Date of Meeting: October 2, 2013

BOARD OF SUPERVISORS
BUSINESS MEETING
ACTION ITEM

21b

SUBJECT: Transportation and Land Use Committee Report:
Phase II Watershed Implementation Plan (WIP) – Future Efforts

ELECTION DISTRICT: Countywide

STAFF CONTACT: Alan Brewer, General Services
Richard Pezzullo, General Services

RECOMMENDATIONS:

Transportation and Land Use Committee: On September 13, 2013, the Transportation and Land Use Committee (TLUC) recommended (3-0-2, Reid and York absent) that the Board of Supervisors (Board) direct staff to implement the Phase II WIP Stakeholder Committee recommendations to the greatest extent possible using existing resources.

Staff: Staff concurs with the recommendation of the TLUC.

BACKGROUND:

At its May 15, 2012, meeting, the Board approved (9-0) the Phase II WIP Community Outreach Work Plan (Work Plan) to develop cost-effective, reasonable scenarios and strategies for meeting Phase II WIP local pollution reduction goals through a public process. The Work Plan included the roles, responsibilities, and potential actions of a Steering Committee, Technical Advisory Committee, Stakeholder Committee, and the community. The process resulted in a mix of best management practices (BMPs), also known as the "Loudoun Scenario," that could be implemented in Loudoun County. The Stakeholder Committee provided input on the impact of the Loudoun Scenario on the community and organizations they represented, the level of effort for BMPs in the Loudoun Scenario, and recommendations for implementing the Loudoun Scenario. Detailed information on the Work Plan, Loudoun Scenario, and Phase II WIP Committees, can be found in the April 12, 2013, Transportation and Land Use Committee item (Attachment 1).

On September 13, 2013, the Transportation and Land Use Committee (TLUC) recommended (3-0-2, Reid and York absent) that the Board of Supervisors (Board) direct staff to implement the Phase II WIP Stakeholder Committee recommendations to the greatest extent possible using existing resources.

This item focuses on the Stakeholder Committee recommendations and options for implementation.

ISSUES:

The Environmental Protection Agency (EPA) mandated that Virginia meet nitrogen, phosphorus, and sediment pollution reduction loads by 2025. Virginia is required to submit progress reports, known as milestones, to the EPA every two years. The Virginia Department of Conservation and Recreation (DCR) indicates that localities will play a significant role in reducing pollutant loads, however, there is a high level of uncertainty concerning specific roles and responsibilities of local governments. Staff is seeking Board direction on the level of effort that the County should undertake to meet local pollution reduction goals.

The Stakeholder Committee made ten (10) recommendations that would assist the County in implementing the Loudoun Scenario and with meeting local pollution reduction goals. Staff worked with County Departments to evaluate the potential effectiveness of the recommendations and to determine which recommendations could be accomplished using existing resources. Each recommendation was divided into tasks and the annual hours needed to implement the recommendation were estimated. The recommendations were grouped