall more than 10% of the total samples taken during any calendar month exceed 400 fecal coliform bacteria per 100 mL of water.

Escherichia coli Standard: *E. coli* bacteria concentrations for freshwater shall not exceed a geometric mean of 126 counts per 100 mL for two or more samples taken during any calendar month and shall not exceed an instantaneous single sample maximum of 235 cfu/100mL.

During any assessment period, if more than 10.5% of a station's samples exceed the applicable standard, the stream segment associated with that station is classified as impaired and a TMDL must be developed and implemented to bring the segment into compliance with the water quality standard. The original impairment designation to Thumb Run, Carter Run, Great Run, and Deep Run was based on violations of an earlier fecal coliform standard that included a numeric single sample maximum limit of 1,000 cfu/100mL.

1.4 Designated Uses

"A. All state waters are designated for the following uses: recreational uses (e.g., swimming and boating); the propagation and growth of a balanced indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish)."

The goal of the CWA is that all streams should be suitable for recreational uses, including swimming and fishing. **Fecal coliform and *E. coli* bacteria** are used to indicate the presence of pathogens in streams supporting the **swimmable use goal**. Bacteria in Thumb Run, Carter Run, Great Run, and Deep Run exceed the fecal coliform criterion.

1.5 Attainability of Primary Contact Recreation Use

For the Carter Run, Great Run, and Deep Run impairments, water quality modeling indicates that even after removal of all bacteria sources (other than wildlife), the stream will not attain standards under all flow regimes at all times. These streams may not be able to attain standards without some reduction in wildlife load.

With respect to these potential reductions in bacteria loads attributed to wildlife, Virginia and USEPA are not proposing the elimination of wildlife to allow for the attainment of water quality standards. However, if bacteria levels remain high and localized overabundant populations of wildlife are identified as the source, then measures to reduce such populations may be an option for local stakeholders if undertaken in consultation with the Virginia Department of Game and Inland Fisheries (VDGIF) or the United States Fish and Wildlife Service (USFWS). Additional information on VDGIF's wildlife programs can be found at http://www.dgif.virginia.gov/hunting/va_game_wildlife/. While managing such overpopulations of wildlife remains as an option for local stakeholders, the reduction of wildlife or changing a natural background condition is not the intended goal of a TMDL.

To address the overall issue of attainability of the primary contact criteria, Virginia proposed during its latest triennial water quality standards review a new "secondary contact" category for protecting the recreational use in state waters. On March 25, 2003, the Virginia SWCB adopted criteria for "secondary contact recreation" which means "a water-based form of recreation, the practice of which has a low probability for total body immersion or ingestion of waters (examples include but are not limited to wading, boating and fishing)." These new criteria became effective on February 12, 2004 and can be found at http://www.deq.virginia.gov/wqs/rule.html.

In order for the new criteria to apply to a specific stream segment, the primary contact recreational use must be removed. To remove a designated use, the state must demonstrate 1) that the use is not an existing use, 2) that downstream uses are protected, and 3) that the source of contamination is natural and uncontrollable by effluent limitations and by implementing cost-effective and reasonable best management practices for nonpoint source control (9 VAC 25-260-10). This and other information is collected through a special study called a Use Attainability Analysis (UAA). All site-specific criteria or designated use changes must be adopted as amendments to the water quality standards regulations. Watershed stakeholders and USEPA will be able to provide comment during this process. Additional information can be obtained at http://www.deq.virginia.gov/wqs/WQS03AUG.pdf

1.6 Project Methodology

The overall goal of this project was to begin the process of restoring water quality in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds. Specific objectives in meeting this goal are:

1. Development of a two-stage implementation plan for the four watersheds;
2. Coordination of public participation; and
3. Control measures implementation.

As stated above, key components of an implementation plan include public participation, assessment of needs, cost/benefit analysis, measurable goals, and timeline to achieve water quality objectives. Public participation was an integral part in developing the implementation plan and is critical to promote reasonable assurance that the implementation actions will occur. Public participation took place during implementation plan development on three levels. First, public meetings were held to inform the public of project end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more-targeted meetings (i.e. working groups and steering committee). Second, working groups were assembled from communities of people with common interests and concerns regarding implementation process and were the primary arena for seeking public input. The following working groups were formed: Agricultural, Residential, and Governmental. A representative from Virginia Department of Conservation and Recreation (VADCR), Rappahannock-Rapidan Regional Commission (RRRC), or Engineering Concepts, Inc. (ECI) attended each working group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from the Agricultural, Residential, and Governmental Working Groups; VADCR; VADEQ; Virginia Department of Health (VDH); VDGIF; Virginia Cooperative Extension (VCE); Fauquier County; Stafford County; John Marshall Soil and Water Conservation District (JMSWCD); Tri-County City Soil and Water Conservation District (TCCSWCD); Natural Resources Conservation Service (NRCS); RRRC; and ECI to guide the development of the IP.

The actions and cost needed in both implementation stages were identified were identified through input from working groups and steering committee, literature review, and discussion with the JMSWCD. Implementation actions that can be promoted through existing programs were identified, as well as actions not currently supported by existing programs. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts. The quantity of control measures, or BMPs, required during implementation was determined through spatial analyses of land use, stream-network, and the Commonwealth of Virginia aerial maps along with regionally appropriate data archived in the VADCR Agricultural BMP Database and TMDL Development documents. The map layers and archived data were combined to establish average estimates of control measures required overall and in each watershed. Additionally, input from local agency representatives, citizens, and contractors were used to verify the analyses. Overall numbers represent the Stage II goal of TMDL source allocation attainment, which is required under WQMIRA and by USEPA for eligibility to receive Section 319 grant funds to apply during implementation. An assessment was also conducted to quantify actions and cost to meet source allocations that translate to an instantaneous standard violation rate of 10.5% or less resulting in removal of Thumb Run, Carter Run, Great Run and Deep Run from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. This is referred to as the Stage I implementation goal.

The assessment of water quality impacts consisted of the development and evaluation of implementation scenarios. Implemental strategies were presented to and evaluated by the steering committee. Based on the evaluated strategies, a staged implementation timeline was developed. Implicit in the process of a staged implementation is targeting of control measures. Targeting was proposed to ensure optimum utilization of resources. Modeling was used to evaluate measurable goals and milestones by linking water quality with specific levels of implementation (e.g., 100% reduction in straight pipes may result in a 10% reduction in

violations of the instantaneous bacteria water quality standard). Through this process, a staged implementation plan was developed that will establish full implementation within 10 years.

Key components of the implementation plan are discussed in the following sections:

- Review of TMDL Development Studies,
- Public Participation,
- Implementation Actions,
- Measurable Goals and Milestones,
- Stakeholder's Roles and Responsibilities,
- Integration with Other Watershed Plans, and
- Potential Funding Sources.

2. REVIEW OF TMDL DEVELOPMENT STUDIES

GKY and Associates, Inc. was contracted by the VADEQ to develop an approvable fecal coliform TMDL for Thumb Run. The TMDL was approved by USEPA in May 2002. Engineering Concepts, Inc. was contracted by the VADEQ to develop an approvable *E. coli* bacteria TMDL for Deep Run, which was approved by USEPA in May 2004. VADEQ developed approvable *E. Coli* bacteria TMDLs for Carter Run and Great Run with subsequent approval by USEPA in March 2005. TMDL development documents can be obtained at the VADEQ office in Woodbridge, VA or via the Internet at www.deq.state.va.us. Watershed description, water quality assessment, public participation, water quality modeling, and allocated reductions were reviewed to determine the implications of TMDL and modeling procedures on implementation plan development

2.1 Watershed Description

Thumb Run, Carter Run, Great Run, and Deep Run are part of the Rapidan-Upper Rappahannock Basin (USGS Hydrologic Unit Code 02080103). Thumb Run, Carter Run, and Great Run watersheds are completely located in Fauquier County, Virginia (Figures 2.1 through 2.4). The northern portion of Deep Run watershed lies in Fauquier County with the southern portion in Stafford County (Figures 2.1 and 2.5). Approximately 34.1, 55.6, 28.3, and 27.0 square miles drain to Thumb Run, Carter Run, Great Run, and Deep Run watersheds, respectively.

Thumb Run flows south from its headwaters to confluence with the Rappahannock River (Figure 2.2). Carter Run flows south from its headwaters near Marshall, Virginia downstream to confluence with Rappahannock River near Waterloo, Virginia (Figure 2.3). Great Run flows south from its headwaters just west of Warrenton, Virginia downstream to confluence with Rappahannock River near Foxville, Virginia (Figure 2.4). Deep Run flows south from its headwaters to confluence with Rappahannock River in Strafford County, Virginia (Figure 2.5). The Rappahannock River continues flows into the Chesapeake Bay.

Figure 2.6 illustrates the land use for Thumb Run, Carter Run, Great Run, and Deep Run watersheds. The Thumb Run watershed area is approximately 21,800 acres, predominately forest (49%) and agricultural (51%) land uses with residential land use comprising less than 1% of the watershed area. The approximately 35,600 acres in the Carter Run watershed is divided between forest (63%), agricultural (35%), and residential (2%) land uses. The Great Run watershed area is approximately 18,100 acres, comprised of forest (51%), agricultural (46%), and residential (3%) land uses. The approximately 17,300 acres in Deep Run watershed are predominately forest (78%) land use with the remaining area comprised of agricultural (21%) and residential land uses.

The estimated populations in Carter Run, Great Run, Thumb Run and Deep Run drainage areas in 2000 were 2,953; 3,580; 880; and 2,524 residents, respectively. The average annual rainfall as recorded at the Warrenton, Virginia (NCDC Station 448888) is 41.17 inches. The weather station in Warrenton, Virginia is approximately seven miles away from Carter Run watershed, two miles from Great Run watershed, and 15 miles from Deep Run watershed. The TMDL for Thumb Run gathered climate information from The Plains weather station, approximately 15 miles from

Thumb Run, where average annual precipitation is 42.12 inches. The approximate average annual maximum temperature for the area of the watersheds is 65.2°F, with the highest average maximum temperature being 86°F in July. The average annual minimum temperature is 43.8°F, with the lowest average temperature being 22.7°F in January.

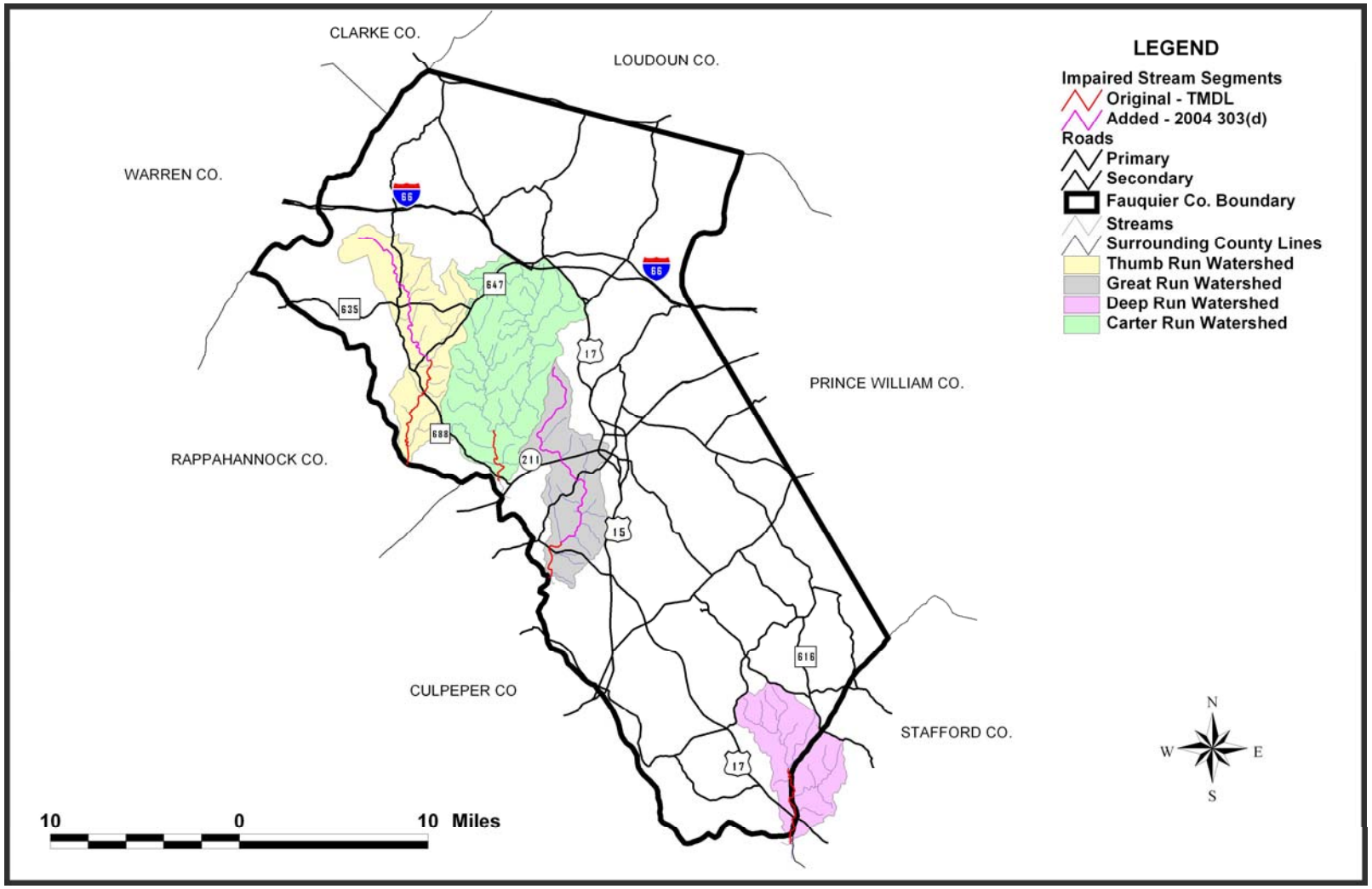

Figure 2.1. Thumb Run, Carter Run, Great Run, and Deep Run watersheds location.

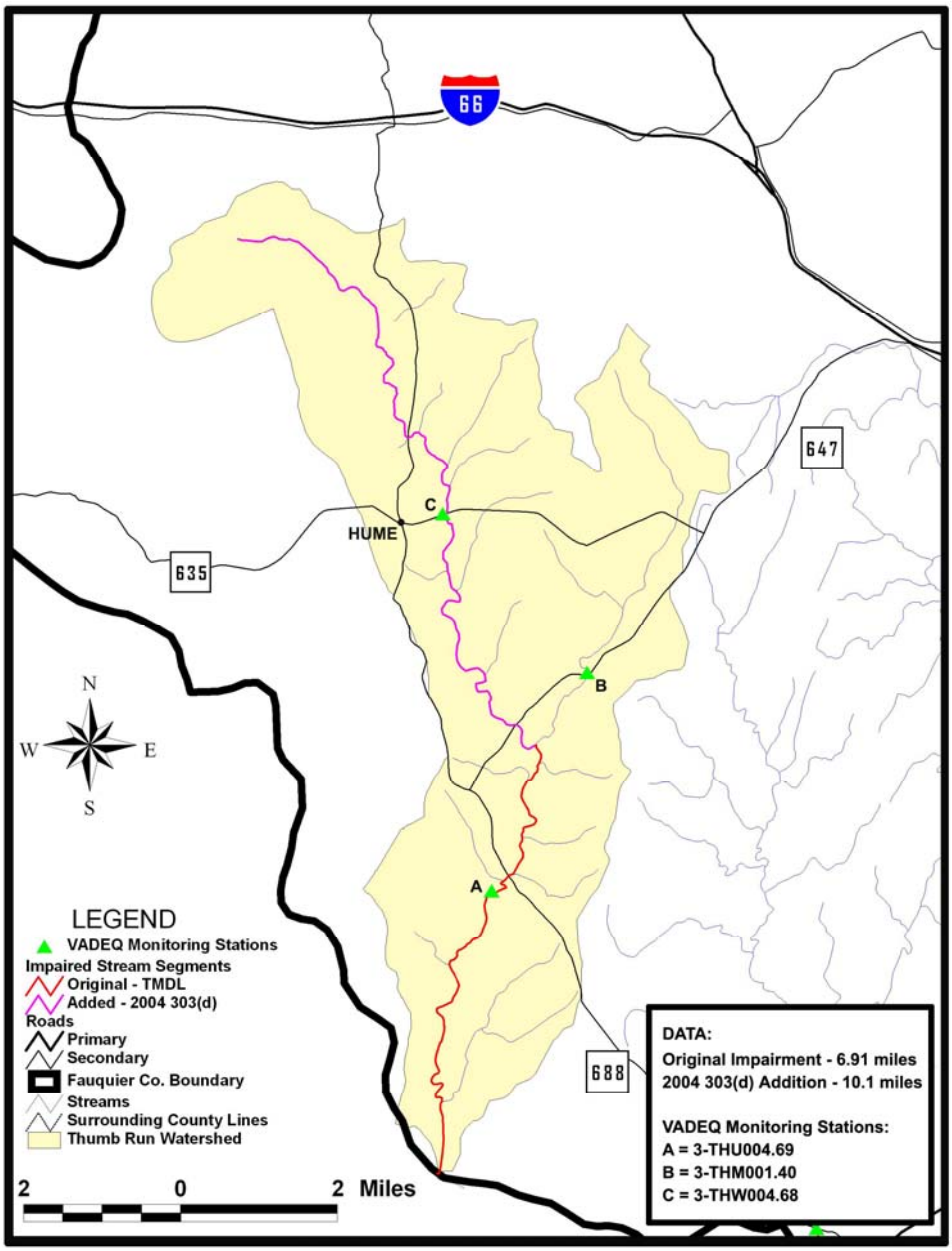

Figure 2.2. Thumb Run impairment.

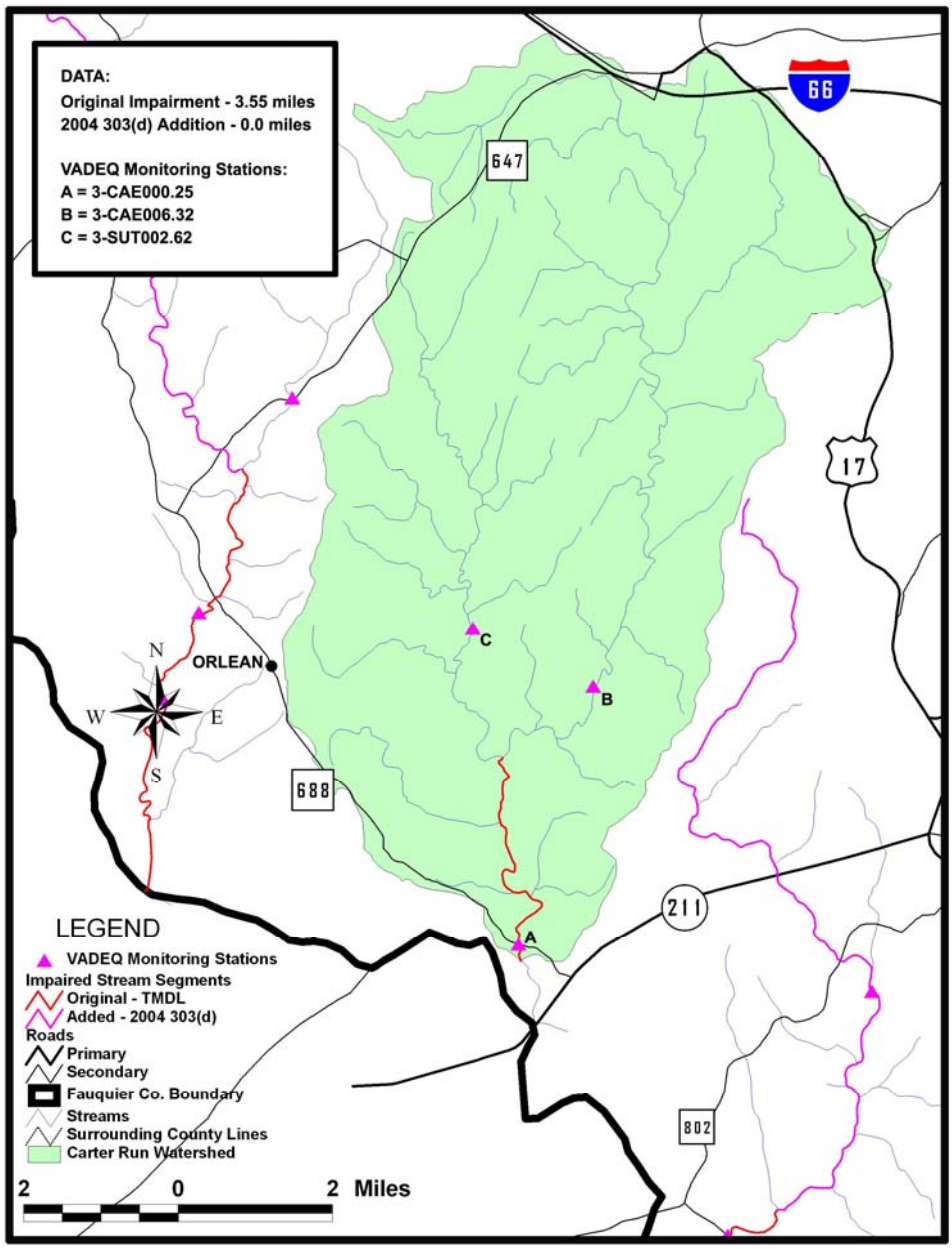

Figure 2.3. Carter Run impairment.

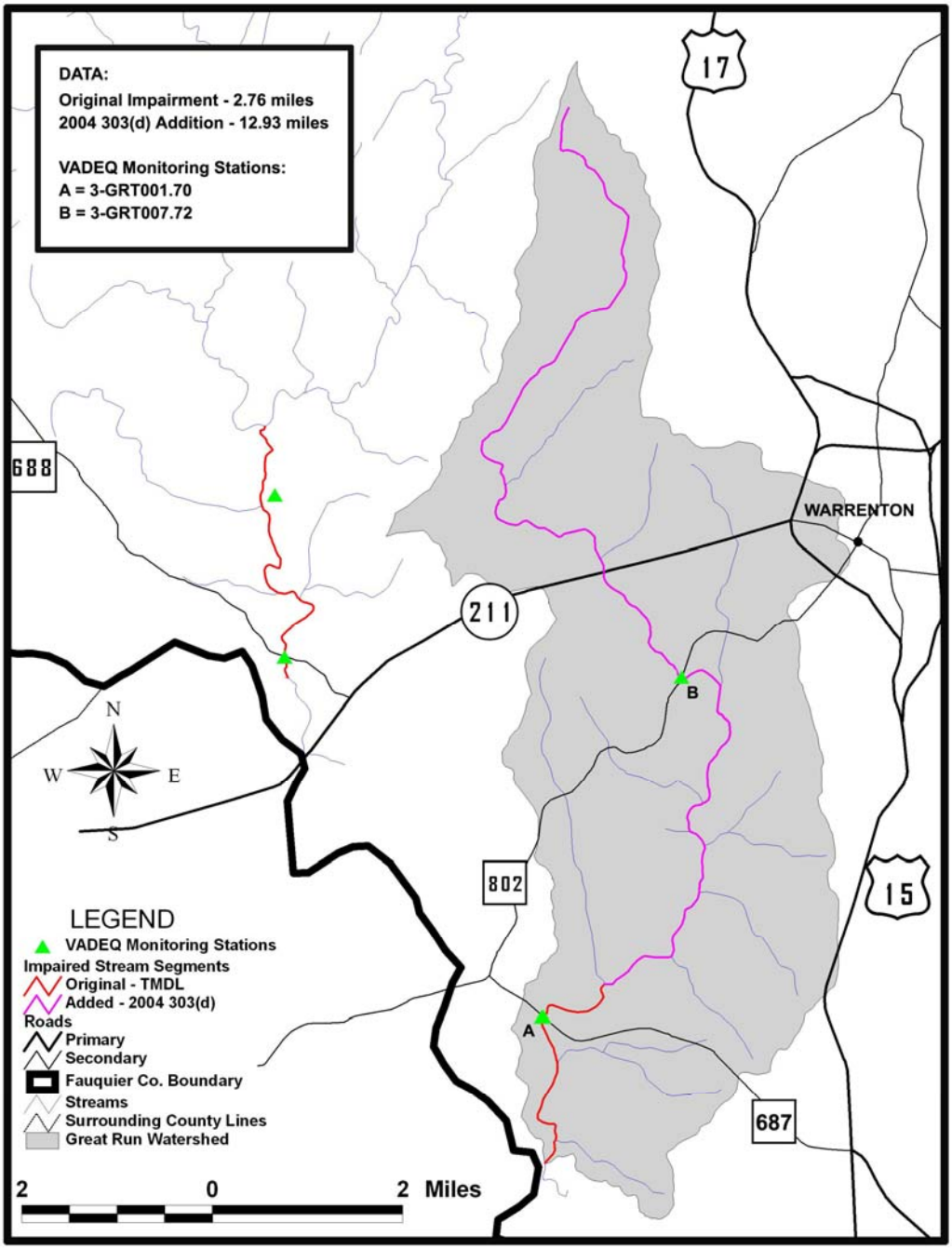

Figure 2.4. Great Run impairment.

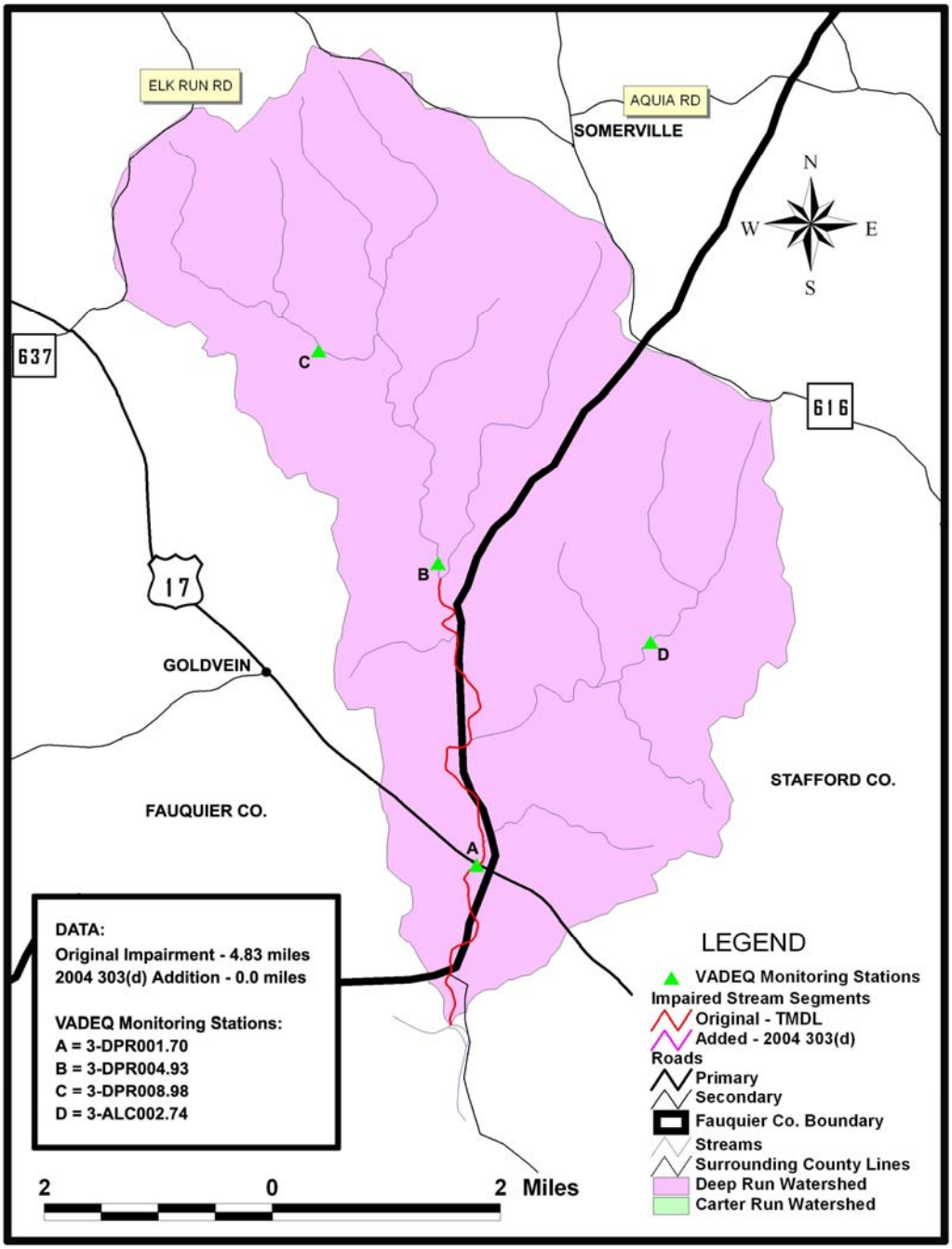

Figure 2.5. Deep Run impairment.

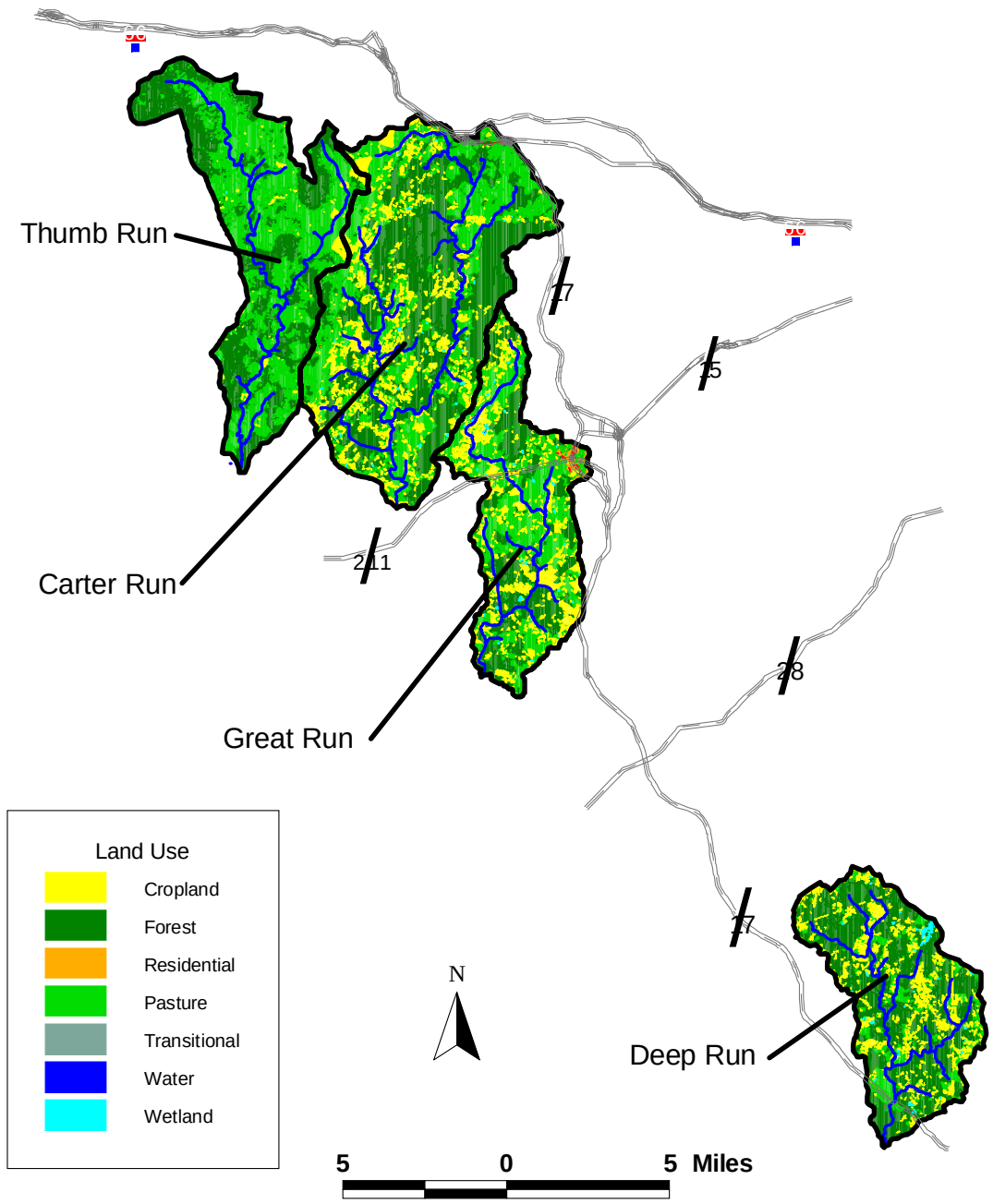

Figure 2.6. Land uses in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

2.2 Water Quality Assessment

Thumb Run (VAN-E01R-01) and Deep Run (VAN-E10R-01) were first listed as impaired streams in 1996 on Virginia's Section 303(d) Total Maximum Daily Load Priority List and Report (VADEQ, 2003a) indicating that the swimmable use goal was not being met. The stream segments were further listed in 2002 and 2004 on Virginia's Section 303(d) Total Maximum

Daily Load Priority List and Report (VADEQ, 2003b, 2004) based on Virginia Department of Environmental Quality (VADEQ) monitoring data. Carter Run (VAN-E02R-01) and Great Run (VAN-E02R-02) were initially listed as impaired streams on Virginia's 1998 Section 303(d) Total Maximum Daily Load Priority List and Report (VADEQ, 2003b) and remained on the 2004 Section 303(d) (VADEQ, 2004) list due to water quality violations of the fecal coliform standard. The Thumb Run TMDL was developed based on the then applicable geometric mean fecal coliform bacteria water quality standard of 200 colony forming units (cfu) / 100 milliliters (ml). The Carter Run, Great Run, and Deep Run TMDLs were developed to meet both the instantaneous (235 cfu/100ml) and geometric mean (126 cfu/100ml) *E. coli* water quality standards.

The impaired portion of Thumb Run (VAN-E01R-01) delineated by VADEQ, beginning at the headwaters of the Thumb Run and continuing downstream approximately 6.91 miles to the confluence of West Branch Thumb Run and East Branch Thumb Run to the Rappahannock River, is listed as impaired by fecal coliform bacteria on Virginia's 2004 list (VADEQ, 2004) due to water quality violations of the bacteria standard at station 3-THU004.69.

The impaired portion of Deep Run (VAN-E10R-01) delineated by VADEQ, beginning at the confluence of Green Branch and continuing downstream approximately 4.83 miles to the confluence with the Rappahannock River, is listed as impaired by fecal coliform bacteria on Virginia's 2004 list (VADEQ, 2004) due to water quality violations of the bacteria standard at station 3-DPR001.70.

The impaired portion of Carter Run (VAN-E02R-01) delineated by VADEQ, beginning at the confluence with South Run and continuing downstream approximately 3.55 miles to the confluence with the Rappahannock River, is listed as impaired by fecal coliform bacteria on Virginia's 2004 list (VADEQ, 2004) due to water quality violations of the bacteria standard at station 3-CAB000.25.

The impaired portion of Great Run (VAN-E02R-02) delineated by VADEQ, beginning at the headwaters of Great Run and continuing downstream approximately 15.69 miles to the confluence with the Rappahannock River, is listed as impaired by fecal coliform bacteria on Virginia's 2004 list (VADEQ, 2004) due to water quality violations of the bacteria standard at station 3-GRT001.70.

2.3 Public Participation

2.3.1 Thumb Run TMDL

During development of the TMDL, three public meetings were held. The first was held in Orlean on August 1, 2001, with approximately 18 people attending. Copies of the presentation materials and diagrams outlining the development of the TMDL were available for public distribution. A public meeting notice was published in the *Fauquier Time Democrat* on August 1, 2001. There was a 30-day public comment period and no written comments were received.

During the second public meeting held in Orlean on November 8, 2001, with approximately 30 people attending, assessment input, bacterial source tracking and model calibration data was

discussed. A public meeting notice was published in the *Virginia Register* and the *Fauquier Time Democrat* on October 31, 2001. A mailing was also sent out to 639 mailbox holders indicating the date, time and location of the public meeting. There was a 30-day public comment period and no written comments were received.

During the third public meeting held in Orlean on April 4, 2002, with approximately 26 people attending, the draft of the TMDL was discussed. Copies of the draft TMDL were available for public distribution. A public meeting notice was published in the *Virginia Register* and the *Fauquier Time Democrat* on March 27, 2002. A mailing was also sent out to indicating the date, time and location of the public meeting. There was a 30-day public comment period and no written comments were received.

2.3.2 Carter Run and Great Run TMDL

During development of the TMDLs, two public meetings were held. The first meeting was held in Marshall, Virginia on January 28, 2004, with approximately five people attending, to discuss the process for the TMDL development and source assessment input. Copies of the presentation materials and diagrams were available at the meeting and on the VADEQ website. A public meeting notice was published in the *Virginia Register* and *Fauquier Time Democrat*. There was a 30-day public comment period and no written comments were received.

During the second public meeting held in Warrenton on November 16, 2004, with approximately 21 people attending, the draft TMDL report was discussed. Copies of the presentation materials and diagrams were available at the meeting and on the VADEQ website. A public meeting notice was published in the *Virginia Register* and the *Fauquier Time Democrat*. A mailing was also sent out to all members on the Technical Advisory Committee for distribution. A mailing was also sent from the John Marshall Soil and Water Conservation District announcing the meeting. There was a 30-day public comment period and no written comments were received.

2.3.3 Deep Run TMDL

During development of the TMDL, three public meetings were held. The first was held at the Mary Walter Elementary School in Bealeton on April 2, 2003, with approximately 12 people attending, to discuss the need for a TMDL and the process for a TMDL development. Copies of the presentation materials and diagrams outlining the development of the TMDL were available for public distribution. A public meeting notice was published in the *Virginia Register*, *Fredericksburg Freelance Star*, and the *Fauquier Times-Democrat*. A postcard mailing announcing the meeting was sent to watershed residents, and the meeting was advertised on the VADEQ and Rappahannock-Rapidan Regional Commission websites. There was a 30-day public comment period and no written comments were received.

During the second public meeting held at the Mary Walter Elementary School in Bealeton on September 17, 2003, with approximately eight people attending, to discuss the draft watershed source assessment and to review the approach for TMDL development. A public meeting notice was published in the *Virginia Register, Fredericksburg Freelance Star,* and the *Fauquier Times-Democrat*. A mailing announcing the meeting was sent to prior meeting attendees, and the meeting was advertised on the VADEQ and Rappahannock-Rapidan Regional Commission

websites. In addition, flyers inviting the public to attend the meeting were distributed through the JMSWCD and TCCSWCD offices and posted at various locations around the watershed. There was a 30-day public comment period and no written comments were received.

During the third public meeting held at the Mary Walter Elementary School in Bealeton on March 10, 2004, with approximately 10 people attending, to discuss the source allocations and reductions required to meet the TMDL. Copies of the draft TMDL were available for public review and comment. A public meeting notice was published in the *Virginia Register, Fauquier Citizen, Fredericksburg Freelance Star,* and the *Fauquier Times-Democrat*. A postcard mailing announcing the meeting was sent to watershed residents and a newsletter announcing the meeting was sent to area appointed elected officials and prior meeting attendees. There was a 30-day public comment period and one written comment was received.

2.4 Water Quality Modeling

In order to understand the implications of the load allocations determined during TMDL development, it is important to understand the modeling methods used in the analysis. For Thumb Run and Deep Run impairments, the United States Geological Survey (USGS) Hydrologic Simulation Program - Fortran (HSPF) water quality model was selected as the modeling framework to simulate existing conditions and perform TMDL allocations. Seasonal variations in hydrology, climatic conditions, and watershed activities can be explicitly accounted for in the HSPF model. For Carter Run and Great Run, a load duration spreadsheet model developed by VADEQ was used to calculate TMDL allocations. Seasonal variations in hydrology, climatic conditions, and watershed activities are not explicitly accounted for in the load duration model.

2.4.1 Sources of Bacteria

Potential sources of bacteria considered in TMDL development included both point source and nonpoint source contributions. Permitted point sources are listed in Table 2.1.

Table 2.1. Permitted point sources in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Stream	VPDES Permit Number	Facility Name
Carter Run	VA0031763	Marshall Waste Water Treatment Plant
Carter Run	VAG406058	Residence
Great Run	VA0021172	Warrenton Town Sewage Treatment Plant*
Thumb Run	VA0060976	Camp Moss Hollow Wastewater Treatment Plant

*Not currently discharging

Non-point bacteria sources from livestock, human, pets, and wildlife were considered in the four watersheds. It is important to understand the types of sources modeled, their delivery mechanisms, and temporal variations. Tables 2.2 through 2.4 give a summary of non-point

source pollution loads. Loads were represented as either land-based loads, where bacteria were deposited on land and available for wash-off during a rainfall event, or as direct loads, where bacteria were directly deposited to the stream. Loads that varied temporally were delivered at a constant rate throughout any given month, but varied on a monthly basis. In Thumb Run and Deep Run watersheds, all loads were spatially distributed based on land use types (e.g. land-based loads from beef cattle were applied to pasture). The nonpoint source load from cattle was modeled as delivering a direct load to the streams in the Thumb Run and Deep Run impairments. A portion of the failing septic systems (Thumb Run only) and straight pipes were modeled as a direct load in the Thumb Run and Deep Run watersheds. Within the Thumb Run and Deep Run watersheds, the non-point source load from wildlife was modeled as a direct load to the stream. Since allocations in Carter Run and Great Run TMDLs were based on in-stream loads, delivery mechanisms and variability of bacteria sources throughout the year was not utilized.

Table 2.2. Bacteria sources modeled during the Thumb Run TMDL development.

Source	Delivery Mechanism(s)	Variation
Wildlife		
Deer	Land-Based & Direct	Spatial
Turkey	Land-Based & Direct	Spatial
Bear	Land-Based & Direct	Spatial
Raccoon	Land-Based & Direct	Spatial
Fox	Land-Based & Direct	Spatial
Muskrat	Land-Based & Direct	Spatial
Beaver	Land-Based & Direct	Spatial
Goose	Land-Based & Direct	Spatial
Wood duck	Land-Based & Direct	Spatial
Agricultural		
Beef Cattle	Land-Based & Direct	Temporal and Spatial
Horse	Land-Based & Direct	Temporal and Spatial
Sheep	Land-Based & Direct	Temporal and Spatial
Hounds	Land-Based	Temporal and Spatial
Residential		
Failing Septic	Land-based & Direct	Spatial
Straight Pipes	Direct	Spatial
Pets	Land-based	Spatial
Biosolids	Land-based	Spatial

Table 2.3. Bacteria sources modeled during the Carter Run and Great Run TMDL development.

Source	Delivery Mechanism(s)	Variation
Livestock	None	None
Human	None	None
Pet	None	None
Wildlife	None	None

Table 2.4. Bacteria sources modeled during the Deep Run TMDL development.

Source	Delivery Mechanism(s)	Variation
Wildlife		
Deer	Land-Based & Direct	Spatial
Turkey	Land-Based & Direct	Spatial
Bear	Land-Based & Direct	Spatial
Raccoon	Land-Based & Direct	Spatial
Fox	Land-Based & Direct	Spatial
Muskrat	Land-Based & Direct	Spatial
Beaver	Land-Based & Direct	Spatial
Goose	Land-Based & Direct	Spatial
Wood duck	Land-Based & Direct	Spatial
Agricultural		
Beef Cattle	Land-Based & Direct	Temporal and Spatial
Horse	Land-Based	Temporal and Spatial
Sheep	Land-Based	Temporal and Spatial
Goats	Land-Based	Temporal and Spatial
Residential		
Failing Septic	Land-based	Spatial
Straight Pipes	Direct	Spatial
Pets	Land-based	Spatial
Biosolids	Land-based	Spatial

2.5 Allocation Reductions

Several model runs were made investigating scenarios that would meet applicable water quality standards for each impairment. The final load reductions required in the Thumb Run and Deep Run impairments are shown in Table 2.5. Table 2.6 lists the required reductions of in-stream loads in the Carter Run and Great Run impairments.

Table 2.5. Load reductions allocated during Thumb Run and Deep Run TMDL Development.

Impairment	Required Load Reductions (%)					
	Livestock DL	Septic DL	Wildlife DL	Pasture	Cropland	Residential*
Thumb Run	100	100	0	0	0	100
Deep Run	99	100	0	99	88	99

DL = direct load; Septic DL = septic systems DL or straight pipes

* Failing septic systems (Thumb Run) ; failing septic systems and pets (Deep Run)

Table 2.6. In-stream load reductions allocated during Carter Run and Great Run TMDL Development.

Impairment	Required Reductions of In-stream Loads (%)			
	Human	Pets	Livestock	Wildlife
Carter Run	94	94	94	94
Great Run	95	95	95	95

2.6 Implications of TMDL and Modeling Procedure on Implementation Plan Development

Major implications of the TMDL development studies included:

- Exclusion of most/all livestock from streams is necessary within all impairments;
- Substantial land-based non-point source (NPS) load reductions are called for on pasture and cropland in Carter Run, Great Run, and Deep Run watersheds;
- All straight pipes and failing septic systems need to be identified and corrected in all impairments;
- Implicit in the requisite to correct straight pipes and failing septic systems is the requirement to maintain all properly functioning septic systems;
- Reductions of pet bacteria loads on residential land in Carter Run, Great Run, and Deep Run watersheds are necessitated; and
- Wildlife bacteria load reductions are necessary in Carter Run and Great Run watersheds based on bacterial source tracking data that was used to determine source reductions.

The TMDL IP focuses on human, pet, and livestock reductions. Water quality modeling has shown that the impairments can be removed from the impaired waters list by addressing human, pet, and livestock sources of bacteria. Wildlife reductions in Carter Run and Great Run watersheds will be handled through continued management by VDGIF and education. In addition, a use attainability analysis could be initiated to convert to a secondary contact designated use if water quality goals are not accomplished after addressing anthropogenic sources to the maximum extent practicable.

In terms of cattle access to streams in the Deep Run watershed, only beef cattle were modeled as supplying direct inputs to the stream implying that other livestock do not have access to the stream. The HSPF model is calibrated to measured levels of fecal bacteria, regardless of source, so the modeled load of fecal bacteria directly deposited by beef cattle is representative of direct loads from all forms of livestock. Therefore, all livestock with stream access were considered in order to reach the reduction in direct depositions that have been deemed necessary in Deep Run. Additionally, calibration helps to ensure that all direct loads have been included in spite of the transport pathway.

3. PUBLIC PARTICIPATION

Public participation was an integral part of the IP development, and is also critical to promote reasonable assurance that the implementation actions will occur. Public participation took place during IP development on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, as well as, a forum for soliciting participation in the smaller, more targeted meetings (i.e. working groups and steering committee). Second, working groups were assembled from communities of people with common interests and concerns regarding the implementation process and were the primary arena for seeking public input. The following working groups were formed: Agricultural, Residential, and Governmental. A representative from VADCR, RRRC, or ECI attended each working group in order to facilitate the process and integrate information collected from the various communities. Third, a steering committee was formed with representation from the Agricultural, Residential, and Governmental Working Groups; VADCR; VADEQ; VDH; VDGIF; VCE; Fauquier County; Stafford County; JMSWCD; TCCSWCD; NRCS; RRRC; and ECI to guide the development of the IP.

The overall goal of the Agricultural, Residential, and Governmental Working Groups was to identify obstacles to implementation in their respective communities and recommend workable solutions that will overcome these obstacles. In addition, the Working Groups were expected to: identify funding/partnering opportunities that would help to overcome obstacles to implementation, review the IP from an environmental perspective, identify the regulatory authority in the specific areas related to implementation, identify existing programs and resources that might be relevant to the situation, and propose additional programs that would support implementation. The Steering Committee had the expressed purpose of formulating the TMDL IP. In addition, this committee had responsibility for identifying control measures that are founded in practicality, establishing a time-line to insure expeditious implementation, and setting measurable goals and milestones for attaining water quality standards.

Additional meetings that supported the project included: a meeting with JMSWCD to discuss BMP identification and quantification and meeting with members of Fauquier County Board of Supervisors to discussion implications of plan on their constituents. All meetings conducted during the course of the IP development are listed in Table 3.1. Over 600 man-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, environmental, and government interests on a local, state, and federal level.

Table 3.1. Meetings held during the Thumb Run, Carter Run, Great Run, and Deep Run TMDL implementation plan development process.

Date	Meeting Type	Location	Attendance	Time (hr)	Meeting Summary
04/12/05	Public Meeting	Warrenton, VA	37	3.0	-----
06/02/05	Agricultural Working Group	Warrenton, VA	9	2.0	Appendix A
06/02/05	Residential Working Group	Warrenton, VA	10	2.0	Appendix B
06/02/05	Government Working Group	Warrenton, VA	16	2.0	Appendix C
08/02/05	Steering Committee	Warrenton, VA	15	2.5	Appendix D
10/03/05	Agricultural Working Group	Warrenton, VA	8	2.0	Appendix A
10/03/05	Residential Working Group	Warrenton, VA	9	2.0	Appendix B
10/03/05	Government Working Group	Warrenton, VA	16	2.0	Appendix C
12/01/05	Agricultural Working Group	Warrenton, VA	5	2.0	Appendix A
01/12/06	Steering Committee	Warrenton, VA	15	2.5	Appendix D
02/21/06	Steering Committee	Warrenton, VA	15	2.0	Appendix D
04/04/06	Public Meeting	Warrenton, VA	18	3.0	-----

3.1 Public Meetings

Attendance at public meetings was critical to the public participation effort, and was encouraged through announcements via email and United States Postal Service, announcement posted on VADEQ and RRRC websites, and contact with local community groups (e.g., JMSWCD, agricultural producer associations, and Fauquier and Stafford County Board of Supervisors).

The first public meeting was held on April 12, 2005 at the Warrenton Community Center in Warrenton, Virginia. Information delivered to the public at the meetings included: a general description of the TMDL process, a more detailed description of TMDL development and IP development, and a solicitation for participation in Agricultural, Residential, and Governmental Working Groups and Steering Committee.

The second public meeting was held on April 4, 2006 at the Warrenton Community Center in Warrenton, Virginia. The primary purpose of this meeting was to present the Thumb Run, Carter Run, Great Run, and Deep Run Bacteria Total Maximum Daily Load Implementation Plan. A presentation was given summarizing the major components of the draft IP. The draft IP and presentation were distributed to attendees. In addition, informational pamphlets describing programs associated with JMSWCD, TCCSWCD, VCE, VADCR, and VADEQ were available.

3.2 Agricultural Working Group

The Agricultural Working Group (AWG) consisted predominantly of beef producers and horse owners throughout the four watersheds. Representatives from organizations that serve this community and will have a role in implementation were also included (e.g., JMSWCD, NRCS, and VADCR).

The first meeting for this group occurred on June 2, 2005 at the VCE office in Warrenton, Virginia. The discussion focused on reviewing the TMDL documents and implications of reductions to BMP installation during implementation, watershed changes since TMDL development, monitoring, strength and weaknesses of funding programs, education / outreach approaches, and selection of representative for steering committee. Minutes of this meeting are included in Appendix A.

The second meeting was held on October 3, 2005 at the Warren Green Building in Warrenton, Virginia. The discussion centered on summary of previous meeting, BMP identification, BMP quantification, locations for livestock exclusion, and potential funding sources. Meeting minutes are included in Appendix A.

The third meeting for this group occurred on December 1, 2005 at the VCE office in Warrenton, Virginia to discuss BMP quantification, implementation cost, education and technical assistance, milestones / timeline, targeting, and report to Steering Committee. Minutes of this meeting are included in Appendix A.

The AWG is confident that current BMPs eligible for cost-share in TMDL areas and proposed recommendations will provide the necessary incentive for producers and horse owners to implement required BMPs to meet specified reductions to direct stream, pasture, and cropland loads. The AWG report to the Steering Committee is included in Appendix E. Challenges, recommendations, and keys for success discussed in the three meetings included:

- Participation from newer farmers, recreational farmers with smaller operations, and renters may be a challenge especially in Carter Run, Great Run, and Thumb Run.
- A full livestock exclusion system (i.e., SL-6 Grazing Land Protection) will be implemented to reduce direct stream loads. In order to allow incentive program participation by horse owners, it was requested that a hardened confinement area be included in the SL-6 Grazing Land Protection specifications. Providing alternative shade for livestock excluded from stream corridor will reduce concentration of livestock at buffer edges. It is recommended that cost-share be provided for a shade structure to farmers with an acceptable livestock exclusion system.
- A new "Pasture Management System BMP" to provide incentive for control of upland pasture loads was recommended.
- An incentive payment is needed to entice farmers to convert cropland to vegetated buffers to help meet specified cropland load reductions.
- Individual contact with farmer to define TMDL, explain what it means to the farmer, and outline options for funding sources will be needed. Additional outreach includes field days, small workshops, field visits, and talks at association meetings. A statewide public service announcement through various media (*e.g.*, radio, newspapers, cable) paid by the Commonwealth about BMPs and incentive programs was also suggested.

3.3 Residential Working Group

The Residential Working Group (RWG) consisting predominantly of watershed residents, agency representatives, VADCR, and RRRC personnel focused on means to educate and involve

public with regard to implementing corrective actions to replace straight pipes, correct failing septic systems, and manage pet waste.

The first meeting for this group occurred on June 2, 2005 at the John Barton Payne Building in Warrenton, Virginia. The discussion focused on reviewing the TMDL documents and implications of reductions to BMP installation during implementation, Virginia's bacteria standard and related questions, public participation process and role of group, education/outreach, and BMPs to be addressed in IP and tools available. Minutes of this meeting are included in Appendix B.

The second meeting was held on October 3, 2005 at the John Barton Payne Building in Warrenton, Virginia. The discussion centered on summary of previous meeting, BMP identification, BMP quantification, cost estimates, education and technical assistance, potential funding sources, monitoring, and selection of representative for steering committee. Meeting minutes are included in Appendix B.

The RWG report to the Steering Committee is included in Appendix E. The following key topics and recommendations resulted from the two RWG meetings:

- An organized education and outreach program, with genuine incentives for participation, will be essential for the implementation effort to succeed. The Fauquier County Health Department is willing to accept responsibility to administer education and technical assistance efforts to address bacteria sources attributed to failing and inadequate on-site sewage disposal systems given technical assistance funding is available to hire a person.
- Several education/outreach techniques need to be utilized during implementation of corrective actions for straight pipes and failing septic systems. The focus must be on obstacles (*e.g.*, money, information, and understanding of issues) that property owners face in correcting problems and proper operation and maintenance of systems Examples included: newspaper articles, small community meetings, workshops, model septic system and video displayed in public buildings, demonstration at county fair, information packet provided through realtors on proper operation and maintenance of on-site sewage disposal systems, and mailings.
- BMPs listed under the cost-share program (*i.e.*, RB-1 through RB-5), pet waste control program (*i.e.*, signage, pet waste disposal stations, and distribution of educational information), vegetative buffers, and structural BMPs (*e.g.*, retention pond) were recommended control measures.

3.4 Governmental Working Group

The Governmental Working Group (GWG) consisted predominantly of agency representatives, VADCR, RRRC, and ECI personnel. The responsibilities of this group were to identify funding sources, available technical resources, appropriate measurable goals and timeline for achievement, regulatory controls currently in place, and potential parties to be responsible for agricultural and residential implementation.

The first meeting for this group occurred on June 2, 2005 at the VCE office in Warrenton, Virginia. The discussion focused on reviewing the bacteria TMDLs and implications of reductions to BMP installation during implementation; public participation process; role of

group; IP components; overview of programs in Fauquier County that address on-site sewage disposal systems, pet waste, agriculture, and wildlife; regulatory controls; and monitoring. Minutes of this meeting are included in Appendix C.

The second meeting was held on October 3, 2005 at the Warren Green Building in Warrenton, Virginia. The discussion centered on summary of previous meeting, monitoring, regulatory control, pet waste, wildlife, primary funding sources, integration with other activities in counties, milestones / timeline, and selection of representative for steering committee. Meeting minutes are included in Appendix C.

The GWG report to the Steering Committee is included in Appendix E. Key topics and recommendations resulting from two meetings included:

- State On-site Sewage Code requires new houses to have an average 1,000 square feet of land available for a replacement drain field. Fauquier County ordinance requires a 200% reserve for non-service District areas and 100% reserve for service District areas.
- Fauquier County Code requires an annual inspection of alternative waste treatment systems. All homes built after 2003 must have the septic tank pumped once every 5 years.
- There are no County restrictions or ordinances that deal with the disposal of pet waste. The Town of Warrenton has a pet waste ordinance.
- A staged approach consisting of the pet waste control program, inventorying number of confined canine units (*i.e.*, hunt clubs, kennels, and veterinary hospitals), and demonstration sites for proper canine waste storage and management was outlined. Vegetative buffers and structural BMPs were recommended as a secondary course of action. GWG believes that Fauquier County is better suited to take on the responsibility of implementing the pet waste component of the IP with technical assistance from DCR, JMSWCD, and VDH.
- VDGIF's position is that increasing kill limits or bag limits for deer will not control overpopulations of deer in the County. There is not enough public land to hunt and the lack of access to private land is a significant issue that contributes to a lack of hunters to manage deer populations. Land use changes and the way residential landscapes are currently designed are contributing to increasing numbers of deer in residential areas. Canadian Geese are protected as a migratory waterfowl. Federal government tells VDGIF how many can be killed, current limit is five geese/per day. Vegetation along farm ponds would discourage geese access. GWG recommends that educational materials be prepared to help landowners understand why wildlife populations are increasing and the various options that are available to landowners to manage wildlife populations on their land. Educational funds made available during implementation phase should be directed at wildlife sources and management options, VDGIF is interested in helping to develop educational materials.
- The GWG members expressed to VADEQ staff the desire to have at least one continual monitoring station in each of the four watersheds beginning in 2006 to measure implementation progress.
- Other activities to be integrated with implementation include: Fauquier Riparian Easement Program Solutions Initiative, Fauquier County Water Resources Management Plan, Warrenton Reservoir Overlay Plan, Fauquier County Comprehensive Plan, Stafford County Comprehensive Plan, Low Impact Development strategies, and Chesapeake Bay Nutrient and Sediment Reduction Strategy for the Rappahannock River Basin.

3.5 Steering Committee

The Steering Committee consisted of representatives from the AWG, RWG, and GWG, watershed residents, county personnel, government agencies, RRRC, and ECI. The steering committee evaluated recommendations from working groups, reviewed BMP quantification and cost estimates, formulated pet waste reduction plan, discussed avenues to address wildlife reductions, devised monitoring plan, and discussed potential funding resources available. The steering committee will periodically revisit implementation progress and suggest plan revisions as needed.

The first meeting for the committee occurred on August 2, 2005 at the Warren Green Building in Warrenton, Virginia. The discussion focused on reviewing the IP process, update on IP process, working group activities reports, pending issues, and schedule review. Minutes of this meeting are included in Appendix D.

The second meeting was held on January 12, 2006 at the VCE office in Warrenton, Virginia. The discussion centered on reviewing the IP process, working group reports (Appendix E) and recommendations, BMP quantification and costs, updated monitoring network for IP, and schedule review. Meeting minutes are included in Appendix D.

The third meeting for the committee occurred on February 21, 2006 at the VCE office in Warrenton, Virginia to review the draft public IP and presentation for the second public meeting.

3.6 Summary

Members of the working groups and steering committee agreed that the cornerstone of the IP is cultivating public involvement and education and encouraging commitment and partnerships among the citizens in the watershed and government agencies in order to reduce bacteria pollution. An assertion to individual responsibility provides a foundation for building partnerships among citizens, businesses, interest groups, and government agencies. It can also cultivate voluntary implementation and long-term support for reducing bacteria levels and restoring water quality in Thumb Run, Carter Run, Great Run, and Deep Run watersheds. Throughout the public participation process, major emphasis was placed on discussing BMPs, locations of control measures, education, technical assistance, monitoring, funding, and timeline.

4. IMPLEMENTATION ACTIONS

4.1 Assessment of Implementation Action Needs

4.1.1 Identification of Control Measures

An important element of the implementation plan is to encourage voluntary implementation of control measures for bacteria reductions on the part of local, state, and federal government agencies, agricultural producers, business owners, and private citizens. In order to encourage voluntary implementation, the best information available on types of control measures and program options that achieve the bacteria reduction goals practically and cost-effectively was obtained. Potential control measures were identified through Steering Committee and Working Group input, literature review, and discussion with the JMSWCD, NRCS, VADCR, VADEQ, VDH, VCE, Fauquier County and Stafford County government personnel. Control measures were assessed based on cost, availability of existing funds, reasonable assurance of implementation, and water quality impacts (Table 4.1).

The cost of installing potential control measures was determined based on published values and discussion with Working Groups, Steering Committee, JMSWCD, NRCS, VADCR, VADEQ, VDH, VCE, and local contractors. Control measures that can be promoted through existing programs were identified, as well as control measures that are not currently supported by existing programs and their potential funding sources. Availability of existing programs was determined through discussion with JMSWCD, NRCS, VADCR, VADEQ, and VDH officials participating in the GWG. The assurance of implementation of specific control measures was assessed through discussion with the AWG, RWG, and GWG.

Table 4.1. Control measures to be implemented with cost estimate and reduction efficiency used:

Control Measure	Unit	Unit Cost ($)	Reduction Efficiency (%)
Agricultural			
Livestock Exclusion System	system	20,000[1]	100
Pasture Management System	acre[2]	200[3]	75
Vegetative Buffer on Cropland	acre[2]	560[3]	20
Manure / Biosolids Incorporation on Cropland	acre[2]	20[3]	80
Retention Pond	acre[4]	2,000[5]	30
Technical Assistance	FTE	60,000[3]	---
Administrative Assistance	FTE	45,000[3]	---
Residential			
Alternative Sewage Disposal System	system	25,000[6]	100
New Septic System	system	7,000[6]	100
Repaired Septic System	system	3,500[6]	100
Pet Waste Control Program	system	3,750[7]	75
Confined Canine Unit Demonstration Project	system	20,000[7]	---
Confined Canine Unit Treatment System	system	5,000[7]	100
Landscape BMP Demonstration Project	system	20,000[8]	---
Retention Pond	acre[4]	2,000[5]	30
Infiltration Trench	acre[4]	9,000[5]	50
Rain Garden	acre[4]	12,000[5]	40
Technical Assistance	FTE	60,000[6]	---
Administrative Assistance	FTE	45,000[6]	---

FTE = full time equivalent
1 John Marshall Soil and Water Conservation data
2 Acres installed
3 CGTD IP Agricultural Working Group
4 Acres treated
5 Environmental Protection Agency, 1999. Preliminary Data Summary of Urban Storm Water Best Management Practices. Publication #: EPA-821-R-99-012.
6 CGTD IP Residential Working Group
7 CGTD IP Steering Committee
8 Swann, C. 1999. A survey of residential nutrient behaviors in the Chesapeake Bay. Widener Burrows, Inc. Chesapeake Bay Research Consortium. Center for Watershed Protection. Ellicott City, MD. 112pp.

The allocations determined during the TMDL development dictate, largely, the control measures that must be employed during implementation. In order to meet the stated reductions in direct deposition from livestock, some form of stream exclusion is necessary. Fencing is the most obvious choice, however, the type of fencing, distance from the stream bank, and most appropriate management strategy for the fenced pasture are less obvious. Accounting for this variability at each farm, a full livestock exclusion system was used to estimate the control measure needed to reduce livestock direct deposition. The proposed Pasture Management System BMP will be utilized during Stage I Implementation to reduce bacteria loads from pasture land-use. If needed, retention ponds will be installed during Stage II Implementation for additional

treatment of the stormwater runoff from pasture land. Conversion of cropland field borders to vegetated buffers and manure / biosolids incorporation into the soil will be utilized to reduce bacteria loads from cropland during Stage I Implementation. Manure / biosolids incorporation or injection is a practice in which farmers inject liquid manure below the soil surface or spread manure, then disk the land. The disking mixes manure with soil and has shown to keep manure and nutrients on the land longer. This practice can be done on cropland or pasture/hay land use where manure or biosolids are applied.

While it is recognized that some farmers will want to minimize the cost of fencing and the amount of pasture lost, it was determined that any fencing installed through the use of cost-share programs should follow established NRCS specifications and be located 35 feet from the stream bank, at a minimum, as is specified in existing Virginia cost-share programs. It is recommended that all fence, even that which is installed solely at the landowners expense, be placed at least 35 feet from the stream. An alternative water source will typically be required with the livestock exclusion system. The JMSWCD staff indicated they have assisted with the installation of various types of alternative water systems, including; wells, spring developments, pumped stream water, and town water. The main criterion is that the system be dependable.

From an environmental perspective, the best management scenario would be to exclude livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life. From a livestock production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve weight gain. Clean water will also improve the health of animals (*e.g.,* cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. Additionally, intensive pasture management, which becomes possible with an alternative water source, has been shown to improve overall farm profitability and environmental impact. From a part-time farmer's perspective, the best management scenario is one that requires minimal input of time. This would seem to preclude intensive pasture management, however, those farmers who have adopted an intensive pasture management system typically report that the additional management of the established system amounts to "opening a gate and getting out of the way" every couple of days. Additionally, the efficient use of the pasture often means that fewer supplemental feedings are necessary. Among both part-time and full-time farmers there are individuals who are hesitant to allow streamside vegetation to grow unrestricted because of aesthetic preferences or because they have spent a lifetime preventing this growth.

Alternative sewage disposal system installation, conventional septic system installation, and on-site sewage disposal system repair will be needed to replace straight pipes and fix failed septic systems during Stage I Implementation. During Stage I Implementation, pet contributions to bacteria runoff from residential land use will be reduced through implementation of pet waste control program in the watersheds, confined canine unit demonstration projects, installation of confine canine unit treatment system, and landscape BMP demonstration projects. If needed, retention ponds, infiltration trenches, and rain gardens will be installed during Stage II Implementation to treat stormwater runoff from the residential land use.

4.1.2 Quantification of Agricultural Control Measures

The actions needed in both implementation stages were quantified. The overall numbers represent the Stage II goal of TMDL source allocation attainment, which is required under WQMIRA and by USEPA for eligibility to receive Section 319 grant funds to apply during implementation. An assessment was also conducted to quantify actions and cost to meet source allocations that translate to an instantaneous standard violation rate of 10.5% or less resulting in removal of Thumb Run, Carter Run, Great Run and Deep Run from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. This is referred to as the Stage I implementation goal.

This project consisted of two TMDLs developed using HSPF (i.e., Deep Run and Thumb Run) and two developed using load duration (i.e., Cater Run and Great Run). For Deep Run and Thumb Run, the bacteria sources were spatially and temporally represented in the HSPF model. Since allocations in Carter Run and Great Run TMDLs were based on in-stream loads, delivery mechanisms and variability of bacteria sources throughout the year were not specified in the TMDL study. Bacteria load reductions for a BMP were applied to the direct or land-based load.

In order to apply appropriate reductions to bacteria loads in Carter Run and Great Run watersheds, the average annual in-stream load per source outlined in the TMDL was translated to direct and land-based bacteria loadings using a source assessment spreadsheet developed by the Biological Systems Engineering Department at Virginia Tech. Populations specified in the TMDL and distribution factors describing local practices were input into the spreadsheet to estimate direct and land-based bacteria loadings. The output from the spreadsheet describing directly deposited bacteria loads was subtracted from the TMDL-prescribed reductions, applying the identified reduction percentage and considering die-off. The balance of the load allocation was assumed to originate from land-based loads for each source. After identification of pollutant delivery pathways in Carter Run and Great Run watersheds, BMP placement strategies in all four watersheds were derived.

The quantity of control measures, or BMPs, required during implementation was determined through spatial analyses of land use, stream-network, and the Commonwealth of Virginia aerial maps along with regionally appropriate data archived in the VADCR Agricultural BMP Database and TMDL Development documents. The map layers and archived data were combined to establish average estimates of control measures required overall and in each watershed. Additionally, input from local agency representatives, citizens, and contractors were used to verify the analyses. Estimates of control practices needed for full implementation in the four watersheds are listed in Tables 4.2 and 4.3.

To estimate fencing requirements, the National Hydrography Dataset (NHD) stream network was overlaid with land use. Not every pasture area has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. Additionally, livestock will occasionally be given access to areas identified as cropland (e.g. following the last cutting of hay for the season). Perennial stream segments that flowed through or adjacent to pasture areas were identified. If the stream segment flowed through the pasture

area, it was assumed that fencing was required on both sides of the stream, while if a stream segment flowed adjacent to the pasture area, it was assumed that fencing was required on only one side of the stream. These assumptions were further refined by overlaying this layer with aerial images to examine land use criteria, size of resultant pasture, and existing BMPs. A map of potential streamside fencing required for streams in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds are shown in Figures 4.1 through 4.4, respectively.

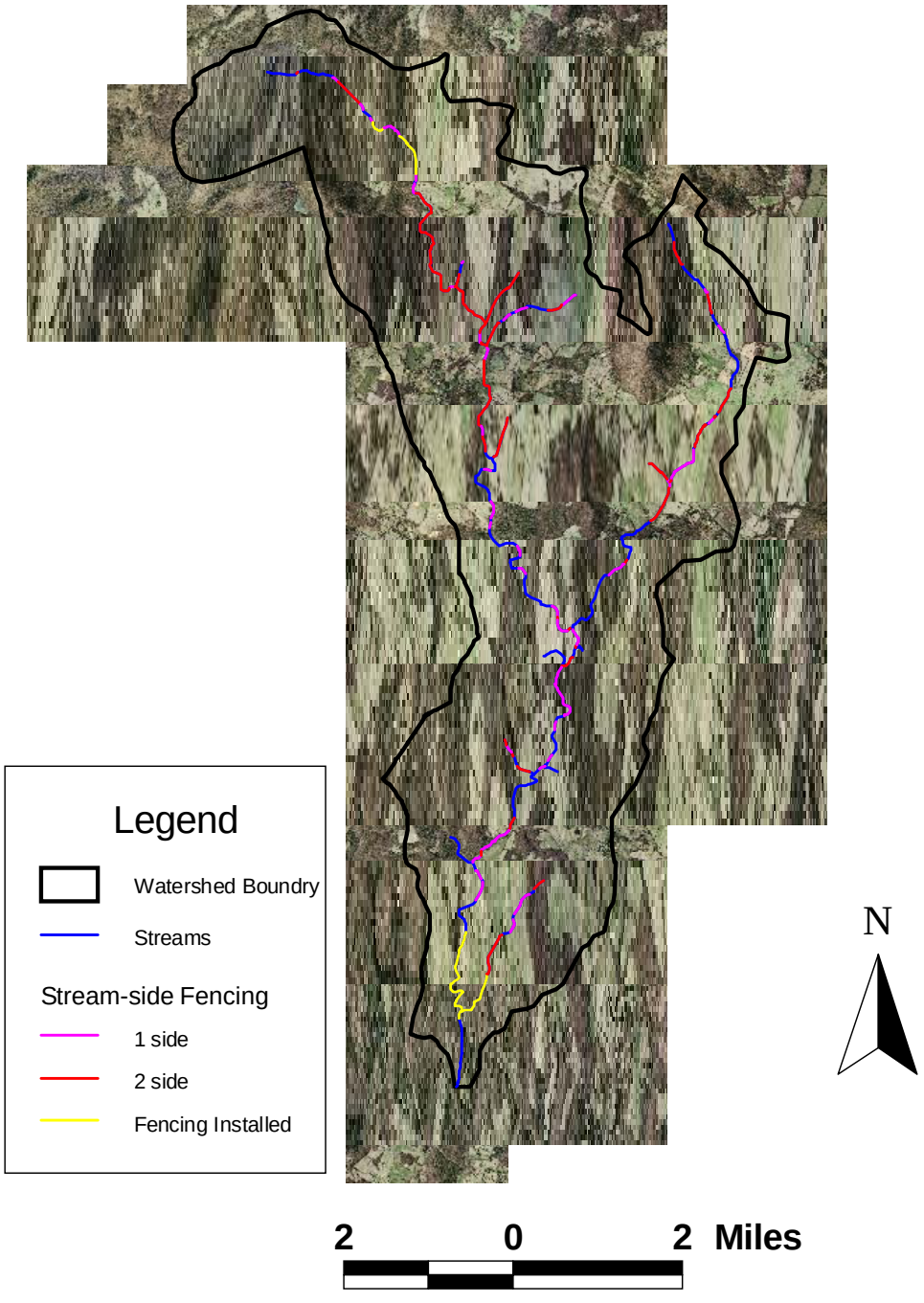

Figure 4.1. Potential pasture livestock access sites in the Thumb Run watershed.

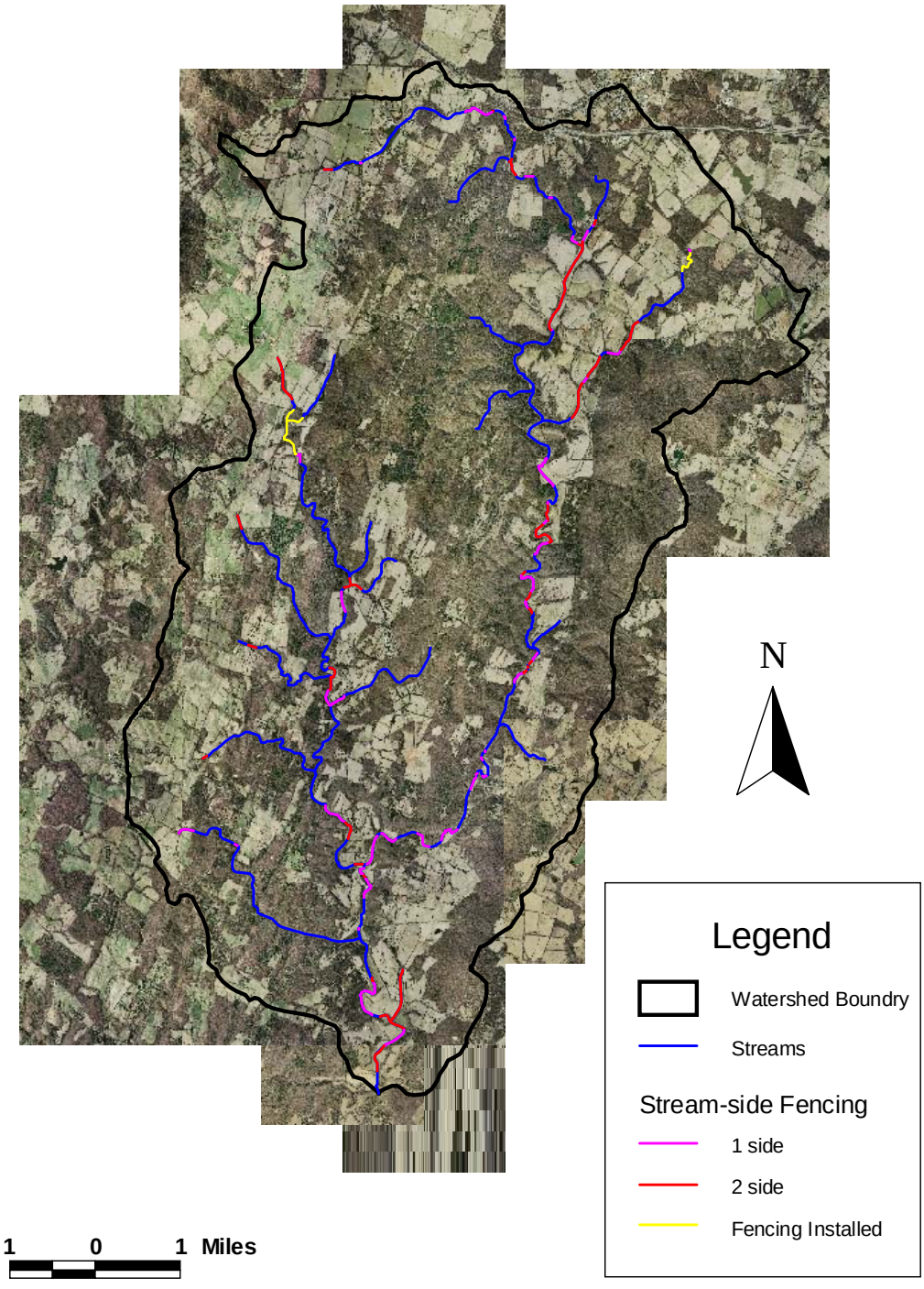

Figure 4.2. Potential pasture livestock access sites in the Carter Run watershed.

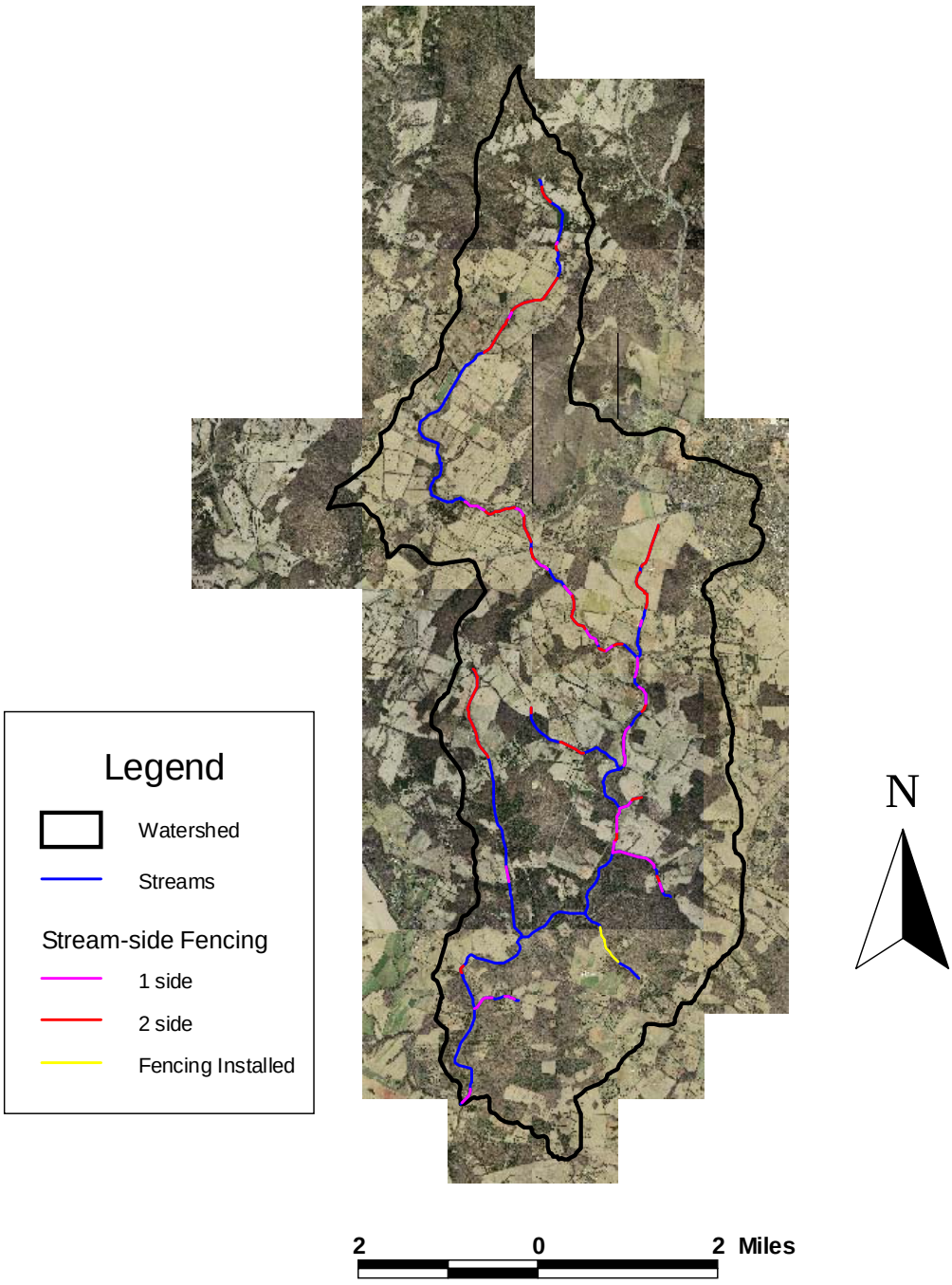

Figure 4.3. Potential pasture livestock access sites in the Great Run watershed.

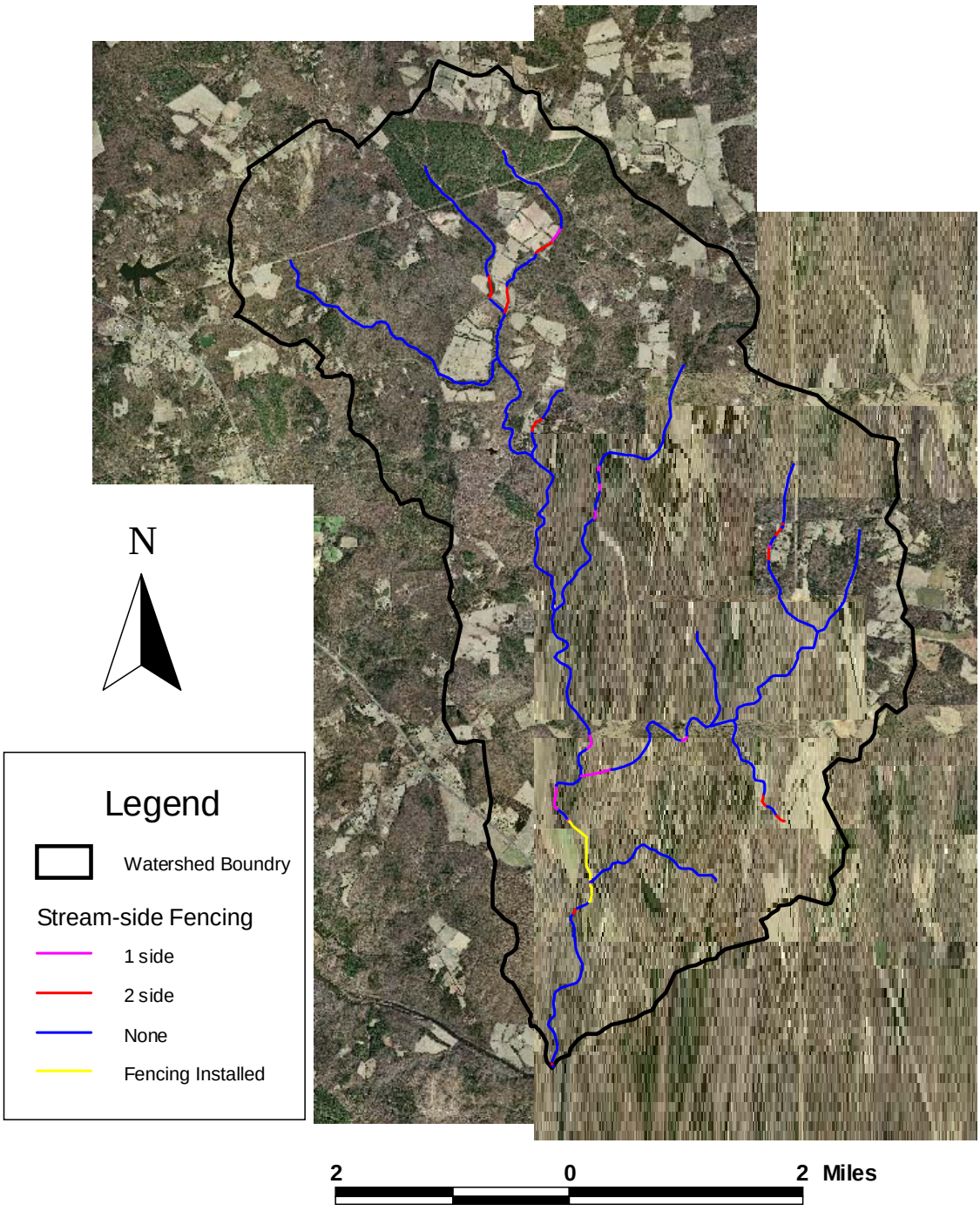

Figure 4.4. Potential pasture livestock access sites in the Deep Run watershed.

The VADCR Agricultural BMP Database was utilized to determine typical characteristics (e.g. streamside fencing length per practice) of full livestock exclusion systems leading to the quantification of the number of required systems. The database was queried for information on the SL-6 Grazing Land Protection Systems installed in the area covered by the JMSWCD and TCCSWCD. The query results showed 297 SL-6 systems installed since 1989 with an average streamside length per system of 2,150 feet. The SL-6 system includes streamside fencing for perennial and intermittent streams, cross fencing for pasture management, hardened crossing, alternative watering system, and 35-feet buffer from the stream. Additional analysis by JMSWCD staff was performed to compare these results. An SL-6 system was designed by JMSWCD staff for three farms varying in size throughout the watersheds. Streamside fencing was calculated for each design then averaged to equal an average 2,150 feet of streamside fencing per system. Existing fencing through participation in a cost-share program is depicted in Figures 4.1 through 4.4. There are approximately 97 miles of perennial streams in the four watersheds. The total length of fencing required on perennial streams in the four watersheds is approximately 68 miles of fence. This exclusion fencing is translated into 167 Grazing Land Protection Systems (SL-6) to be installed during Stage I to insure full exclusion of livestock from the streams.

Table 4.2. Estimation of total streamside fencing and number of full exclusion systems required in Thumb Run, Carter Run, Great Run, and Deep Run watersheds during Stage I implementation.

Impairment	Sub-watersheds	Total Fence Required (mi)	Livestock Exclusion Systems (#)
Carter Run	NS	20.6	51
Great Run	NS	15.9	39
Thumb Run	West 1	10.6	26
	West 2	3.3	8
	East 1	4.8	12
	Main 1	2.4	6
	Main 2	5.8	14
Deep Run	D-1	1.8	4
	D-2	0.0	0
	D-3	0.0	0
	D-4	0.7	2
	D-5	0.6	1
	D-6	0.7	2
	D-7	0.7	2
	D-8	0.0	0
TOTAL		**67.9**	**167**

NS= no sub-watersheds delineated during TMDL implementation development step

In order to address the bacteria load reductions on pasture land needed in Thumb Run, Carter Run, Great Run, and Deep Run watersheds, the benefit of including a 35-feet buffer with

streamside fencing was calculated. A reduction efficiency of 100% was assumed for the buffered area (i.e. fenced out pasture) coupled with 50% efficiency for upland area twice that of the buffered area. Using these efficiencies, the area treated by the buffer was calculated for each watershed. The ratio of the buffered area bacteria load and the applied bacteria load from the TMDL was calculated for pasture livestock access. The average reductions afforded to pasture lands load reduction by the buffers were estimated for Thumb Run, Carter Run, Great Run, and Deep Run, respectively, at 2.2%, 1.5%, 1.7%, and 1.79%. It was decided by the AWG that half the pasture land use would be included in the full live stock exclusion system. The bacteria load from the remaining pasture land use would be managed using the proposed pasture management BMP. The reduction efficiency of the proposed pasture management system BMP was estimated at 75%. Total of 16,270 acres in the four watersheds will be included in the pasture management system BMPs during Stage I (Table 4.3). These reduction efficiencies when added for each watershed were not sufficient to meet specified TMDL reduction goals on pasture land use. Therefore, runoff from pasture land acreage specified in the TMDL documents will need to be treated additionally with retention ponds to meet the specified reductions in the TMDL (Table 4.3).

A 35-feet border at the outside edge of cropland fields was calculated and summed for each watershed to determine amount of cropland acres that need to be converted to vegetated buffers. Bacteria load reductions on the remaining cropland acreage will be achieved through manure / biosolids incorporation. Conversion of approximately 3,200 cropland acres to vegetative buffers and manure incorporation into soil on approximately 5,334 cropland acres during Stage I was estimated to address required cropland reductions (Table 4.4).

Table 4.3. Estimation of pasture and cropland bacteria load reduction BMPs required in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds during Stage I and II implementation.

Impairment	Sub-watershed	Stage I			Stage II
		Pasture Management System (ac[1])	Vegetated Buffers (ac[1])	Manure Incorporation (ac[1])	Retention Pond (ac[1])
Carter Run	NS*	5,910	1,352	2,164	5,910
Great Run	NS*	4,010	890	1,696	4,010
Thumb Run	West 1	1,068	18	34	1,068
	West 2	1,540	10	18	1,540
	East 1	1,041	60	112	1,041
	Main 1	522	0	0	522
	Main 2	1,035	61	114	1,035
Deep Run	D-1	183	173	180	183
	D-2	72	55	81	72
	D-3	108	70	113	108
	D-4	140	86	160	140
	D-5	225	133	219	225
	D-6	125	76	141	125
	D-7	260	190	267	260
	D-8	32	22	32	32
TOTAL		**16,271**	**3,196**	**5,331**	**16,271**

[1] Acres installed.
[2] Cost included in livestock exclusion system cost.
[3] Acres treated.
*NS= no sub-watersheds delineated during TMDL implementation development step

4.1.3 Quantification of Residential Control Measures

The number of straight pipes and failing septic systems were based on numbers reported in the TMDL documents. It was decided that budgeting should be based on correcting all systems identified. It was assumed that half the straight pipes would be replaced with a conventional septic system and half replaced with an alternative waste treatment system. Failing septic systems were assumed to be corrected by repairing the existing septic system (40%), installing a new conventional septic system (50%), or installing a new alternative waste treatment system (10%). It is estimated that 102 septic system repairs, 146 conventional septic systems, and 44 alternative waste treatment systems are considered necessary to correct straight pipes and failing septic systems in the four watersheds during Stage I (Table 4.4).

In order to apply appropriate reductions to bacteria loads in Carter Run and Great Run watersheds, bacteria loads from on-site sewage disposal systems and pets were separated by translating the average annual in-stream load per source outlined in the TMDL to direct and land-based bacteria loadings using a source assessment spreadsheet developed by the Biological Systems Engineering Department at Virginia Tech. Populations and number of on-site sewage disposal systems specified in the TMDL and distribution factors describing local practices were input into the spreadsheet to estimate direct and land-based bacteria loadings. The output from the spreadsheet describing directly deposited bacteria loads was subtracted from the TMDL-prescribed reductions, applying the identified reduction percentage and considering die-off. The balance of the load allocation was assumed to originate from land-based loads for each source. After identification of the pollutant delivery pathways, control measures for pet waste reductions in Carter Run, Great Run, and Deep Run watersheds were derived.

A four-step program was proposed to address pet waste reductions. In the first step, a pet waste control program consisting of educational packets, signage, and disposal stations in public areas will be instituted (Table 4.5). Identification of confined canine units (CCU), conducting two CCU waste treatment demonstration projects, and installing approximately 25 CCU waste treatment systems will comprise the second step (Table 4.5). The third step will be to conduct two demonstration projects to promote landscape BMP installation to homeowners (Table 4.5). Steps one through three will be completed during Stage I of implementation. If necessary, the fourth step occurring during Stage II will be BMP installations to treat storm water runoff. Assuming a distribution of 60% treatment by retention ponds and 20% treatment each for infiltration trenches and raingardens, it was estimated that treatment of storm water runoff from 797 acres by retention ponds, 265 acres by infiltration trenches, and 265 acres by rain gardens, may be necessary (Table 4.6).

Table 4.4. Alternative waste disposal system, new septic system, and repaired septic system needed to correct straight pipes and failing septic systems in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds during Stage I implementation.

Impairment	Sub-watershed	Straight Pipes Corrections			Failing Septic Systems Corrections			
		AWTS	New SS	Total	AWTS	New SS	Repaired SS	Total
		(#)	(#)	(#)	(#)	(#)	(#)	(#)
Carter Run	NS	6	5	11	3	14	11	28
Great Run	NS	7	7	14	3	17	14	34
Thumb Run	West 1	1	0	1	0	2	1	3
	West 2	0	0	0	1	2	0	3
	East 1	0	0	0	0	1	2	3
	Main 1	0	0	0	0	1	2	3
	Main 2	0	0	0	1	2	1	4
Deep Run	D-1	1	0	1	1	5	4	10
	D-2	0	1	1	2	12	10	24
	D-3	1	1	2	2	12	10	24
	D-4	1	0	1	1	11	9	21
	D-5	1	1	2	2	12	9	23
	D-6	0	1	1	4	18	14	36
	D-7	1	1	2	4	19	14	37
	D-8	1	0	1	0	1	1	2
TOTAL		**20**	**17**	**37**	**24**	**129**	**102**	**255**

*NS= no sub-watersheds delineated during TMDL implementation development step
AWTS = Alternative Waste Treatment System, SS = Septic System

Table 4.5. Corrective actions for pet waste reductions during Stage I in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Impairment	Pet Waste Control Program (#)	CCU Demonstration (#)	CCU BMPs (#)	Landscape Demonstration (#)
Carter Run	1	1	10	1
Great Run	1	1	10	0
Thumb Run	0	0	0	0
Deep Run	1	0	5	1
TOTAL	**3**	**2**	**25**	**2**

CCU – concentrated canine unit

Table 4.6. Corrective actions for pet waste reductions during Stage II in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Impairment	Subwatershed	Retention Pond (acres treated)	Infiltration Trench (acres treated)	Rain Garden (acres treated)
Carter Run	NS	388	129	129
Great Run	NS	301	100	100
Thumb Run	West 1	0	0	0
	West 2	0	0	0
	East 1	0	0	0
	Main 1	0	0	0
	Main 2	0	0	0
Deep Run	D-1	24	9	9
	D-2	11	3	3
	D-3	14	5	5
	D-4	14	4	4
	D-5	8	3	3
	D-6	4	1	1
	D-7	30	10	10
	D-8	3	1	1
TOTAL		**797**	**265**	**265**

*NS= no sub-watersheds delineated during TMDL implementation development step

4.2 Assessment of Technical Assistance Needs

Members of the AWG, RWG, and GWG agree that technical assistance and education are keys to getting people involved in implementation. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what will most practically get the job done. Several education/outreach techniques will be utilized during implementation. Articles describing the TMDL process, the reasons why high levels of fecal bacteria are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible (*e.g.*, newsletters, packet to new homeowners, and targeted mailings).

Workshops and demonstrations should be organized to show landowners the extent of the problem, the effectiveness of control measures, and the process involved in obtaining technical and financial assistance.

For the agricultural community, field days, pasture walks, and demonstrations offered through local farm groups were recommended. The emphasis was on having local farmers discuss their experiences with the cost-share programs, demonstrating the advantages of a clean water source and pasture management, and presenting monitoring results to demonstrate the problem. It is generally accepted that farmers will be more persuaded by discussion with local technical personnel or fellow farmers who have implemented the suggested control measures than through presentations made by state-agency representatives. Articles describing the TMDL process, the reasons why high levels of bacteria are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made available to the public through as many channels as possible (e.g. Farm Bureau newsletters, FSA newsletters, and targeted mailings). Notices using all media outlets (e.g, cable television, public access channel programming, links on county website) need to be posted regarding status of implementation. Posting of informative/recognition signage throughout watershed (e.g, conservation practices implemented on farm) may prompt neighbors to participate. In general, a proactive approach to education needs to take place, whereby, technicians need to contact each landowner instead of waiting for the landowner to make contact.

For residential issues, public outreach should focus on means to educate and involve public with regard to implementing corrective actions to replace straight pipes, correct failing septic systems, and manage pet waste. Several education/outreach techniques need to be utilized during implementation of corrective actions for straight pipes and failing septic systems. The focus must be on obstacles (*e.g.*, money, information, and understanding of issues) that property owners face in correcting problems and proper operation and maintenance of systems Examples included: newspaper articles, small community meetings, workshops, model septic system and video displayed in public buildings, demonstration at county fair, information packet provided through realtors on proper operation and maintenance of on-site sewage disposal systems, and mailings. Technical assistance and educational outreach tasks were identified during plan development that would be needed during implementation. The following tasks associated with agricultural and residential programs were identified:

Agricultural Programs

1. Make contacts with landowners in the watershed to make them aware of implementation goals and cost-share assistance programs.
2. Provide technical assistance for agricultural programs (e.g. survey, design, layout, and approval of installation).
3. Develop educational materials & programs.
4. Organize educational programs (*e.g.*, pasture walks, presentations at field days or club events…).

5. Distribute educational materials (*e.g.*, informational articles in FSA or Farm Bureau newsletters, local media).
6. Handle and track cost-share.
7. Assess and track progress toward BMP implementation goals.
8. Follow-up contact with landowners who have installed BMPs.
9. Coordinate use of existing agricultural programs and suggest modifications where necessary.

Residential Programs

1. Identify failing septic systems & straight-pipes (*e.g.*, stream walks, analysis of aerial photos, mailings, monitoring, home visit).
2. Identify confined canine units (*e.g.*, mailings, County databases, site visit).
3. Track on-site sewage disposal system repairs/ replacements/ installations for human and confined canine units.
4. Handle and track cost-share.
5. Develop educational materials & programs.
6. Organize educational programs and demonstration projects.
7. Distribute educational materials (*e.g.*, informational pamphlets on TMDL & on-site sewage disposal systems).
8. Assess progress toward implementation goals.
9. Follow-up contact with landowners who have participated in the program(s).

Historically, the JMSWCD, TCCSWCD, and NRCS have taken the lead for agricultural technical assistance in the four watersheds. The VDH has been the primary organization for managing on-site sewage waste disposal. In order to quantify the number and type of agricultural control practices historically designed and implemented through the cost-share program by the JMSWCD, the VADCR Agricultural BMP Database was utilized. The period encompassed by the database was 1989 through 2004. In that time, the average number of BMPs installed was 48 per year with eight per year as the minimum and 131 per year as the maximum (Table 4.7).

Table 4.7. Number of BMPs installed with JMSWCD staff assistance through cost-share program for period between 1989 and 2004.

Year	BMPs	JMSWCD Staff	
		Technical	***Administrative***
1989	92	2	1
1990	131	2	1
1991	96	2	1
1992	31	2	1
1993	24	2	1
1994	23	2	1
1995	22	2	1
1996	8	2	1
1997	24	2	1
1998	36	2	1
1999	78	2	1
2000	59	2	1
2001	59	2	1
2002	37	2	1
2003	23	2	1
2004	28	2	1
Total	**771**	**32**	**16**

To determine the number of full time equivalents (FTE) considered necessary for agricultural technical assistance during implementation, the total practices needed to be installed per year during implementation was divided by the number of BMPs that one FTE can process in a year. It was assumed that all BMPs would need some level of technical assistance and the FTE would be responsible for educational outreach. Coupling the number of BMPs processed historically and estimates provided by JMSWCD, 20 FTE providing technical assistance and 10 FTE providing administrative assistance for the agricultural program are needed throughout implementation. Distribution of the technical assistance is outlined in Chapter 5.

Members of the RWG and GWG estimated that 10 technical FTE and five administrative FTE would be required throughout implementation to provide technical assistance and educational outreach tasks to correct on-site sewage disposal system problems. Members of the RWG, GWG, and steering committee estimated a five technical FTE and 2.5 administrative FTE throughout implementation would be required to address pet waste reductions. The number of FTE needed to provide assistance during implementation in the four watersheds is listed in Chapter 5.

4.3 Cost Analysis

4.3.1 Control Measures

Associated cost estimations for each implementation action during Stages I and II were calculated by multiplying the average unit cost per the number of units in each impairment shown in Table 4.1. The total average installation cost for full livestock exclusion systems in the four watersheds is $3.34 million (Table 4.8). Cost to reduce pasture loadings during Stage I using pasture management system BMPs and Stage II utilizing retention ponds will be $3.25 million and $32.5 million, respectively (Table 4.8). The total installation cost for control measures to obtain the cropland land-applied reductions in the four watersheds is estimated at $1.90 million (Table 4.8). Estimated corrective action costs needed to replace straight pipes and fix failing septic systems totaled $2.48 million excluding technical assistance (Table 4.9). The cost to implement the first three steps of the pet waste reduction process total cost an estimated $0.22 million excluding technical assistance (Table 4.10). Table 4.11 lists the cost to implement the fourth step of the pet waste reduction process to meet the Stage II goal.

Table 4.8. Estimated cost to install full livestock exclusion systems, pasture management systems, vegetated buffers on cropland, and manure/biosolids incorporation on cropland in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Impairment	Sub-shed	Stage I					Stage II	Total Cost
		Livestock Exclusion Systems ($)	Pasture Management System ($)	Vegetated Buffers ($)	Manure Incorporation ($)	Stage I Total ($)	Retention Pond ($)	($)
Carter Run	NS	1,020,000	1,182,000	757,120	43,280	3,002,400	11,820,000	14,822,400
Great Run	NS	780,000	802,000	498,400	33,920	2,114,320	8,020,000	10,134,320
Thumb Run	West 1	520,000	213,600	10,080	680	744,360	2,136,000	2,880,360
	West 2	160,000	308,000	5,600	360	473,960	3,080,000	3,553,960
	East 1	240,000	208,200	33,600	2,240	484,040	2,082,000	2,566,040
	Main 1	120,000	104,400	0	0	224,400	1,044,000	1,268,400
	Main 2	280,000	207,000	34,160	2,280	523,440	2,070,000	2,593,440
Deep Run	D-1	80,000	36,600	96,880	3,600	217,080	366,000	583,080
	D-2	0	14,400	30,800	1,620	46,820	144,000	190,820
	D-3	0	21,600	39,200	2,260	63,060	216,000	279,060
	D-4	40,000	28,000	48,160	3,200	119,360	280,000	399,360
	D-5	20,000	45,000	74,480	4,380	143,860	450,000	593,860
	D-6	40,000	25,000	42,560	2,820	110,380	250,000	360,380
	D-7	40,000	52,000	106,400	5,340	203,740	520,000	723,740
	D-8	0	6,400	12,320	640	19,360	64,000	83,360
TOTAL		**3,340,000**	**3,254,200**	**1,789,760**	**106,620**	**8,490,580**	**32,542,000**	**41,032,580**

Table 4.9. Estimated cost to replace straight pipes and fix failing septic systems in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Impairment	Sub-shed	Straight Pipes Corrections			Failing Septic Systems Corrections				Total Cost
		AWTS	New SS	Total	AWTS	New SS	Repaired SS	Total	
		(#)	(#)	(#)	(#)	(#)	(#)	(#)	($)
Carter Run	NS	150,000	35,000	185,000	75,000	98,000	38,500	211,500	396,500
Great Run	NS	175,000	49,000	224,000	75,000	119,000	49,000	243,000	467,000
Thumb Run	West 1	25,000	0	25,000	0	14,000	3,500	17,500	42,500
	West 2	0	0	0	25,000	14,000	0	39,000	39,000
	East 1	0	0	0	0	7,000	7,000	14,000	14,000
	Main 1	0	0	0	0	7,000	7,000	14,000	14,000
	Main 2	0	0	0	25,000	14,000	3,500	42,500	42,500
Deep Run	D-1	25,000	0	25,000	25,000	35,000	14,000	74,000	99,000
	D-2	0	7,000	7,000	50,000	84,000	35,000	169,000	176,000
	D-3	25,000	7,000	32,000	50,000	84,000	35,000	169,000	201,000
	D-4	25,000	0	25,000	25,000	77,000	31,500	133,500	158,500
	D-5	25,000	7,000	32,000	50,000	84,000	31,500	165,500	197,500
	D-6	0	7,000	7,000	100,000	126,000	49,000	275,000	282,000
	D-7	25,000	7,000	32,000	100,000	133,000	49,000	282,000	314,000
	D-8	25,000	0	25,000	0	7,000	3,500	10,500	35,500
TOTAL		**500,000**	**119,000**	**619,000**	**600,000**	**903,000**	**357,000**	**1,860,000**	**2,479,000**

*NS = sub-watersheds delineated during TMDL implementation development step

Table 4.10. Estimated cost to reduce pet waste bacteria loads during Stage I implementation (Steps 1 – 3) in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Impairment	Pet Waste Control Program	CCU Demonstration	CCU BMPs	Landscape Demonstration	Stage I Cost
	($)	($)	($)	($)	($)
Carter Run	3,750	20,000	50,000	20,000	93,750
Great Run	3,750	20,000	50,000	0	73,750
Thumb Run	0	0	0	0	0
Deep Run	3,750	0	25,000	20,000	48,750
TOTAL	**12,000**	**40,000**	**125,000**	**40,000**	**216,250**

Table 4.11. Estimated cost to reduce pet waste bacteria loads during Stage II implementation (Step 4) in the Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Impairment	Sub-shed	Retention Pond ($)	Infiltration Trench ($)	Rain Garden ($)	Total Cost ($)
Carter Run	NS	776,000	1,161,000	1,548,000	3,485,000
Great Run	NS	602,000	900,000	1,200,000	2,702,000
Thumb Run	West 1	0	0	0	0
	West 2	0	0	0	0
	East 1	0	0	0	0
	Main 1	0	0	0	0
	Main 2	0	0	0	0
Deep Run	D-1	48,000	81,000	108,000	237,000
	D-2	22,000	27,000	36,000	85,000
	D-3	28,000	45,000	60,000	133,000
	D-4	28,000	36,000	48,000	112,000
	D-5	16,000	27,000	36,000	79,000
	D-6	8,000	9,000	12,000	29,000
	D-7	60,000	90,000	120,000	270,000
	D-8	6,000	9,000	12,000	27,000
TOTAL		**1,594,000**	**2,385,000**	**3,180,000**	**7,159,000**

*NS= no sub-watersheds delineated during TMDL implementation development step

4.3.2 Technical Assistance

It was determined by the JMSWCD, VADCR, VDH, GWG, and Steering Committee members that it would require $60,000 and $45,000 to support the salary, benefits, travel, training, and incidentals for education of one technical FTE and administrative FTE, respectively. The total cost to provide assistance in the agricultural and residential programs during Stage I implementation is expected to be $0.83 million and $0.62 million, respectively. Technical assistance cost for Stage II is listed in Table 5. The total implementation cost including technical assistance is $12.63 million with the agricultural cost being $9.32 million and the residential cost $3.31 million.

4.4 Benefit Analysis

4.4.1 Human Health

The primary benefit of implementation is cleaner waters in Virginia, where bacteria levels in Thumb Run, Carter Run, Great Run, and Deep Run will be reduced to meet water quality standards. It is hard to gage the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other

sources. However, the incidence of infection from fecal sources, through contact with surface waters, should be reduced considerably. The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry.

4.4.2 Aquatic Community Improved, Nutrient and Sediment Load Reductions

Stream bank protection provided through exclusion of livestock from streams will improve the aquatic habitat in these streams. Vegetated buffers that are established will also help reduce sediment and nutrient transport to the stream from upslope locations. The installation of improved pasture management systems should also reduce soil and nutrient losses, increase infiltration of precipitation thereby decreasing peak flows downstream. Reductions in nutrient and sediment loadings contribute to attainment of nutrient and sediment reduction goals for the Commonwealth of Virginia Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the Rappahannock River and Northern Neck Coastal Basins, April 2004. Local initiatives, such as Fauquier County Riparian Easement Program, will additionally be complemented by actions performed during TMDL implementation.

4.4.3 Economics

An important objective of the IP is to foster continued economic vitality and strength. Healthy waters can improve economic opportunities for Virginians, and a healthy economic base can provide the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the landowner, along with the expected environmental benefits. For example, exclusion of cattle from streams leads to the development of alternative (clean) water sources, improved pasture management, and private sewage system maintenance will each provide economic benefits. Additionally, money spent by landowners, government agencies, and non-profit organizations in the process of implementing the IP will stimulate the local economy.

The benefit of a pasture management system BMP is improved profit through more efficient utilization and harvest of forage by grazing animals. Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal (VCE, 1996). Several factors contribute to greater profitability: stocking rate can usually be increased by 30% to 50%; high-quality, fresh, and unsoiled vegetative growth available throughout the grazing system increases weight gain per acre; vigor of the pasture sod is improved; and handling and checking grazing animals is easier. More accurate estimates of the amount of forage available, greater uniformity in grazing of pastures, flexibility of harvesting and storing forage not needed for grazing, and extending the length of the grazing season while providing a more uniform quality and quantity of forage throughout the season are important benefits afforded by this system (VCE, 1996).

In terms of economic benefits to homeowners, an improved understanding of private sewage systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. In addition, investment in the home is protected with a properly functioning sewage disposal system. A home's value can be

decreased up to 40% with a failed septic system (Shepherd, 2006). The average septic system will last 20-25 years if properly maintained. Proper maintenance includes; knowing the location of the system components and protecting them by not driving or parking on top of them, not planting trees where roots could damage the system, keeping hazardous chemicals out of the system, and pumping out the septic tank every three to five years. The cost of proper maintenance, as outlined here, is relatively inexpensive in comparison to repairing or replacing an entire system.

4.4.4 Livestock Herd Health

A clean water source coupled with exclusionary fencing has been shown to increase weight gains; decrease stress; reduce herd health risks associated with increased exposure to water-transmitted diseases, bacteria, virus and cysts infections; reduce mastitis and foot rot; and decrease herd injuries associated with cattle climbing unstable streambanks or being stuck in mud.

5. MEASUREABLE GOALS AND MILESTONES

The end goals of implementation are:

1) Restored water quality in the impaired waters, and
2) Subsequent de-listing of streams from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters.

Expected progress in implementation is established with two types of milestones; *implementation milestones* and *water quality milestones*. Implementation milestones establish the percentage of control measures installed within certain timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. Progress toward end goals will be assessed during implementation through tracking of control measure installations by JMSWCD, TCCSWCD, VDH, VADCR, Fauquier County, and Stafford County. The VADEQ will continue to assess water quality through its monitoring program. Other monitoring project activities in the watersheds (e.g., Thumb Run *E. coli* Coliscan Monitoring Project) will be coordinated with VADEQ to augment the VADEQ monitoring program.

Implementation will occur over 10 years and be assessed in two stages. Stage I is based on meeting source allocations that translate to an instantaneous standard violation rate of 10.5% or less resulting in removal of Thumb Run, Carter Run, Great Run and Deep Run from the Commonwealth of Virginia's Section 303(d) List of Impaired Waters. The Stage II goal is based on implementing source allocations to meet the specified TMDL goal, 0% violation of water quality standards. Implementation of control measures is scheduled for nine years beginning in June 2006 lasting to June 2015 (Tables 5.1 and 5.2). After implementation inception, five milestones will be met in Stage I, one milestone at the end of Stage I in the fifth year, three milestones in Stage II, and a final milestone in year 10 (Table 5.3).

Implementation in years one through five for agricultural source reductions focuses on livestock exclusion, pasture management systems, vegetative buffers on cropland, and manure incorporation on cropland. BMPs installed in years six through nine are based on additional treatment of runoff from pasture land using storm water BMPs to remove remaining bacteria load not treated with the pasture management systems installed during Stage I. These storm water BMPs (*i.e.*, retention ponds) are more costly and are logistically more difficult to design and locate on individual farms.

Implementation in years one through five for residential bacteria loads focuses on identification and removal of straight pipes, repairing or replacing failed septic systems, a pet waste control program, installation of storage and treatment systems for waste from confined canine units (CCU), and a storm water management landscape demonstration. BMPs to be installed in years six through nine are based on treating runoff from residential areas where pet waste is still considered a source contributing to the bacteria standard violations. The storm water runoff would be treated with retention ponds, infiltration trenches, and rain gardens.

An instantaneous water quality standard violation rate from 8% to 12% is anticipated, based on water quality modeling projections when the fifth year implementation milestone equaling 100%

installation of agricultural BMPs (excluding retention ponds), residential on-site sewage disposal systems, and a pet waste control program that includes storage and treatment of waste from CCUs (Table 5.3). The four impaired streams would be in a probable position to be de-listed upon attainment of the Stage I goal. Milestone six occurring in the fifth year is attainment of the Stage I goal. If the water quality has not improved to the point that the streams can be de-listed upon attaining the Stage I implementation goal a process could be initiated (*i.e.*, use attainability analysis) to change the designated use of Thumb Run, Carter Run, Great Run, and Deep Run. The current designated use is full contact recreation, which includes swimming. Virginia allows the adoption of a secondary contact designated use in the case that human, livestock, and pet sources are addressed to the maximum extent practicable and water quality goals are not being obtained.

Table 5.1. Percentage of practices to be installed addressing livestock exclusion and land-applied reductions with amount of technical assistance needed in Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Year	Livestock Exclusion Systems		Pasture Management System		Vegetative Buffers		Manure Incorporation		Retention Pond		Tech. Assist.	Admin. Assist.
	(%)	(#)	(%)	(ac[1])	(%)	(ac[2])	(%)	(ac[2])	(%)	(ac[1])	(FTE[3])	(FTE)
1	10	17	10	1,627	10	320	10	533	0	0	2.0	1.0
2	20	33	20	3,254	20	640	20	1,067	0	0	2.0	1.0
3	20	33	20	3,254	20	640	20	1,067	0	0	2.0	1.0
4	30	50	30	4,881	30	960	30	1,600	0	0	2.0	1.0
5	20	34	20	3,254	20	640	20	1,067	0	0	2.0	1.0
6	0	0	0	0	0	0	0	0	24	3,905	2.0	1.0
7	0	0	0	0	0	0	0	0	24	3,905	2.0	1.0
8	0	0	0	0	0	0	0	0	26	4,230	2.0	1.0
9	0	0	0	0	0	0	0	0	26	4,230	2.0	1.0
10	0	0	0	0	0	0	0	0	0	0	2.0	1.0
Total	**100**	**167**	**100**	**16,270**	**100**	**3,200**	**100**	**5,334**	**100**	**16,270**	**20.0**	**10.0**

[1] Acres treated.
[2] Acres installed
[3] Implementation will begin with one FTE.

Table 5.2. Percentage of practices to be installed addressing straight pipes, failing septic systems, and land-applied pet waste reductions with amount of technical assistance needed in Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Year	Straight Pipes Corrected		Failed Septic System Corrected		Pet Waste Control Program		CCU Demo.		CCU Treatment System		Landscape Demo.		Retention Pond		Infiltration Trench		Rain Garden		TA	AA
	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)	(ac[1])	(%)	(ac[1])	(%)	(ac[1])	(FTE)	(FTE)
1	20	7	20	51	100	3	50	1	0	0	0	0	0	0	0	0	0	0	1.5	0.75
2	20	7	20	51	0	0	50	1	40	10	0	0	0	0	0	0	0	0	1.5	0.75
3	20	7	20	51	0	0	0	0	60	15	0	0	0	0	0	0	0	0	1.5	0.75
4	20	8	20	51	0	0	0	0	0	0	100	1	0	0	0	0	0	0	1.5	0.75
5	20	8	20	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0.75
6	0	0	0	0	0	0	0	0	0	0	0	0	20	159	20	53	20	53	1.5	0.75
7	0	0	0	0	0	0	0	0	0	0	0	0	20	159	20	53	20	53	1.5	0.75
8	0	0	0	0	0	0	0	0	0	0	0	0	20	159	20	53	20	53	1.5	0.75
9	0	0	0	0	0	0	0	0	0	0	0	0	40	319	40	106	40	106	1.5	0.75
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0.75
Total	**100**	**37**	**100**	**255**	**100**	**3**	**100**	**2**	**100**	**25**	**100**	**1**	**100**	**797**	**100**	**265**	**100**	**265**	**15.0**	**7.50**

[1] Acres treated. CCU = Confined Canine Unit; Demo. = Demonstration; TA = Technical Assistance; AA = Administrative Assistance

Table 5.3. Implementation and water quality milestones for Thumb Run, Carter Run, Great Run, and Deep Run watersheds .

Milestone	Stage	Date	Implementation Milestones								Water Quality Milestone			
			Livestock Exclusion Systems (%)	Pasture Management System BMPs (%)	Cropland Land-Applied BMPs (%)	Retention Ponds (%)	Straight Pipes (%)	Failing Septic Systems (%)	Stage I Pet Waste BMPs (%)	Stage II Pet Waste BMPs (%)	Instantaneous Water Quality Standard Exceedance in: Carter Run[1] (%)	Great Run[1] (%)	Thumb Run[2] (%)	Deep Run[1] (%)
0		6/1/06	Implementation Begins								34	35	35	35
1	I	6/1/07	10	10	10	---	20	20	20	---	30	31	32	35
2		6/1/08	30	30	30	---	40	40	40	---	20	25	28	33
3		6/1/09	50	50	50	---	60	60	60	---	16	22	23	29
4		6/1/10	80	80	80	---	80	80	80	---	10	11	14	21
5		6/1/11	100	100	100	---	100	100	100	---	10	11	8	12
6		12/1/11	De-listing from Section 303(d) List of Impaired Waters											
7	II	6/1/12	---	---	---	24	---	---	---	20	8	7	0	8
8		6/1/13	---	---	---	48	---	---	---	40	4	5	0	4
9		6/1/14	---	---	---	74	---	---	---	60	4	5	0	0.16
10		6/1/15	---	---	---	100	---	---	---	100	0	0	0	0
11		6/1/16	TMDL Load Allocations Attained											

[1] Exceedance based on instantaneous *E. coli* standard of 235 cfu/100ml.
[2] Exceedance based on instantaneous fecal coliform standard of 1,000 cfu/100ml.

Table 5.4. Implementation cost associated with percentage of practices installed addressing agricultural and residential practices along with technical assistance needed in Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Year	Agricultural				Residential						Total Cost
	Livestock Exclusion Systems	Land-applied BMPs	Tech Assist.	Total Agric. Cost	Straight Pipe Corrected	Failed Septic System Corrected	OSSDS Tech. Assist.	Pet Waste Reductions	Pet Waste Tech. Assist.	Total Res. Cost	
	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)	($)
1	334,000	515,000	165,000	1,014,000	118,400	377,400	83,000	31,000	41,000	650,800	1,664,800
2	668,000	1,030,000	165,000	1,863,000	118,400	377,400	83,000	70,000	41,000	689,800	2,552,800
3	668,000	1,030,000	165,000	1,863,000	118,400	377,400	83,000	75,000	41,000	694,800	2,557,800
4	1,002,000	1,546,000	165,000	2,713,000	118,400	377,400	83,000	20,000	41,000	639,800	3,352,800
5	668,000	1,030,000	165,000	1,863,000	118,400	377,400	83,000	20,000	41,000	639,800	2,502,800
6	0	7,810,000	165,000	7,975,000	0	0	0	1,434,000	41,000	1,475,000	9,450,000
7	0	7,810,000	165,000	7,975,000	0	0	0	1,434,000	41,000	1,475,000	9,450,000
8	0	8,461,000	165,000	8,626,000	0	0	0	1,434,000	41,000	1,475,000	10,101,000
9	0	8,461,000	165,000	8,626,000	0	0	0	2,868,000	41,000	2,909,000	11,535,000
10	0	0	165,000	165,000	0	0	0	0	41,000	41,000	206,000
Total (1-5)	**3,340,000**	**5,151,000**	**825,000**	**9,316,000**	**592,000**	**1,887,000**	**415,000**	**216,000**	**205,000**	**3,315,000**	**12,631,000**
Total (1-10)	**3,340,000**	**37,693,000**	**1,650,000**	**42,683,000**	**592,000**	**1,887,000**	**415,000**	**7,386,000**	**410,000**	**10,690,000**	**53,373,000**

5.1 Targeting

The process of a staged implementation implies targeting of control measures, ensuring optimum utilization of resources. In quantifying agricultural BMPs through the use of aerial, land use, farm tracts, and stream network GIS layers, maps were formulated showing potential livestock access, crop fields, and pastures per farm tract. Maps created of the Thumb Run, Carter Run, Great Run, and Deep Run watersheds are depicted in Figures 4.1 through 4.4. These maps identify farm tracts that JMSWCD and TCCSWCD should concentrate efforts in. Owners will be contacted and progression through BMP installation will be tracked. Known problem areas, clusters of older homes, or houses in close proximity to streams known by the VDH will be targeted for onsite treatment system control measures. Steps outlined in pet waste BMP stages results in targeting of source type and resources.

5.2 Monitoring

Implementation progress success will be determined by water quality monitoring conducted by VADEQ through the agency's monitoring program. VADEQ will monitor at nine monitoring locations in the Thumb Run, Carter Run, Great Run and Deep Run watersheds (Figure 5.1 and Table 5.5). Station 3-DPR001.70 in the Deep Run watershed is an ambient trend station and will be monitored indefinitely on a bi-monthly basis during implementation. The remaining eight ambient stations will be monitored on a bi-monthly basis from January 2006 through December 2007, after which monitoring continuation by VADEQ beyond this period will be evaluated. A separate *E. coli* coliscan monitoring project with 10 stations located throughout the Thumb Run watershed is currently underway. The JMSWCD has the lead for this project. Monitoring stations description and location are depicted in Table 5.6 and Figure 5.2. Monitoring results are accessible on the VADEQ website (http://www.deq.state.va.us/water/).

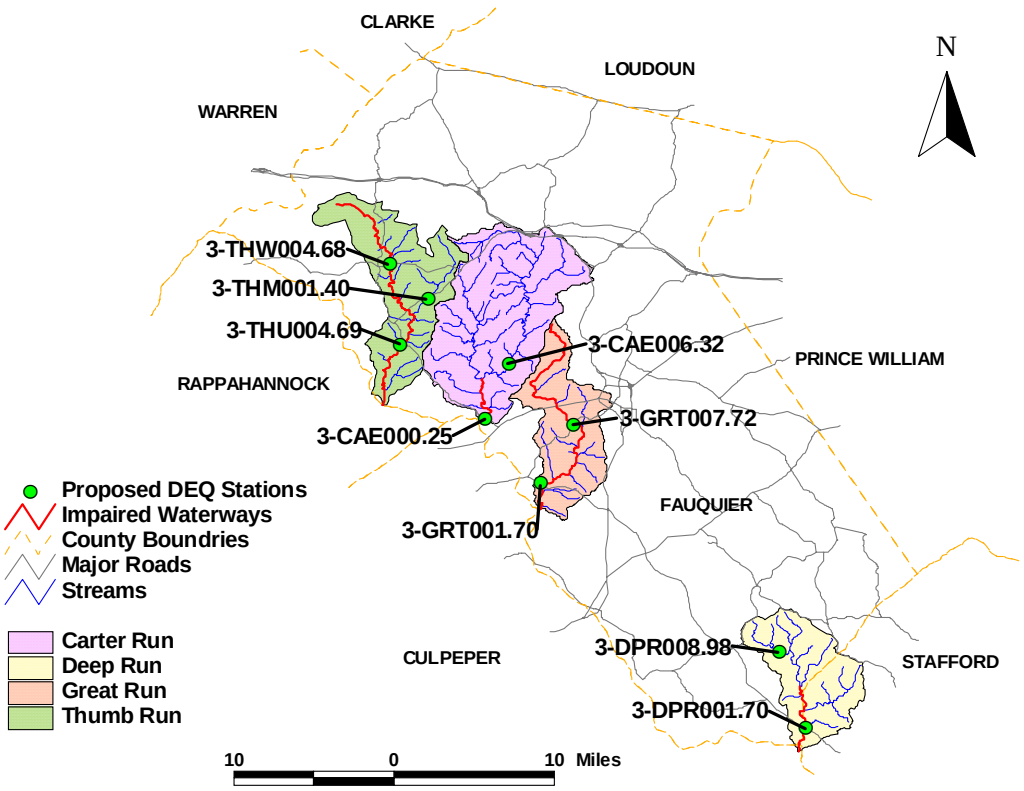

Figure 5.1. Location of VADEQ monitoring stations.

Table 5.5. VADEQ monitoring station IDs, locations, type, and monitoring schedules in Thumb Run, Carter Run, Great Run, and Deep Run watersheds.

Station ID	Station Location	Station Type	Monitoring Period
3-THW004.68	West Branch Thumb Run @ Rt. #635 (Humes Rd.)	Ambient Watershed	01/06 – 12/07
3-THM001.40	East Branch Thumb Run @ Rt. #647 (Cresthill Rd.)	Ambient	01/06 – 12/07
3-THU004.69	Thumb Run @ Rt. 688 (Leeds Manor Rd.)	Ambient Watershed	01/06 – 12/07
3-CAB006.32	Carter Run @ Rt. #738	Ambient Watershed	01/06 – 12/07
3-CAB000.25	Carter Run @ Rt. #688	Ambient Watershed	01/06 – 12/07
3-GRT007.72	Great Run @ Rt. #802	Ambient Watershed	01/06 – 12/07
3-GRT001.70	Great Run @ Rt. #687	Ambient Watershed	01/06 – 12/07
3-DPR008.98	Deep Run @ Rt. #634	Ambient	01/06 – 12/07
3-DPR001.70	Deep Run @ Rt. #17	Ambient Trend	01/06 – indefinite

Table 5.6. Description of E. coli coliscan stations in Thumb Run watershed.

Sample Site #	Station Location	Comments	Monitoring Period
TR1	Main Branch Thumb Run at Rt. 736 bridge	Gravel road, wooden bridge	10/05 – 09/06
TR2	Main Branch at Rt. 688 bridge	Tall bridge, need rope and tube	10/05 – 09/06
TR3	West Branch on Rt. 647, 1 mile north of Rt. 688	Just past Rosewood Lane	10/05 – 09/06
TR4	West Branch on Rt. 635, .5 mile east of Hume	None	10/05 – 09/06
TR5	West Branch on Rt. 688 at Leeds Chapel Rd.	Just before Leeds Episcopal Church	10/05 – 09/06
TR6	West Branch on Canaan Road west of Rt. 688	Canaan Road is opposite of Rt. 729	10/05 – 09/06
TR7	West Branch on Rt. 728	Site is just past Sunnyside Lane	10/05 – 09/06
TR8	East Branch on Rt. 732	Near intersection with Rt. 724	10/05 – 09/06
TR9	East Branch on Rt. 635	Just west of Rt. 647 intersection	10/05 – 09/06
TR10	East Branch on Rt. 647	Vernon Mills on topo map	10/05 – 09/06

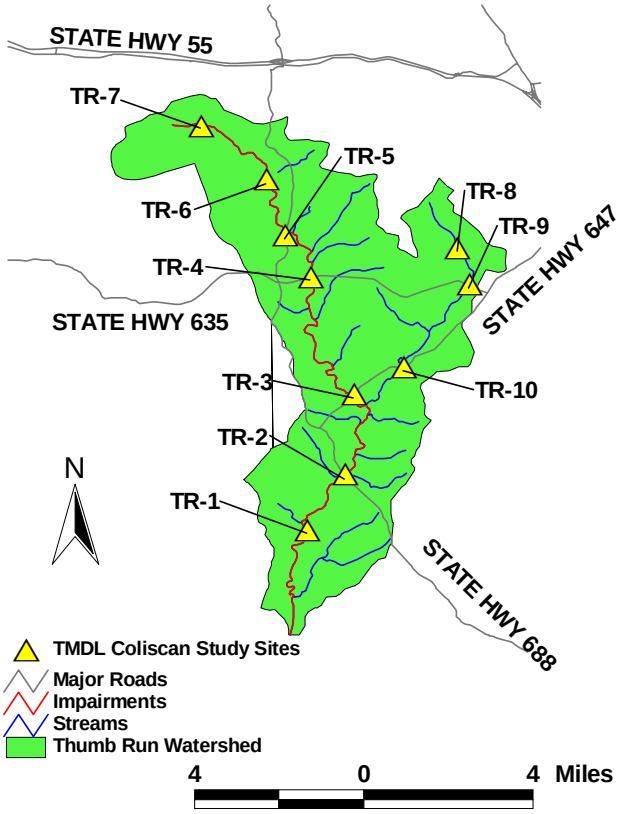

Figure 5.2. E.coli coliscan station locations in Thumb Run watershed.

6. STAKEHOLDER'S ROLES AND RESPONSIBILITIES

Achieving the goals of implementation will only occur with stakeholder participation. Excessive amounts of fecal bacteria in surface water used for recreation have been known to indicate an increased risk of pathogen-induced illness to humans (USEPA, 2001). Infections due to pathogen-contaminated recreational waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases (USEPA, 1986). According to the Centers for Disease Control and Prevention, known pathogens account for an estimated 14 million illnesses, 60,000 hospitalizations, and 1,800 deaths per year in the United States (Mead, 2006). As stakeholders, we must assess the risk we are willing to accept and then implement measures to safeguard the public from these risks. Water quality standards are society's implementation of legislative measures resulting from an assessment of the acceptable risks.

Stakeholders are individuals who live or have land management responsibilities in the watershed, including government agencies, businesses, private individuals and special interest groups. Successful implementation depends on stakeholders taking responsibility for their role in the process, the primary role falls on the local groups that are most affected; that is, businesses, community watershed groups, and citizens. However, local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. Stakeholder participation and support is essential for achieving the goals of this TMDL effort (*i.e.*, improving water quality and removing streams from the impaired waters list). Virginia's approach to correcting non-point source pollution problems continues to be encouragement of participation through education and financial incentives; that is, outside of the regulatory framework. If, however, voluntary approaches prove to be ineffective, it is likely that implementation will become less voluntary and more regulatory.

The roles and responsibilities of some of the major stakeholders on a federal, state, and local level are as follows:

USEPA: The USEPA has the responsibility of overseeing the various programs necessary for the success of the CWA. However, administration and enforcement of such programs falls largely to the states.

NRCS: The NRCS is the federal agency that works hand-in-hand with the American people to conserve natural resources on private lands. NRCS assists private landowners with conserving their soil, water, and other natural resources. Local, state and federal agencies and policymakers also rely on the expertise of NRCS staff. NRCS is also a major funding stakeholder for impaired water bodies through the Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Incentive Program (EQIP).

In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments in conjunction with the state can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people who can be shown to be causing some harm to the claimant. Through hearing the claims of citizens in civil court, and the claims of government representatives in criminal court, the judicial branch of

government also plays a significant role in the regulation of activities that impact water quality. Currently, there are five state agencies responsible for regulating and/or overseeing statewide activities that impact water quality associated with bacteria in Virginia. These agencies include: VADEQ, VADCR, VDACS, VDH, and VCE.

VADEQ: The State Water Control Law authorizes the State Water Control Board to control and plan for the reduction of pollutants impacting the chemical and biological quality of the State's waters resulting in the degradation of the swimming, fishing, shell fishing, aquatic life, and drinking water uses. For many years the focus of VADEQ's pollution reduction efforts was the treated effluent discharged into Virginia's waters via the VPDES permit process. The TMDL process has expanded the focus of VADEQ's pollution reduction efforts from the effluent of wastewater treatment plants to the pollutants causing impairments of the streams, lakes, and estuaries. The reduction tools are being expanded beyond the permit process to include a variety of voluntary strategies and BMPs. VADEQ is the lead agency in the TMDL process. The Code of Virginia directs VADEQ to develop a list of impaired waters, develop TMDLs for these waters, and develop IPs for the TMDLs. VADEQ administers the TMDL process, including the public participation component, and formally submits the TMDLs to USEPA and the State Water Control Board for approval. VADEQ is also responsible for implementing point source WLAs, assessing water quality across the state, and conducting water quality standard related actions.

VADCR: The VADCR is authorized to administer Virginia's NPS pollution reduction programs in accordance with §10.1-104.1 of the Code of Virginia and §319 of the Clean Water Act. USEPA is requiring that much of the §319 grant monies be used for the development of TMDLs. Because of the magnitude of the NPS component in the TMDL process, VADCR is a major participant the TMDL process. VADCR has a lead role in the development of IPs to address correction of NPSs contributing to water quality impairments. VADCR also provides available funding and technical support for the implementation of NPS components of IPs. The staff resources in VADCR's TMDL program focus primarily on providing technical assistance and funding to stakeholders to develop and carry out IPs, and support to VADEQ in TMDL development related to NPS impacts. VADCR staff will also be working with other state agencies, Soil and Water Conservation Districts, and watershed groups to gather support and to improve the implementation of TMDL plans through utilization of existing authorities and resources.

VDACS: The VDACS Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis. If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken, which may include civil penalties. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, *etc*. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures.

Fauquier County Health Department: The Fauquier County Health Department is responsible for maintaining safe drinking water measured by standards set by the USEPA. Their duties also include septic system regulation and regulation of biosolids land application. Like VDACS, VDH is complaint driven. Complaints can range from a vent pipe odor that is not an actual

sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. For TMDLs, VDH has the responsibility of enforcing actions to correct failed septic systems and/or eliminate straight pipes (Sewage Handling and Disposal Regulations, 12 VAC 5-610-10 *et seq.*). The VDH has accepted the responsibility of working with landowners to implement the corrective actions to remove straight pipes and failing on-site sewage disposal systems and provide educational information and coordinate programs/events.

VCE: VCE is an educational outreach program of Virginia's land grant universities (Virginia Tech and Virginia State University), and a part of the national Cooperative State Research, Education, and Extension Service, an agency of the United States Department of Agriculture. VCE is a product of cooperation among local, state, and federal governments in partnership with citizens. VCE offers educational programs and technical resources for topics such as crops, grains, livestock, poultry, dairy, natural resources, and environmental management. VCE has published several publications that deal specifically with TMDLs. For more information on these publications and to find the location of county extension offices, visit www.ext.vt.edu. VCE has agreed to promote education and provide outreach to citizens, businesses, and developers regarding necessary pet waste reductions.

Local government groups work closely with state and federal agencies throughout the TMDL process; these groups possess insights about their community that may help to ensure the success of TMDL implementation. These stakeholders have knowledge about a community's priorities, how decisions are made locally, and how the watershed's residents interact. Some local government groups and their roles in the TMDL process are listed here:

JMSWCD & TCCSWCD: The JMSWCD and TCCSWCD are local units of government responsible for the soil and water conservation work within Fauquier and Stafford counties, respectively. The district's overall role is to increase voluntary conservation practices among farmers, ranchers and other land users Specific to the TMDL implementation, the districts will lead education and technical assistance efforts and track BMP implementation for the agricultural program.

Fauquier and Stafford County Government Departments: Government staff will work closely with local and state agencies, citizens, and the RRRC to implement the TMDLs.

RRRC: Environmental planning is a long-standing area of emphasis of the RRRC, which is complementary to the TMDL process. RRRC continues to promote efficient development of the environment by assisting and encouraging local governmental agencies to plan for the future. TMDL development and implementation plan development have been contracted through the RRRC. The RRRC will continue to work with VADCR and the Steering Committee to periodically revisit implementation progress and suggest plan revisions as needed.

Citizens & Businesses: The primary role of citizens and businesses is simply to get involved in the TMDL process. This may include participating in public meetings, assisting with public outreach, providing input about the local watershed history, and/or implementing best management practices to help restore water quality.

7. INTEGRATION WITH OTHER WATERSHED PLANS

Each watershed within the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographical boundaries and goals. These include but are not limited to, the Chesapeake Bay 2000 agreement, Chesapeake Bay Nutrient and Sediment Reduction Strategy for the Rappahannock River Basin, roundtables, Water Quality Management Plans, sediment and erosion control regulations, stormwater management, Source Water Assessment Program, and local comprehensive plans. The progress of these projects or programs needs continuous evaluation to determine possible effects on implementation goals. For example, financial and technical resources may be maximized for implementation by coordinating and expanding the planning and implementation activities of these on-going watershed projects or programs. Recent initiatives within Fauquier County include:

Fauquier County Riparian Easement Program

Initiated in August 2005, the program is a cooperative effort among regional and county agencies and local non-profits to secure riparian easements for the purpose of improving, protecting and preserving stream and river water quality. Application has been made to VADCR for funding to support a program manager. Currently in the early planning phase, the program will focus on tax incentives, development proffers and the proposed VADEQ nutrient trading program to fund easement purchases. Agencies/groups involved include: Fauquier County Dept. of Community Development, Fauquier County Agricultural Development Office, Fauquier County Administration, Fauquier County Health Department, Fauquier County GIS Department, VADCR, VADEQ, Virginia Department of Forestry (VDOF), Occoquan Watershed Monitoring Laboratory, Rappahannock River Basin Commission, RRRC, Northern Virginia Regional Commission, Virginia Outdoors Foundation, Piedmont Environmental Council, Goose Creek Association, Friends of the Rappahannock, and Citizens for Fauquier County.

Fauquier County Water Resources Management Plan

Although focused primarily on groundwater, the plan, currently in its development phase, will evaluate all existing water supplies, demand projections, surface water data and resource management issues related to both ground and surface water. Background work for the management plan began in March 2005 as an initiative of the Fauquier County Water Resource Management Program, which coordinates local and regional surface and groundwater issues and initiatives, collects, reviews and analyzes information to guide land development decisions, and coordinates local water resource protection programs.

8. POTENTIAL FUNDING SOURCES

Potential funding sources available during implementation were identified during plan development. It was noted that Great Run is designated as potential spawning habitat for Blue Back Herring and could be eligible for additional funding from U.S. Fish and Wildlife Service or VDGIF. A brief description of program and requirements is provided below. Detailed description of each source (i.e., eligibility requirements, specifications, incentive payments) can be obtained from the JMSWCD, TCCSWCD, VADCR, NRCS, VCE, and VADEQ.

Virginia Agricultural Best Management Practices Cost-Share Program

The Program is administered by VADCR to improve water quality in the state's streams, rivers and the Chesapeake Bay. The basis of the program is to encourage the voluntary installation of agricultural best management practices to meet Virginia's NPS pollution water quality objectives. This program is funded by the state Water Quality Improvement Fund (WQIF) and the federal Chesapeake Bay Program Implementation Grant monies through local Soil and Water Conservation Districts (SWCDs). Farmers and landowners are encouraged to use BMPs on their land to better control sediment, nutrient loss, and transportation of pollutants into our waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. The objective is to solve water quality problems by fixing the worst problems first. Cost-share is typically 75% of the actual cost, not to exceed the local maximum. http://www.dcr.state.va.us/sw/docs/bmpsbro2.pdf

Virginia Agricultural Best Management Practices Tax Credit Program

The program provides a tax credit for approved agricultural BMPs that are installed to improve water quality in accordance with a conservation plan approved by the local SWCD. The goal of this program is to encourage voluntary installation of BMPs that will address Virginia's NPS pollution water quality objectives. For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, shall be allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. "Agricultural best management practices" are approved measures that will provide a significant improvement to water quality in the state's streams and rivers, and is consistent with other state and federal programs that address agricultural nonpoint source pollution management. Any practice approved by the local SWCD Board shall be completed within the taxable year in which the credit is claimed. The credit shall be allowed only for expenditures made by the taxpayer from funds of his/her own sources. The amount of such credit shall not exceed $17,500 or the total amount of the tax imposed by this program, whichever is less, in the year the project was completed, as certified by the Board. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with other cost-share programs on the stake holder's portion of BMP costs. It is also approved for use in supplementing the cost of repairs to streamside fencing. http://www.dcr.state.va.us/sw/docs/bmpsbro2.pdf

Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible organizations include local governments, SWCDs, and individuals. Grants for point sources are administered through VADEQ and grants for nonpoint sources are administered through VADCR. Most WQIF grants provide matching funds on a 50/50 cost-share basis. Successful applications are listed as draft/public-noticed agreements, and are subjected to a public review period of at least 30 days. http://www.deq.virginia.gov/bay/wqif.html

Virginia Forest Stewardship Program
The program is administered by the VADOF to protect soil, water, and wildlife and to provide sustainable forest products and recreation. http://www.vdof.org/resources/f127_po.pdf

Virginia Small Business Environmental Compliance Assistance Fund
The program provides financial assistance to small businesses by providing loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs certified as eligible by VADCR. Interest rates are fixed at 3%, and the maximum loan available is $100,000. There is a $30 non-refundable application processing fee. The program will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act. http://www.dba.state.va.us/financing/programs/small.asp

Community Development Block Grant Program
The Department of Housing and Urban Development sponsors this program, intended to develop viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities primarily for persons of low and moderate income. Recipients may initiate activities directed toward neighborhood revitalization, economic development, and provision of improved community facilities and services. Specific activities may include public services, acquisition of real property, relocation and demolition, rehabilitation of structures, and provision of public facilities and improvements, such as new or improved water and sewer facilities. http://www.hud.gov/offices/cpd/communitydevelopment/programs/index.cfm

Federal Clean Water Act 319 Incremental Funds
EPA develops guidelines that describe the process and criteria to be used to award CWA Section 319 NPS grants to states. States may use up to 20% of the Section 319 incremental funds to develop NPS TMDLs as well as to develop watershed-based plans for Section 303(d) listed waters. The balance of funding can be used for implementing watershed-based plans for waters that have completed TMDLs. Implementation of both agricultural and residential BMPs is eligible. VADCR administers the money, in coordination with the Nonpoint Source Advisory Committee (NPSAC), to fund watershed projects, demonstration and educational programs, nonpoint source pollution control program development, and technical and program staff. VADCR reports annually to the USEPA on the progress made in nonpoint source pollution prevention and control. http://www.epa.gov/owow/nps/319/319stateguide-revised.pdf

Conservation Reserve Program (CRP)

The program offers annual rental payments, incentive payments for certain activities, and cost-share assistance to establish approved cover on cropland. Contract duration is between 10 and 15 years, and cost-share assistance is provided up to 50% of costs. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration. Offers are accepted and processed during fixed signup periods that are announced by Farm Service Agency (FSA). All eligible (cropland) offers are ranked using a national ranking process. Payments are based on a per-acre soil rental rate. Cost-share assistance is available to establish the conservation cover of tree or herbaceous vegetation. The per-acre rental rate may not exceed the Commodity Credit Corporation's maximum payment amount, but producers may elect to receive an amount less than the maximum payment rate, which can increase the ranking score. To be eligible for consideration, the following criteria must be met: 1) cropland was planted or considered planted in an agricultural commodity two of the five most recent crop years; and 2) cropland is classified as "highly-erodible" by NRCS. Eligible practices include planting these areas to trees and/or herbaceous vegetation. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximizes wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. http://www.nrcs.usda.gov/programs/crp/

Conservation Reserve Enhancement Program (CREP)

In Virginia, this is a partnership program between the USDA and the Commonwealth of Virginia, with the VADCR being the lead state agency. The program uses financial incentives to encourage farmers to enroll in contracts of 10 to 15 years or perpetual easements to remove lands from agricultural production. This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% - 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. The statewide goal is 8,000 acres. The landowner can obtain and complete CREP application forms at the FSA center. The forms are forwarded to local NRCS and SWCD offices while FSA determines land eligibility. If the land is deemed eligible, NRCS and the local SWCD determine and design appropriate conservation practices. A conservation plan is written, and fieldwork is begun, which completes the conservation practice design phase. FSA then measures CREP acreage, conservation practice contracts are written, and practices are installed. The landowner submits bills for cost-share reimbursement to FSA. Once the landowner completes BMP installation and the practice is approved, FSA and the SWCD make the cost-share payments. The SWCD also pays out the state's one-time, lump sum rental payment. FSA conducts random spot checks throughout the life of the contract, and the agency continues to pay annual rent throughout the contract period. http://www.dcr.state.va.us/sw/crep.htm

Environmental Quality Incentives Program (EQIP)
This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. Approximately 65% of the EQIP funding for the state of Virginia is directed toward "Priority Areas." These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. The purposes of the program are achieved through the implementation of an EQIP plan of operation, which includes structural and land management practices on eligible lands. Contracts up to ten years are written with eligible producers. Cost-share of 75%, 25% tax credit, and/or incentive payments are made available to implement one or more eligible conservation practices, such as animal waste management facilities, terraces, filter strips, tree planting, and permanent wildlife habitat. Incentive payments can be made to implement one or more management practices, such as nutrient management, pest management, and grazing land management. http://www.nrcs.usda.gov/programs/eqip/

Wetlands Reserve Program (WRP)
The program provides an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal lands from agriculture. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. The program offers three enrollment options: permanent easements, 30-year easement, and restoration cost-share agreement (10-year agreement where USDA pays 75% of the restoration costs). Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities. At any time, a landowner may request that additional activities be added as compatible uses. Land eligibility is dependent on length of ownership, whether the site has been degraded as a result of agriculture, and the land's ability to be restored. Restoration agreement participants must show proof of ownership. Easement participants must have owned the land for at least one year and be able to provide clear title. http://www.nrcs.usda.gov/programs/wrp/

Wildlife Habitat Incentives Program (WHIP)
WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands. USDA and the participant enter into a five to ten year cost-share agreement for wildlife habitat development. In Virginia, high priority habitat needs include: early grassland habitats that are home to game species such as quail and rabbit, as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share up to 75% is available for the cost of installing practices. Applicants will be competitively ranked within the state and certain areas and practices will receive higher ranking based on their value to wildlife. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field borders and hedgerows. http://www.nrcs.usda.gov/programs/whip/

Forestry Incentives Program (FIP)
The purpose of this program is to encourage development, management, and protection of private forestland. http://www.nrcs.usda.gov/programs/fip/

Small Watershed Program and Flood Prevention Program (Public Law 83-566)
The purpose of this program is to assist federal, state, local agencies, local government sponsors, tribal governments, and program participants to protect watersheds from damage caused by erosion, floodwater, and sediment, to conserve and develop water and land resources; and to solve natural resource and related economic problems on a watershed basis. The program empowers local people or decision makers, builds partnerships, and requires local and state funding contributions. Both technical and financial assistance is available for watersheds not exceeding 250,000 acres. http://www.nrcs.usda.gov/programs/watershed/index.html

U.S. Fish and Wildlife Service Private Stewardship Program
Funds individuals or groups engaged in local, private, and voluntary conservation efforts to benefit federally listed, proposed, or candidate species, or other at risk species. http://endangered.fws.gov/grants/private_stewardship.html

U.S. Fish and Wildlife Service Conservation Grants
Funds states to implement conservation projects to protect federally listed threatened or endangered species and species at risk. http://grants.fws.gov/state.html

Clean Water State Revolving Fund
USEPA awards grants to states to capitalize their Clean Water State Revolving Funds (CWSRFs). The states, through the CWSRF, make loans for high-priority water quality activities. As loan recipients make payments back into the fund, money is available for new loans to be issued to other recipients. Eligible projects include point source, nonpoint source and estuary protection projects. Point source projects typically include building wastewater treatment facilities, combined sewer overflow and sanitary sewer overflow correction, urban stormwater

control, and water quality aspects of landfill projects. Nonpoint source projects include agricultural, silviculture, rural, and some urban runoff control; on-site wastewater disposal systems (septic tanks); land conservation and riparian buffers; leaking underground storage tank remediation, etc. Estuary protection projects include all of the above point and nonpoint source projects, as well as habitat restoration and other unique estuary projects. http://www.epa.gov/owmitnet/cwfinance/cwsrf/

Southeast Rural Community Assistance Project (Southeast RCAP)
The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other community organizations complement the Southeast RCAP central office staff across the region. They can provide (at no cost to a community): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education, facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward repair/replacement/installation of a septic system and $2,000 toward repair/replacement/installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level. The federal poverty threshold for a family of four is $18,850. http://www.sercap.org

Chesapeake Bay Small Watershed Grants Program
Partnership between the EPA Chesapeake Bay Program and the National Fish and Wildlife Foundation that provides grants to organizations working on a local level to protect and improve watersheds in the Chesapeake Bay basin, while building citizen-based resource stewardship. http://www.nfwf.org/chespeake/index.htm

National Fish and Wildlife Foundation
Private, non-profit 501c(3) tax-exempt organization that fosters cooperative partnerships to conserve wildlife, plants, and the habitats on which they depend. A General Challenge Grants Program and a Special Grants Program are offered. Grants are available to federal, state, and local governments, educational institutions, and non-profit organizations through General Challenge Grants. Of particular interest is the Special Grant – Southern Rivers Conservation whereby on-the-ground projects are eligible to restore and enhance riparian and riverine habitat in twelve southeastern states, including Virginia. Stream restoration activities are eligible through this grant program. Offers are accepted throughout the year and processed during fixed signup periods. The signup periods are on a year-round, revolving basis, and there are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, full proposal evaluation, and a Board of Directors decision. An approved pre-proposal is a pre-requisite to the submittal of the full proposal. Grants generally range between $10,000 and $150,000. Payments are based on need. Projects are funded in the U.S., and any international areas that host migratory wildlife from the U.S., marine animals, or endangered species. Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. If the project does not fall into the criteria of any special grant programs, the proposal may be submitted as a general grant if it falls under the following guidelines: 1) it promotes fish, wildlife and habitat conservation, 2) it involves other conservation and community interests, 3) leverages available funding, and 4)

evaluates project outcomes. A pre-proposal that is not accepted by a special grant program may be deferred to the general grant program. http://www.nfwf.org/programs/grant_apply.htm

In addition to the current cost-share programs, the funding source that is expected to play the largest role in the first year of implementation is the Section 319 Incremental Funds. The Section 319 Incremental Funds will be used to fund appropriate BMPs at the levels described in the Virginia Agricultural BMP Cost-Share Program. In addition, these funds will be used to offer incentive payments for specific practices, fund technical assistance, support educational programs, and fund residential cost-share programs. Based on these funding sources, a possible funding scenario for BMP installation in the first year of implementation is presented in Table 8.1. This scenario represents 10% installation of livestock exclusion systems, 10% of pasture management BMPs installed, 10% of cropland converted to vegetated buffers, 10% of cropland manure incorporated into soil, 20% of straight pipes replaced, and 20% of failed septic systems fixed. The scenario does not account for agricultural or residential technical assistance.

Table 8.1. Possible installation funding scenario for first year of implementation.

TMDL Incentive Funds	
Agricultural Practices	637,500
Residential Practices	160,500
Subtotal	798,000
Landowner	
Agricultural Practices	212,500
Residential Practices	160,500
Subtotal	373,000
Total	**1,171,000**

9. LIST OF ACRONYMS

AWG	Agricultural Working Group
AWTS	Alternative Waste Treatment System
BMP	Best Management Practice
CCU	Confined Canine Unit
CREP	Conservation Reserve and Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Funds
ECI	Engineering Concepts, Inc.
EQIP	Environmental Quality Incentive Program
FSA	Farm Service Agency
FTE	Full Time Equivalent
GWG	Governmental Working Group
IP	Implementation Plan
JMSWCD	John Marshall Soil and Water Conservation District
NPS	Nonpoint Source
NRCS	Natural Resources Conservation Service
OSSDS	On-Site Sewage Disposal System
RB-1	Septic System Pump-Out
RB-2	Connection of Malfunctioning OSSDS or Straight Pipe to Public Sewer
RB-3	Septic Tank System Repair
RB-4	Septic Tank Installation / Replacement
RB-5	Alternative On-Site Waste Treatment System
RCAP	Rural Community Assistance Program
RRRC	Rappahannock-Rapidan Regional Commission
RWG	Residential Working Group
SL-6	Grazing Land Protection System
SWCD	Soil and Water Conservation District
TCCSWCD	Tri-County City Soil and Water Conservation District
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
VADCR	Virginia Department of Conservation and Recreation
VADEQ	Virginia Department of Environmental Quality
VADOT	Virginia Department of Forestry
VCE	Virginia Cooperative Extension
VDACS	Virginia Department of Agriculture and Consumer Services

VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
WQMIRA	Water Quality Monitoring, Information and Restoration Act
WHIP	Wildlife Habitat Incentive Program
WRP	Wetland Reserve Program

10. REFERENCES

Engineering Concepts, Inc., 2004. Bacteria TMDL for Deep Run Stafford and Fauquier County, Virginia. Submitted to Virginia Department of Environmental Quality, April 2004.

GKY and Associates, Inc., 2002. Fecal Coliform TMDL Development for Thumb Run, Virginia. Submitted to Virginia Department of Environmental Quality, April 25, 2002.

Meade, 2006. Food-Related Illness and Death in the United States, by Paul S. Mead, et al. Centers for Disease Control and Prevention. Vol. 5 No. 5. http://www.cdc.gov/ncidod/eid/vol5no5/mead.htm

NRCS, 2005. Field Office Technical Guide. Washington, D.C.: USDA Natural Resources and Conservation Service. Available at: http://efotg.nrcs.usda.gov/treemenuFS.aspx?Fips=51087&MenuName=menuVA.zip.

USEPA, 1999. Preliminary Data Summary of Urban Stormwater Best Management Practices. Publication # EPA-821-R-99-012. August, 1999.

USEPA, 2001. Protocol for Developing Pathogen TMDLs: First Edition. Publication # EPA-841-R-00-002. January, 2001.

VADCR, 2003. Guidance Manual for Total Maximum Daily Load Implementation Plans. The Commonwealth of Virginia: Department of Conservation and Recreation and Department of Environmental Quality.

VADEQ, 1998. Commonwealth of Virginia Section 303(d) List of Impaired Waters.

VADEQ, 2004. Commonwealth of Virginia Section 303(d) List of Impaired Waters.

VADEQ, 2005a. Bacteria TMDL for Carter Run Fauquier County, Virginia. Submitted to Virginia Department of Environmental Quality, January 2005.

VADEQ, 2005b. Bacteria TMDL for Great Run Fauquier County, Submitted to Virginia. Virginia Department of Environmental Quality, January 2005.

VCE. 1996. Controlled Grazing of Virginia's Pastures, by Harlan E. White and Dale D. Wolf, Virginia Cooperative Extension Agronomists; Department of Forages, Crop, and Soil Environmental Sciences, Virginia Tech. Publication Number 418-012. July 1996. http://www.ext.vt.edu/pubs/livestock/418-012/418-012.html

APPENDIX A

Agricultural Focus Group Meeting Notes

AGRICULTURAL WORKING GROUP MEETING SUMMARY- JUNE 2, 2005

NOTE: *This is an attempt to summarize main topics / key areas covered in the focus group. Please add to this list and make corrections wherever needed. This information will be presented to the Steering Committee in the form of a working group report to be incorporated into the plan; therefore, the overall group needs to agree with the information.*

Group membership

- Meeting attendees: John Bauserman, John Chambers, Gray Coyner, Frank Horn, Arney Johnson Jr., Nicolaas Kortlandt, Jay Marshall, Byron Petrauskas, and Tom Turner
- Individuals at the meeting represented the Deep Run and Thumb Run watersheds.
- There were no individuals from the Carter Run and Great Run watersheds present at the meeting.
- Review of sign-in list from kick-off public meeting revealed an individual each in Carter Run and Great Run had signed up to participate in the working group.
- Agreed that meeting location was appropriate and one agricultural working group could address issues relevant to the four watersheds.

TMDL development

- 100% reduction is hard to comprehend.
- Wildlife reduction not specified in Thumb Run. It was mentioned that any wildlife management procedures implemented more than likely will be at the county level and therefore Thumb Run would be included.
- Opinions were expressed that buffers will create more habitat for wildlife (deer) and create a bigger problem - unless population levels are managed.
- The accuracy of the source assessment was questioned, in particular, straight pipes. It was explained that the estimates were based on the best information available and estimates should be treated as precautionary allowing funds to be set aside to correct the straight pipes that are found.

Watershed changes

- Operations in the watersheds have changed over last several years.
    1. Have gone out of business.
    2. Dairy operation in Deep Run watershed changed to beef operation.
    3. Overall increase in horse population.
- Wildlife population (i.e., deer and geese) has increased with more geese residencies.
- Several miles of exclusion fencing has been installed, especially in Thumb Run, which needs to be accounted. Thumb Run has shown the most progress (of the four watersheds) in implementing BMPs due to farmers initiating contact with district and the word spreading.

Monitoring data

- Monitoring on Thunb Run was stopped in 2002. Members would like to see if BMPs implemented since TMDL development are making a difference. Need to make request to DEQ to find out the status.
- It was suggested that additional monitoring stations and more frequent sampling would help to evaluate progress and pinpoint areas of concern. For example, improvements below a monitoring station would not be reflected in samples collected at that station by DEQ.
- It was stated that a common sense approach needs to be taken first before we go out and spend more money on monitoring (e.g., we know cows in stream and straight pipes are problems, so let's fix them).

Constraints / suggestions for implementation

- Parts of the CREP program and cost-share programs need to be combined to equal the promised 75% cost-share.
- USDA cost estimates are well below local costs. Local averages verified by district need to be incorporated into cost-share allotment.
- Programs do not fully cover BMP maintenance costs.
- CREP dollars are projected to disappear in September 2007.
- Good possibility that incentive programs will not apply to horse operations that are less than 10 acres.
- Larger, established producers know about incentive programs, reaching the newer farmers / recreational farmers with smaller horse and exotic species operations will be a challenge especially in Carter Run, Great Run, and Thumb Run.
- May be difficult to get owner or renter of rented pasture to participate in cost-share program. BMP maintenance for required time (e.g., 10 years) will be an issue. The district has had positive and negative experience with signing renters up for cost-share programs.
- How do you deal with bad actors, especially those upstream of a farm that has implemented the necessary BMPs.
- Need BMP cost-share provided for shade structure and alternative water source with no fencing.
- Up to two years to fully train additional technical assistance may be needed to design additional BMPs. In addition to agricultural programs, the district handles erosion and control program for the county.
- Contractor availability, especially excavators, could hinder BMP installation.

Education / outreach

- A variety of issues / topics (e.g., crop, beef, horse) have been covered in previous field days in the area. Generally, there has been a good response from farmers.
- Field days, small workshops, and field visits would work best to inform farmers as to exactly what the TMDL means to them and what will most practically get the job done. During field day, workshops and farm visit an informational packet defining the TMDL and what it means to the farmer, options farmer has for funding sources (e.g. voluntary, cost-share, and tax credit) with requirements of each and list of components with cost (e.g. alternative watering systems) should be distributed.

- Farmer needs to feel that he is not the only one installing practices instead everyone is putting in practices. Convincing neighbor that they have to participate will work. Use Thumb Run as an example.
- A watershed group that farmers can contact with questions / comments may have better response that contacting a government agency.
- A statewide public service announcement through various media (e.g., radio, newspapers, cable) paid by the Commonwealth about BMPs and incentive programs was suggested.

Potential funding sources

- Three key programs used by district and NRCS
    1) CREP – cropland
    2) CREP – forest
    3) Virginia Cost-Share Program
- District has never turned away money; the money could always be spent.
- It was proposed that fencing materials be purchased in bulk quantity to enable a cost reduction to farmers. The concept would be more beneficial to smaller farms than cost-share programs. Tyson Foods had favorable results with a program in the Shenandoah Valley where fans were purchased in bulk quantity and sold to producers at a reduced rate. The materials would be available to farmers in the impairments only. The program could be used to tract voluntary practices being implemented.

Steering Committee

- John Bauserman, with John Chambers serving as an alternate, was elected to represent the agricultural group at the steering committee meetings.
- Will conduct two to three meetings in the evening from 7:00 PM to 9:00 PM throughout the project.

AGRICULTURAL WORKING GROUP MEETING SUMMARY- OCTOBER 3, 2005

Group Membership

- The following individuals were present at the meeting: John Bauserman, Jay Branscome, Larry Dunn, Frank Horn, Arney Johnson Jr., Dennis Pearson, Byron Petrauskas, and Tom Turner

Implementation Plan Development Overview

- Reviewed items covered in 6/2/05 Agricultural Working Group Meeting
- Reviewed handout distributed in Government Working Group summarizing DEQ ambient monitoring in place and planned for the Carter, Great, Thumb and Deep Runs watersheds
    - As of August 2005 there is only one continual monitoring location in the four watersheds, station 3-DPR001.70 in Deep Run
    - Additional monitoring is scheduled for another station in Deep Run and three stations in Thumb Run during the period of 2007-2009, and monitoring locations in Carter and Great Runs would be rotated in during 2009-2011
    - Copy of handout requested by group members
- John Marshall SWCD to begin monthly coliscan monitoring for E.coli enumerations from 10/1/05 through 9/30/06 in Thumb Run watershed
- Monitoring discussion
    - Concerned whether location and frequency of monitoring was sufficient to evaluate progress, for instance, improvements below DEQ station on Thumb Run are not reflected in samples collected at station
    - Monitoring results can be used in educational program
    - It was suggested that monitoring be performed upstream and downstream of farm with substantial land in conservation practices, particularly on a tributary stream, knowing difficulty in isolating upstream bacteria contributions on main streams
    - Should monitoring be used to isolate contribution from Stafford County versus Fauquier County?

Best Management Practices (BMPs) Identification

- Potential practices listed in the Virginia Agricultural BMP Handbook with associated bacteria removal efficiency to be utilized during implementation to reduce livestock direct deposition and land-based loads were reviewed
- Suggested changes to SL-6A Small Acreage Grazing System
    - Group requests eligibility apply to horse owners not in agricultural production
    - Group requests cost-share be provided to participants in addition to tax credit
- Other BMPs and indirect strategies that may be considered were discussed
    - Chain harrowing pasture to break-up manure patties showed most promise
        - Farmers typically perform after winter feeding where animals more confined

        - Group requests incentive (e.g., tax credit) to be provided for purchase of chain harrow
- BMP installation cost estimates to be reviewed by John Marshall SWCD

BMP Quantification

- Members reviewed maps identifying potential livestock access to continuous streams
- Discussed how intermittent streams were included in analysis
    - SL-6 requires fencing of intermittent streams while CREP does not
- Will translate potential livestock access areas to SL-6 Grazing Land Protection Systems using characteristics of previously installed systems
- Left maps with Tom Turner to review with John Marshall SWCD personnel and provide average BMP characteristics including costs

Education and Technical Assistance

- Provided handout with suggested education/outreach techniques to be utilized during implementation
- Technical assistance and educational outreach tasks required of personnel during implementation were provided in the handout
- John Marshall SWCD
    - Will take lead in agricultural technical assistance for Fauquier County
    - Education coordinator on staff, need to evaluate impact TMDL program will have on work load
- Tri-County / City SWCD
    - Will take lead in agricultural technical assistance for Stafford County
- Technical assistance quantified through evaluation of district's historic BMP designed per employee along with current district employees consultation

Potential Funding Sources

- Handout summarizing various state and federal funding sources that can be potentially used in the implementation phase was distributed
    - Working group members were asked to review funding information to ensure information is current, feedback at meeting will be incorporated
- Members stated Great Run watershed was designated as blue heron habitat and would be eligible for additional funding from U.S. Fish and Wildlife

AGRICULTURAL WORKING GROUP MEETING SUMMARY- DECEMBER 1, 2005

Group Membership

- The following individuals were present at the meeting: Jay Branscome, Arney Johnson Jr., Jay Marshall, Byron Petrauskas, and Tom Turner

Best Management Practices (BMPs) Identification

- Requirements of the proposed "Pasture Management System BMP" to provide incentive for control of upland pasture loads were discussed and included:
  - Must have a NRCS specified livestock exclusion system installed
  - Must have soil testing performed for nutrient applications. Lime and fertilizer applied based on testing allowing nutrients to be more readily available resulting in an improved stand.
  - Must maintain a 3-inch minimum grass height
  - Must mow pastures to control woody vegetation
  - Must chain harrow pasture to break-up manure piles after livestock are removed from field
  - Tax credit provided for chain harrow purchase
  - Incentive payment of $200/ac to be provided. Incentive payment similar to no-till payments that have been successful at obtaining buy-in.
- Discussed benefit of vegetative buffers on the edge of cropland to help meet specified cropland load reductions. An incentive payment of $560/ac would be needed to entice farmers to convert cropland to vegetated buffers.
- Discussed incentive payment for manure/biosolids incorporation into cropland soil. An incentive payment of $20/acre was deemed adequate.

BMP Quantification

- Reviewed quantification and cost for BMPs addressing livestock stream exclusion and land-based loads on pasture and cropland land uses.

Education and Technical Assistance

- Reviewed historical information describing the number and cost of BMPs designed by the JMSWCD between 1989 and 2004 and concluded that two technical FTE and one administrative FTE divided evenly between the watersheds would be needed during each year of implementation
- Field days, small workshops, and field visits would work best to inform farmers as to exactly what the TMDL means to them and what will most practically get the job done. During field day, workshops and farm visit an informational packet defining the TMDL and what it means to the farmer, options farmer has for funding sources (e.g. voluntary, cost-share, and tax credit) with requirements of each and list of components with cost (e.g. alternative watering systems) should be distributed. A variety of issues / topics (e.g., crop, beef, horse) have been covered in previous field days in the area. Generally, there has been a good response from farmers. A watershed group that farmers can contact with questions / comments may have better response that contacting a government agency.

- A statewide public service announcement through various media (e.g., radio, newspapers, cable) paid by the Commonwealth about BMPs and incentive programs was suggested.

Milestones / Timeline

- Reviewed proposed 10-year timeline with identified milestones and seemed reasonable.
- The district will utilize maps produced during BMP quantification to target landowners. The plan will be to start at the impairment outlet and work along the main stem until all landowners have been contacted. Interested landowners outside this progression will not be turned away if money is available.
- Reviewed total implementation cost.

Steering Committee Report

- Discussed items to include in the Agricultural Working Group Report to Steering Committee.

APPENDIX B

Residential Focus Group Meeting Notes

RESIDENTIAL WORKING GROUP MEETING SUMMARY- JUNE 2, 2005

7:00-9:00pm
John Barton Payne Building Warrenton, VA

Attendees

Toni Crouch, Bill Gouldthorpe, Chuck Hoysa, Nancy Huffine, Frank Hyson, Charlie Lunsford, Bill Plissner, Charles Shepherd, Bob Tudor, Jeffrey Walker

Review of Bacteria TMDLs

- Overall nonpoint source load allocations for each of the four impairments were discussed.

- Handout #1 distributed consisting of data slides excerpted from April 12, 2005, TMDL IP Kick-Off Meeting presentation

- Challenge of comparing data from four different TMDLs, each employing somewhat varying methodologies

- Overview of other implementation plan initiatives currently underway

Review of Virginia's Bacteria Standards and Related Questions

- Questions regarding effects of nutrient loading and other contaminants in streams: Will nutrients be addressed? Do nutrients make the bacteria reproduce faster? Are there provisions under the implementation planning process for testing of contaminants besides fecal coliform and e. coli bacteria?

  It was explained that nutrients would be indirectly addressed through likely buffer recommendations of the Agriculture working group, together with Virginia's Tributary Strategy effort, but that with respect to other contaminants, reduction of fecal coliform and e. coli bacteria would be the primary focus of the plan.

- How were straight pipe/failing septic estimates arrived at in the TMDL studies without visiting homes? Are any of the four streams or their banks navigable or walkable such that a visual scan for/confirmation of straight pipes might be feasible?

  Straight pipe estimates were arrived at using an accepted equation that takes into account both the age of a dwelling unit and its proximity to impaired stream in question. With the exception of some isolated stretches, Carter, Great, Thumb and Deep Runs are for the most part non-navigable by canoe and not easily walkable, although a stream walk was completed of Thumb Run by JMSWCD in January 2000.

- What impact, if any, does water treatment plant in Warrenton have on fecal coliform levels in Great Run?

It was explained that plant and its output had been factored into Great Run study as a permitted use; no indication that it has been out of compliance.

Public Participation Process & Role of the Residential Working Group

- It was referenced that role of group will be to focus on: means of identifying and eliminating straight pipes from dwellings and businesses, involving and educating the public with respect to septic system best management practices, encouraging the proper disposal of pet waste, and securing necessary funding and technical assistance relative the above.

- Acknowledgment that public involvement is critical if upcoming five-year plan is to be effective

- Importance of providing incentives for homeowners to participate as compliance with plan recommendations will be strictly voluntary

Education/Outreach

- Request for more detailed maps for use at next meeting—individual watersheds as opposed to overview map, with road delineations—for members of the public to more easily discern which watersheds they live in

- Among other potential outreach ideas discussed: possible class or workshop offering at Lord Fairfax Community College, cable public access channel programming, links on county website, display booth at county fair, information kiosks (with bag dispensers) at area parks

Residential BMPs to be Addressed in Implementation Plan and Tools Available

- Discussion of early maintenance and mandatory (every five year) pump out requirements for alternative systems as specified in county code

- Handout #2 distributed outlining VA Dept. of Conservation & Recreation approved BMPs, with descriptions and cost-share details for each

Next Meeting Date

Next working group meeting will be in early September.

RESIDENTIAL WORKING GROUP MEETING SUMMARY- OCTOBER 3, 2005

7:00-9:00pm
John Barton Payne Building Warrenton, VA

Attendees
Toni Crouch, Chuck Hoysa, Nancy Huffine, Frank Hyson, Charlie Lunsford, Bill Plissner, Charles Shepherd, Bob Tudor, Jeffrey Walker

The meeting began with an overview of the first working group meeting that was held on June 2, 2005.

BMP Identification

- Engineering Concepts, Inc. (ECI) described that the residential bacteria sources that need to be reduced according to the TMDLs include failing septic systems, straight pipes and pet waste.

- The five BMPs that will be cost-share during the implementation phase to address failing septic systems and straight pipes were discussed. These include:
    1. RB-1 Septic Tank Pumpout
    2. RB-2 Connection of Malfunctioning On-site Sewage Disposal System or Straight Pipe to Public Sewer
    3. RB-3 Septic Tank System Repair
    4. RB-4 Septic Tank System Installation/Replacement
    5. RB-5 Alternative On-site Waste Treatment System

- Other strategies to be considered in the implementation plan will include indirect actions such as signage on public lands, survey to determine pet waste disposal practices, educational materials identifying acceptable pet waste disposal methods, inventory of pet kennels, leash law; pet waste collection and removal, vegetative buffers, and structural stormwater BMPs.

BMP Quantification and Cost Estimates

- The group reviewed data regarding the number of straight pipes and failing septic systems per impaired stream segment based on TMDL studies. ECI high and low cost estimates to eliminate straight pipes and correct failing septic systems were reviewed with a combination of the five BMPs listed above. Charles Shepherd with Fauquier County Health Dept. commented that some of the unit costs needed to be increased to reflect local conditions. ECI agreed to follow up with the Health Dept. to get better cost-data.

- Also, a suggestion was made to consider looking at various data sets as soils, lot size, and GIS with land and stream boundaries to help identify problem areas.

Educational and Technical Assistance

- The group reviewed a list of educational outreach approaches/tools that was based on input from the first working group meeting. Some of the suggestions

had originated in the government working group as well. The working group thought that the list was adequate and these recommendations will be included in the working group report to the Steering Committee.

- The working group reviewed a list of technical assistance and educational outreach tasks required of personnel that will be needed to carry out the implementation of the residential program.

- Recommendation was made not to limit educational outreach to just the Carter, Great, Thumb, and Deep Runs watersheds, but try to outreach to all County residents as much as possible.

- Charles Shepherd indicated that his agency would be willing to be responsible for implementing the component of the residential program pertaining to human bacteria sources from straight pipes and failing on-site sewage disposal systems contingent on funding (*i.e.*, from EPA Section 319 funds) for technical assistance.

Potential Funding Sources

- A handout was provided summarizing federal and state programs with potential funding, to be included in the plan document.

Other Topics

- The working group was updated regarding the details of a monitoring component for the IP that would include DEQ ambient monitoring and citizen monitoring through a grant that the John Marshall SWCD has with DEQ to fund coliscan monitoring for the period of 10/05 through 9/06.

- The group was updated on discussions regarding pet waste management that took place during the second government working group held earlier that afternoon.

- An update on the Fauquier Riparian Easement Program Solutions (FREPS) Initiative was provided.

Working Group Representative on Steering Committee

- In closing, Nancy Huffine volunteered to represent the Residential Working Group on the Steering Committee.

APPENDIX C

Government Focus Group Meeting Notes

GOVERNMENT WORKING GROUP MEETING SUMMARY- JUNE 2, 2005

Attendees

Deirdre Clark, Fauquier County Community Development; Gray Coyner, John Marshall SWCD; Tony Hooper, Fauquier County Administration; Ron Hughes, VA Dept. of Game & Inland Fisheries; Jennifer Krick, John Marshall SWCD; Charlie Lunsford, VA Dept. Conservation & Recreation; Byron Petrauskas, Engineering Concepts, Inc.; Rex Rexrode, USDA Natural Resources Conservation Service; Jim Sawyer, Fauquier County Community Development; Charles Shepherd, VA Dept. Health; Mary Sherrill, Fauquier County Community Development; Mary Lou Trimble, John Marshall SWCD; Jeffrey Walker, Rappahannock-Rapidan Regional Commission.

Review of bacteria TMDLS

- Overall nonpoint source load allocations for each of the four impairments were discussed.
- Load allocations are found in the TMDLs for livestock access to streams, upland agricultural loads, human sources from on-site sewage disposal, pets, and wildlife.
- Implementation will be based on a staged approach.

Public Participation Process

- Public participation process was discussed which consists of (2) public meetings; meetings of government, agriculture, and residential working groups, and a steering committee.

Primary Role of the Government Working Group

- Roles of the government working group were presented and discussed.

Implementation Plan Components

- Requirements from the Virginia Water Quality Monitoring Information and Restoration Act of 1997 were discussed.
- Requirements of the EPA 319 Program (9) eligibility criteria in order to receive TMDL implementation funding were discussed.
- Implementation Plan will be written to address state and federal requirements mentioned above.

Overview of Programs in Fauquier County that Address On-Site Sewage Disposal Systems, Pet Waste, Agriculture and Wildlife

On-Site Sewage Disposal Systems

- Fauquier County local ordinance requires an annual inspection of alternative waste treatment systems.
- New homes are required to have a minimum of a 1,000 square feet available for a replacement drainfield.
- All homes build after 2003 must have the septic tank pumped once every 5 years.

Pet Waste

- There are no local restrictions or ordinances that deal with the disposal of pet waste.
- Group discussed that to address load reductions necessary in TMDL the most practicable approach would be education and to have appropriate disposal materials at public park areas in the watersheds.
- There was mention that in some areas of the state with a significant pet bacteria loading a number of dog kennels are present. May need to inventory dog kennels on the impaired streams.

Agriculture

- USDA Conservation Reserve and Enhancement Program has been a popular program in the County.
- Lack of fencing contractors in the County is somewhat of a problem (7 or 8).
- Number of non-bovine livestock types in the watersheds and most do not have a concept of clean water.
- The SL-6A practice (Small Grazing Management System) is a tax credit only practice for landowners that are not in agricultural production. Consideration should be given to making this a cost-share practice with TMDL cost-share funds.
- Other USDA programs that were mentioned included EQIP, WHIP, Wetland Reserve Program and Grassland Reserve program.

Wildlife

- Increased kill limits or bag limits is not what is needed to control overpopulation of deer in the County.
- There is not enough public land to hunt on and the access to land for hunting is a significant issue as more and more landowners for various reasons deny access for hunting. Lack of hunters contributing to overpopulations.
- Land use changes and the way residential landscapes are currently managed have increased deer populations in residential areas.
- Canadian Geese are protected as a migratory waterfowl. Federal government tells DGIF how many can be killed, current limit 5 geese/per day. Vegetation along farm ponds would discourage geese access.
- "Earn A Buck Program" was mentioned, must kill (2) does in order to kill a buck.

Regulatory Controls

- Sewage Handling and Disposal Regulations and Agricultural Stewardship Act will be mentioned in the implementation plan.
- Any other regulatory controls (i.e., local ordinances) that could assist in implementing the plan need to be identified.

Monitoring Component

- DEQ ambient monitoring program will help to validate progress during implementation of plan.
- DEQ will be asked to present an update on-going monitoring on the (4) impaired streams and future monitoring schedules at the next government working group meeting.
- It was mentioned that DEQ had not monitored in Thumb Run since 2002 and that a number of livestock operations were no longer operating and a number of BMPs had been implemented since 2002.
- Plan needs to address any on-going citizen monitoring efforts and whether citizen monitoring should be utilized.

Next Meeting

Next working group meeting will be in early September.

GOVERNMENT WORKING GROUP MEETING SUMMARY- OCTOBER 3, 2005

Group membership
The following agencies/groups were represented at the meeting: VA Dept. of Conservation & Recreation, VA Dept. of Health, Fauquier County Government, Rappahannock-Rapidan Regional Commission, VA Dept. of Game & Inland Fisheries, Natural Resources Conservation Service, John Marshall Soil & Water Conservation District, and Engineering Concepts, Inc.

The meeting began with an overview of the first working group meeting that was held on June 2, 2005.

Monitoring

- A map and table were provided that summarized the DEQ ambient monitoring in place and planned for the Carter, Great, Thumb and Deep Runs watersheds As of August 2005 there is only one continual monitoring location in the (4) watersheds, station 3-DPR001.70 in Deep Run. Additional monitoring is scheduled for another station in Deep Run and three stations in Thumb Run during the period of 2007-2009, and monitoring locations in Carter and Great Runs would be rotated in during 2009-2011. The working group members expressed to DEQ staff the desire to have at least one continual monitoring station in each of the four watersheds beginning in 07/06 to measure implementation progress. **Action item: letter to be forwarded to DEQ making this request.**

- Monthly coliscan monitoring for E.coli enumerations to be funded by DEQ for the period of 10/1/05 through 9/30/06. John Marshall SWCD will be responsible for administering this monitoring using citizen volunteers. **Action item: need to obtain station descriptions and locations to include in the implementation plan (IP).**

Regulatory Controls

- The Virginia Agricultural Stewarship Act and the Sewage Handling and Disposal Regulations will be referenced in the implementation plan as state laws that will
- provide regulatory support.

- In regards to local ordnances, Article II. On-Site Sewage System Design, Maintenance and Monitoring, will be referenced.

- The pet waste ordinance within the City of Warrenton will be referenced.

- The Stafford County portion of the Deep Run watershed is within the jurisdiction of the County's storm sewer systems and this system is covered by a MS-4 permit that outlines a stormwater management program that must be followed. **Action item: contact Stafford County to account for BMPs/control strategies**

planned for implementation in the Deep Run portion of the watershed that could reduce the bacteria land load in Deep Run.

Pet Waste

- County staff reported that currently there is not an adequate way to inventory and account for the number of businesses that have confined pets that should be a source to outreach to in developing control strategies to manage pet waste.

- Most practicable approach to managing pet waste would be staged implementation by focusing on education for pet owners, and inventorying the number of hunt clubs, pet training facilities, boarding facilities, and grooming operations to get a handle on locations by watershed and numbers of pets during the implementation phase. Work with a selected few to initiate several demonstration projects for properly managing and disposing of pet waste with the thought to initiate a cost-share assistance program.

- A couple of types of demonstration projects and potential costs will be included in the IP.

- Educational signage and pet waste disposal stations on public lands in the (4) watersheds are recommended.

- Fauquier County seems to be the local entity based suited to take on the responsibility of implementing this part of the IP with technical assistance from DCR, JMSWCD and VDH. **Action item: identify responsible stakeholder(s).**

Wildlife

- It was recommended that educational materials be prepared to help landowners understand why wildlife populations are increasing and the various options that are available to landowners to manage wildlife populations on their land.

- DGIF expressed interest in helping develop the educational materials.

- It was recommended that some of the educational funds for implementation be directed at wildlife sources and management options.

Primary Funding Sources

- Engineering Concepts, Inc. prepared a handout that summarized the various state and federal sources of funding that could be potentially used in the implementation phase. Working group members were asked to review the funding information to insure that it up to date.

- If there are local sources of funding these need to be identified.

Integration with Other Activities in the County

- The other activities that have been identified to date that need to be referenced in the IP and discussion needs to be provided on their integration are as follows:
    1. Fauquier Riparian Easement Program Solutions (FREPS) Initiative
    2. Fauquier County Water Resources Management Plan
    3. Chesapeake Bay Nutrient and Sediment Reduction Strategy for the Rappahannock River Basin.

Milestones/Timeline

- Engineering Concepts, Inc. will develop some implementation-based timelines (e.g., percentage of various BMPs/control strategies by source category to be implemented on an annual basis for a 5-year period) and some water quality based timelines (e.g., percentage reductions of bacteria standard violations) to be presented at the next Steering Committee meeting.

Working Group Representative on Steering Committee

An individual is needed to represent the government working group on the Steering Committee. A working group report will be prepared based on minutes from the two working group meetings that will include recommendations from the working group. The representative does not have to write the report. **Action item: if interested contact Jeff Walker.**

APPENDIX D

Steering Focus Group Meeting Notes

STEERING COMMITTEE MEETING- AUGUST 2, 2005

7:00pm

Warren Green Building, Warrenton, VA

Meeting Summary

Attendees: John Bauserman, Jay Branscome, Deirdre Clark, Kimberly Davis, Nancy Huffine, Frank Hyson, Jennifer Krick, Charlie Lunsford, Jay Marshall, Byron Petrauskas, Rex Rexrode, Mary Sherrill, Bob Tudor, Tom Turner, Jeffrey Walker

Review of Implementation Plan Process

- First public meeting held April 12th.
- Agriculture, Residential and Government Working Group meetings took place on June 2nd.
- Second round of working group meetings will be scheduled for September.

Update on Implementation Plan Development Status

- Data layers compiled to date by Engineering Concepts, Inc include: watershed boundaries, stream network, land use (National Land Cover dataset, 2001 & 1992), aerial photography (VGIN 2002), confined animal feeding operations, existing agricultural BMPs, farm tracts, and parcels.
- BMP types will be partitioned into treatment of direct sources to stream and land-based runoff.
- Preliminary streamside fencing summary was provided. Estimated 72 miles of livestock exclusion fencing needed: 24.3 miles in Thumb Run watershed, 23.4 miles in Carter Run, 19.7 miles in Great Run, and 4.3 miles in Deep Run.
- Number of corrective actions for on-site sewage disposal systems listed in TMDL report. Corrective options to be identified based on repairs and replacement of failing on-site systems with traditional septic systems and alternative waste treatment systems.
- Next steps include: translate streamside fencing into exclusion systems, land-based agricultural BMP analysis, verify BMP quantification results with agencies and agricultural working group, develop residential BMP scenarios, and calculate technical assistance and educational support required.

Working Group Activities Report

- *Residential*- Ten individuals attended the first meeting of the residential working group. Topics of discussion included review of TMDLs, Virginia bacteria standards and related questions, role of the residential working group and public participation process, education/outreach and BMPs to be addressed, and tools/programs available to support implementation. Fauquier County has a

mandatory septic tank pump-out requirement and inspection & maintenance requirements for alternative waste treatment systems.

- *Government*- Fifteen individuals attended the first meeting of the government working group. Topics of discussion included review of TMDLs and IP components, role of government working group and public participation process, overview of programs in Fauquier County that address bacteria source categories in TMDLs (*i.e.*, on-site sewage disposal, pets, agriculture, and wildlife), regulatory controls, and monitoring.
- *Agricultural*- Nine individuals attended the first meeting of the agricultural working group. Topics of discussion included review of TMDLs, watershed changes, monitoring data, constraints/suggestions for implementation, education/outreach, and potential funding sources. Other topics included recent cost increases in fencing materials and lack of a sufficient number of local fencing contractors to assist with installation. Suggestions were made to consider contractual arrangements whereby a contractor is selected based on a fixed price for fencing using an invitation for bid process and buying fencing material in bulk.

Pending Issues

The committee was asked if there are any local ongoing or planned water issues, programs, planning activities, studies, etc. that should be considered and incorporated into the IP planning process. Among other issues/initiatives referenced:

- *Fauquier County Water Resources Management Plan*- currently being developed by consultants Jamie Emery and David Hirschman
- *Fauquier Riparian Easement Program Solutions (FREPS)* initiative- scheduled to kick off shortly, in collaboration with UVA Institute for Environmental Negotiation.

Review of Schedule

- Working groups will have a second meeting in September, with a possibility of a third meeting for one or more groups.
- Steering Committee will probably have two more meetings.
- Draft IP to be presented at a public meeting in early December, followed by a 30-day comment period.
- Final IP projected to be completed in January 2006.

Questions and Comments

- Other groups that were identified as possible candidates for inclusion and/or sources of information included: Citizens for Fauquier County (CFFC), Goose Creek Scenic River Advisory Committee, and Central Rappahannock [River] Roundtable. *To be approached in advance of next Steering Committee meeting.*
- The question was asked as to how VDH tracks mandatory septic pump-outs and comment made regarding importance of obtaining data regarding county's monitoring of alternative treatment systems currently in use. *To be forwarded for input by VDH.*
- The question was asked whether Stafford County is also on board with the TMDL implementation planning process and likely BMPs that are going to be needed on

agricultural and residential land in the lower portion of the Deep Run watershed. *Stafford County representatives have been notified of meetings to date and are being forwarded regular updates. A follow-up invitation will be extended to participate in the next steering committee meeting.*

Meeting Handouts and Powerpoint Presentations

- Available for viewing/download at: www.rrregion.org/tmdl_fauq

STEERING COMMITTEE MEETING- JANUARY 12, 2006

Meeting Summary

Attendees:

John Bauserman, Deirdre Clark, Nancy Huffine, Frank Hyson, Arney Johnson, Jr., Charlie Lunsford, Jay Marshall, Byron Petrauskas, Bill Plissner, Mary Sherrill, Rex Rexrode, Bryant Thomas, Bob Tudor, Tom Turner, Jeffrey Walker

Review of Implementation Plan Process

- Agriculture, residential and government working group meetings took place on June 2, and, October 3. A third agricultural working group meeting took place on December 1.
- First Steering Committee meeting took place on August 1.
- Third Steering Committee meeting was scheduled for February 21 with the final public meeting in March.

Working Group Reports & Recommendations *(to be included in the Implementation Plan Technical Report)*

- **Residential:** Nancy Huffine presented the residential working group report. The report recommends that the educational programs/activities dealing with on-site sewage disposal systems be countywide and not be restricted to the four subject watersheds in the implementation plan (IP). A question was raised about a flyer that the John Marshall Soil and Water Conservation District had distributed on septic systems [Winter 2005 newsletter] and whether or not the subject flyer might serve as an information resource. Stream walks were discussed as one way to identify potential straight pipes and failing septic systems. Deirdre Clark reported that the County will be flown in March 2006 and up to date aerial photography will be available to plan and target implementation.
- **Agriculture:** John Bauserman presented the agricultural working group report. This working group has recommended a pasture management system BMP with an incentive payment of $200 per acre and a tax credit for an equipment purchase (*i.e.*, chain harrow) to help distribute manure piles but it was noted that specifications would need to be developed and adopted before it would be cost-share eligible. A question was raised about adding EQIP to the programs used by the district and NRCS. It is recommended that it be added as one of the USDA funding sources but remove the "key programs" reference. It was mentioned that CREP disappears in 2007. It was mentioned that the smaller farms (horses and hobby) will need to be targeted and rented land is an issue especially the cost-share maintenance requirements. Comment was made that one-one-contacts are essential to encourage participation and to insure agriculture producers, horse farms, and hobby farms understand what the TMDLs require.
- **Government:** Deirdre Clark gave the government working group report. It was noted that the requirement that "new homes are required to have a minimum of a 1,000 square feet of land available for a reserve drainfield is in the state Sewer

Code and not in a Fauquier County ordinance. [Comment was made that **County? or state ordinance ? does require a 200% reserve for non-service areas and 100% reserve for service areas?]** It was recommended that the Reservoir Overlay for Warrenton Area be added to the section in the working group report, "Integration with Other Activities in the County". Also, comprehensive plan should be referenced and noted that draft low-impact-development strategies are included.

Discussion of BMP Quantification and Costs

- Byron Petrauskas , Engineering Concepts, Inc distributed and discussed a handout titled, "BMP Quantification and Cost". The Steering Committee made several recommendations after considering the information:
    - 1) At the public meeting in March when the draft IP is presented do not emphasize the Stage II implementation BMP numbers and cost. The Stage II goal is based on implementing the source allocations in the TMDL so both the instantaneous standard and geometric mean standard are attained. The Stage II cost is $38.6 million. The Stage I goal is based on meeting source allocations that will get the instantaneous standard violation rate to 10% or less and remove the impaired streams (i.e., Thumb, Carter, Great and Deep) from the Impaired Waters List at a cost of $10.5 million.
    - 2) Should include BMPs and cost to implement BMPs to control/treat runoff from agricultural land and residential land in Thumb Run since the more restrictive *E. coli* standard will be applied.

Updated Monitoring Network for Implementation Plan

It was reported that DEQ has agreed to monitor (9) monitoring sites in the four watersheds on a bi-monthly basis beginning in 2006. As a result, all four watersheds will have on-going monitoring in place. The question was raised as to why DEQ doesn't monitor closer to the outlet of the Thumb Run watershed. The DEQ monitoring station at the lowest point of the watershed is 4.69 miles upstream from the outlet. Bryant Thomas explained that in order for DEQ to sample further downstream they would have to access private land since there are no bridge crossings from state roads. Accessing private land to sample is difficult and at the same time adhere to a sampling schedule and monitor the number of sites scheduled for the sampling event. A suggestion was made to take a look the *E. coli* coliscan monitoring at station TR1 (below the DEQ station) and at TR2 at the DEQ station to verify water quality conditions in the lower portion of Thumb Run.

Review of Schedule

- Third Steering Committee meeting scheduled for February 21 – discuss draft IP and review/comment on public meeting presentation.
- Final public meeting date (March)

STEERING COMMITTEE MEETING- FEBRUARY 21, 2006

Meeting Summary

Attendees:
Charles Shepherd, Tom Turner, Arney Johnson, Rex Rexrode, Jay Branscome, John Spencer, Tim Mize, Nancy Huffine, Bob Tudor, Jay Marshall, Frank Hyson, Mary Sherrill, Charlie Lunsford, Jeff Walker, and Byron Petrauskas

Review of Draft Implementation Plan

- Byron Petrauskas with ECI, Inc. walked the Steering Committee through the draft implementation plan page by page.
- Members of the Committee provided comments and asked questions.
- Comments were addressed and incorporated in the April 4 draft implementation plan.

Review of the Final Public Meeting Presentation

- Byron Petrauskas provided an overview of the PowerPoint presentation for the final public meeting.

Final Public Meeting

- Jeff Walker presented two possible dates for the final public meeting which included March 28 or April 4. The Committee decided to go with April 4.
- The public meeting location that was selected was the Warrenton Community Center.

APPENDIX E

Working Group Reports to Steering Committee

RESIDENTIAL WORKING GROUP REPORT TO STEERING COMMITTEE- JANUARY 12, 2006

Working Group Members
Toni Crouch
Bill Gouldthorpe
Chuck Hoysa
Nancy Huffine
Frank Hyson
Charlie Lunsford
Bill Plissner
Charles Shepherd
Bob Tudor
Jeffrey Walker

Meeting Dates
Thursday, June 2, 2005, 7:00 – 9:00 PM
Monday, October 3, 2005, 7:00 – 9:00 PM

Goal and Tasks
The primary objective of the Residential Working Group (RWG) was to address the sources of bacteria attributable to residential and business land uses, such as straight pipes, failing septic systems, and also pet wastes; come up with means of educating and involving the public with regard to accepted best management practices; identify potential obstacles to implementation, such as lacking or incomplete data; and seek practical solutions to those obstacles.

Key Topics and Recommendations
The following key topics and recommendations resulted from the two RWG meetings:

Education and Technical Assistance

- An organized education and outreach program, with genuine incentives for participation, will be essential in order for the implementation effort to succeed. The Fauquier County Health Department is willing to accept responsibility to administer the education and technical assistance efforts to address the bacteria sources attributed to failing and inadequate on-site sewage disposal systems based on 319 funding to hire a person.
- Several education/outreach techniques need to be utilized during implementation. The focus must be on obstacles that property owners face in correcting problems (e.g., money, information, understanding of issues). Need to identify techniques applicable to area. Suggestions include:
    - Articles describing the TMDL process, the reasons why high levels of bacteria are a problem, the methods through which the problem can be corrected, the assistance that is currently available for landowners to deal with the problem, and the potential ramifications of not dealing with the problem should be made

available to the public through as many channels as possible (e.g. newsletters, flyers included with utility bills, and targeted mailings).

- Small community meetings, workshops, and demonstrations should be organized to show landowners the extent of the problem (e.g., septic system failure), the effectiveness of control measures, and the process involved in obtaining technical and financial assistance. Lord Fairfax Community College was mentioned as a possible location.
- Educational tools, such as a model septic system that could be used to demonstrate functioning and failing septic systems, and video of septic maintenance and repair, could be set-up in public building such as the library or county administration building.
- Notices using all media outlets (e.g, cable tv public access channel programming, links on county website) will be posted regarding septic systems (e.g. a reminder to pump-out septic tank every 3-5 years).
- Educational program should include description of proper maintenance of septic systems and the economic advantages associated with proper maintenance.
- Literature or demonstration could be set-up at the county fair.
- An educational packet will be included about septic system issues for new homeowners. Need to work through Realtors.
- A residential specialist dealing with residential sources will contact homeowners after identification of straight pipes or failing septic systems and explain options available for correcting the problems and for funding sources. This individual will also target outreach to residential areas where there is greater potential for straight pipes and failing septic systems based on age of structures, soils, proximity to streams, etc.
- Post informative signage about proper pet waste disposal.
- Provide information kiosks with pick-up bags and/or receptacles for disposal of pet waste at area parks, common areas, etc.
- Promote developers to provide signage about proper pet waste disposal, pick-up bags and/or receptacles along common walking areas.

➢ In addition, the following tasks were identified as being required (of implementing agency personnel) in order for outreach to be successful:

1. Identify failing septic systems & straight-pipes (e.g. stream walks, analysis of aerial photos, mailings, monitoring, home visit) and report to VDH.
2. Track septic system repairs/ replacements/ installations (traditional and alternative).
3. Handle and track cost-share.
4. Develop educational materials & programs.
5. Organize educational programs (e.g. demonstration septic pump-outs).

6. Distribute educational materials (e.g. informational pamphlets on TMDL & on-site sewage disposal systems).
7. Assess progress toward implementation goals.
8. Follow-up contact with property owners who have participated in the program(s).

Best Management Practices

- The following practices are potential BMPs under the cost-share program that may be utilized during implementation:
  - RB-1 Septic Tank Pump-out;
  - RB-2 Connection of Malfunctioning On-site Sewage Disposal System or Straight Pipe to Public Sewer;
  - RB-3 Septic Tank System Repair;
  - RB-4 Septic Tank System Installation / Replacement; and
  - RB-5 Alternative On-site Waste Treatment System.
- Other strategies to consider:
  - Indirect actions
    - Signage on public land
    - Survey to determine pet waste disposal practices
    - Educational materials identifying acceptable pet waste disposal methods
    - Inventory of pet kennels
    - Leash law
  - Pet waste collection and removal
  - Vegetative buffers
  - Structural BMPs (e.g., retention pond)

Potential Funding Sources

- Identified potential funding sources, with applicability to residential implementation include:
  - Virginia Water Quality Improvement Fund (WQIF), administered by the Virginia Department of Conservation and Recreation
  - Community Development Block Grant Program (CDBG), administered by the Virginia Department of Housing and Community Development
  - Federal Clean Water Act Section 319 Incremental Funds
  - Virginia Revolving Loan Program
  - Southeast Rural Community Assistance Project

Timeline and Targeting

- The 5-year implementation timeline and 10-year stream de-listing timeline seem reasonable.

AGRICULTURAL WORKING GROUP REPORT TO STEERING COMMITTEE- JANUARY 12, 2006

Group Membership
John Bauserman
Jay Branscome
John Chambers
Gray Coyner
Larry Dunn
Frank Horn
Arney Johnson Jr.
Nicolaas Kortlandt
Jay Marshall
Dennis Pearson
Byron Petrauskas
Tom Turner

Meeting Dates
Thursday, June 2, 2005, 7:00 – 9:00 PM
Monday, October 3, 2005, 7:00 – 9:00 PM
Thursday, December 1, 2005, 7:00 – 9:00 PM

Goal and Tasks
The overall goal and responsibility of the Agricultural Working Group (AWG) is to address the sources of bacteria attributed to agricultural operations, identify any obstacles to implementation of agricultural load reductions, and seek practical solutions to these obstacles. Specific tasks of the working group include:

- Identify potential constraints to BMP implementation
- Identify preferred and/or innovative best management practices (BMPs)
- Identify outreach methods for engaging producers
- Identify appropriate measurable goals and timeline for achieving implementation goals
- Identify alternative funding sources / partnerships that will promote implementation
- Review implementation strategies from an agricultural perspective

Key Topics and Recommendations
The following key topics and recommendations resulted from the three AWG meetings:

Monitoring

- Monitoring on Thumb Run was stopped in 2002. Members would like to see if BMPs implemented since TMDL development are making a difference. Additional monitoring stations and more frequent sampling is requested to help evaluate progress and pinpoint areas of concern. At a minimum, a bi-monthly monitoring station closest to the impairment outlet is suggested.
- John Marshall Soil and Water Conservation District (JMSWCD) began monthly coliscan monitoring for *E. coli* enumerations from 10/1/05 through 9/30/06 in Thumb Run watershed. Funding similar studies throughout implementation would enable evaluation of water quality gains throughout points in the entire watershed.
- Funds should be sought to perform monitoring upstream and downstream of farm with substantial land in conservation practices, particularly on a tributary stream, utilizing monitoring results in the educational program.

Best Management Practices

- Larger, established producers know about incentive programs, reaching the newer farmers / recreational farmers with smaller horse and exotic species operations will be a challenge especially in Carter Run, Great Run, and Thumb Run. May be difficult to get owner or renter of rented pasture to participate in cost-share program. BMP maintenance for required time (e.g., 10 years) will be an issue. The district has had positive and negative experience with signing renters up for cost-share programs.
- In order to allow incentive program participation by horse owners, it is requested that a sacrifice area be included in the SL-6 Grazing Land Protection specifications.
- A new "Pasture Management System BMP" to provide incentive for control of upland pasture loads is recommended with the following criteria:
    - Must have a NRCS specified livestock exclusion system installed
    - Must have soil testing performed for nutrient applications. Lime and fertilizer applied based on testing allowing nutrients to be more readily available resulting in an improved stand.
    - Must maintain a 3-inch minimum grass height
    - Must mow pastures to control woody vegetation
    - Must chain harrow pasture to break-up manure piles after livestock are removed from field
    - Tax credit provided for chain harrow purchase
    - Incentive payment of $200/ac to be provided. Incentive payment similar to no-till payments that have been successful at obtaining buy-in.
- Vegetative buffers on the edge of cropland will help meet specified cropland load reductions. An incentive payment of $560/ac is needed to entice farmers to convert cropland to vegetated buffers.
- Providing alternative shade for livestock excluded from stream corridor will reduce concentration of livestock at buffer edges. It is recommended that cost-share be

provided for a shade structure to farmers with an acceptable livestock exclusion system.

- The group is confident that current BMPs eligible for cost-share in TMDL areas and proposed additions will provide the necessary incentive for producers and horse owners to implement required BMPs to meet the specified TMDL reductions.

Technical Assistance and Education

- JMSWCD will provide technical assistance in the Thumb Run, Carter Run, and Great Run watersheds. JMSWCD will collaborate with Tri-County/City Soil and Water Conservation District (TCCSWCD) in the Deep Run watershed with JMSWCD and TCCSWCD taking the lead on the Fauquier County and Stafford County portions, respectively.
- Two technical assistance full time equivalents (FTE) and one administrative assistance. FTE divided evenly between the watersheds are needed to support implementation.
- Field days, small workshops, and field visits would work best to inform farmers as to exactly what the TMDL means to them and what will most practically get the job done. During field day, workshops and farm visit an informational packet defining the TMDL and what it means to the farmer, options farmer has for funding sources (e.g. voluntary, cost-share, and tax credit) with requirements of each and list of components with cost (e.g. alternative watering systems) should be distributed. A variety of issues / topics (e.g., crop, beef, horse) have been covered in previous field days in the area. Generally, there has been a good response from farmers. A watershed group that farmers can contact with questions / comments may have better response that contacting a government agency.
- A statewide public service announcement through various media (e.g., radio, newspapers, cable) paid by the Commonwealth about BMPs and incentive programs was suggested.

Potential Funding Sources

- USDA cost estimates are well below local costs. Local averages verified by district need to be incorporated into cost-share allotment. Programs do not fully cover BMP maintenance costs. Contractor availability could hinder BMP installation.
- Conservation Reserve Enhancement Program (CREP) dollars are projected to disappear in September 2007.
- Three key programs used by district and NRCS:
    4) CREP – cropland
    5) CREP – forest
    6) Virginia Cost-Share Program
- Great Run watershed was designated as potential spawning habitat for Blue Back Herring and could be eligible for additional funding from U.S. Fish and Wildlife Service or Virginia Department of Game and Inland Fisheries.

Timeline and Targeting

- The 5-year implementation timeline and 10-year stream de-listing timeline seem reasonable.

- The district will utilize maps produced during BMP quantification to target landowners. The plan will be to start at the impairment outlet and work along the main stem until all landowners have been contacted. Interested landowners outside this progression will not be turned away if money is available.

GOVERNMENT WORKING GROUP REPORT TO STEERING COMMITTEE - JANUARY 12, 2006

Working Group Members
Deidre Clark, Fauquier County Community Development
Gray Coyner, John Marshall SWCD
Tony Hooper, Fauquier County Administration
Steve Hubble, Stafford County, Dept. of Code Administration
Ron Hughes, VA Dept. of Game & Inland Fisheries
Jennifer Krick, John Marshall SWCD
Charlie Lunsford, VA Dept. of Conservation & Recreation
Byron Petrauskas, Engineering Concepts, Inc.
Rex Rexrode, USDA Natural Resources Conservation Service
Jim Sawyer, Fauquier County Community Development
Charles Sheppard, VA Dept. of Health
Mary Sherrill, Fauquier County Community Development
Bryant Thomas, VA Dept. of Environmental Quality
Mary Lou Trimble, John Marshall SWCD
Tom Turner, John Marshall SWCD
BJ Valentine, Fauquier County Community Development
Jeffrey Walker, Rappahannock-Rapidan Regional Commission

Meeting Dates
Thursday, June 2, 2005, 3:00 – 5:00 PM
Monday, October 3, 2005, 2:00 – 4:00 PM

Goal and Tasks
The primary responsibilities of the Government Working Group (GWG) are the following: 1) identify funding sources, 2) identify available technical resources, 3) identify appropriate "measurable goals" and timeline for achievement, 4) identify regulatory controls in place, and 5) identify potential parties to be responsible for agricultural and residential implementation.

Key Topics and Recommendations
The following key topics and recommendations resulted from the two GWG meetings:

Local/State/Federal Programs that Address Bacteria Pollution Sources

On-Site sewage Disposal Systems:

1. County ordinance requires an annual inspection of alternative waste treatment systems.
2. New homes are required to have a minimum of 1,000 square feet of land available for a replacement drainfield.

3. All homes built after 2003 must have the septic tank pumped once every 5 years.

Pet Waste:

1. There are no County restrictions or ordinances that deal with the disposal of pet waste. The Town of Warrenton has a pet waste ordinance.

2. Most practicable approach to attain allocations in TMDLs would be staged implementation by focusing on education of pet owners regarding need for proper disposal of pet waste; inventorying the number of hunt clubs, pet training facilities, boarding facilities and grooming operations to get a number of such businesses and locations by watershed, and work with a selected few to initiate several demonstration projects for properly disposing of pet waste with the concept of following up with cost–share control measures.

3. BMPs such as rain gardens and vegetative buffers on residential land are the preferred control measures with structural BMPs (i.e., retention ponds, infiltration trenches, bioretention filters, etc.) a last resort based on implementation costs and maintenance.

4. Educational signage and pet waste disposal stations on public lands in the four watersheds are recommended.

5. GWG believes that Fauquier County is best suited to take on the responsibility of implementing the pet waste component of the IP with technical assistance from DCR, JMSWCD, and VDH.

Agriculture:

1. USDA Conservation Reserve and Enhancement Program has been a popular program in the County. Other USDA programs utilized locally include EQIP, Wetland Reserve Program and Grassland Reserve Program.

2. Lack of fencing contractors in the County is somewhat of a problem (only 7 or 8).

3. Number of non-bovine livestock types in the watersheds and most do not have a concept of clean water.

4. The SL-6A practice (Small Grazing Management System) is a tax credit only practice for landowners that are not in agricultural production. Consideration should be given to making this a cost-share practice with TMDL cost-share funds.

Wildlife:

1. VA DGIF's position is that increasing kill limits or bag limits for deer will not control overpopulations of deer in the County. There is not enough public land to hunt and the lack of access to private land is a significant issue that contributes to a lack of hunters to manage deer populations. Land use changes and the way residential landscapes are currently designed are contributing to increasing numbers of deer in residential areas.

2. Canadian Geese are protected as a migratory waterfowl. Federal government tells DGIF how many can be killed, current limit 5 geese/per day. Vegetation along farm ponds would discourage geese access.

3. GWG recommends that educational materials be prepared to help landowners understand why wildlife populations are increasing and the various options that are available to landowners to manage wildlife populations on their land. Educational funds made available during implementation phase should be directed at wildlife sources and management options, DGIF is interested in helping to develop educational materials.

Regulatory Controls

- Sewage Handling and Disposal Regulations and Agricultural Stewardship Act will be mentioned in the implementation plan.

- Local ordinances pertaining to the maintenance and operation of on-site sewage disposal systems will be referenced in the implementation plan.

Monitoring

- The GWG members expressed to DEQ staff at the October 3rd working group meeting the desire to have at least one continual monitoring station in each of the four watersheds beginning in 2006 to measure implementation progress. A request via letter was forwarded to Bryant Thomas with the DEQ Woodbridge Office on November 28.

- John Marshall SWCD has been funded by DEQ to conduct monthly coliscan monitoring for *E. coli* from 10/05 through 9/06. Station description and locations will be included in the implementation plan.

Primary Funding Sources

- Engineering Concepts, Inc. prepared a handout that summarized the various state and federal sources of funding that could be potentially used in the implementation phase.

- Local sources of funding have not been identified.

Integration with Other Activities in the County

- Other activities that have been identified that need to be referenced in the IP and discussion on their integration are as follows:
    1. Fauquier Riparian Easement Program Solutions (FREPS) Initiative

    2. Fauquier County Water Resources Management Plan

    3. Chesapeake Bay Nutrient and Sediment Reduction Strategy for the Rappahannock River Basin.

Milestones/Timeline

- Engineering Concepts, Inc. will develop implementation-based timelines (e.g., percentage of various BMPs/control strategies by source category to be implemented on an annual basis for a 5-year period) and some water quality based timelines (e.g., percentage reductions of bacteria standard violations) to be presented to the Steering Committee.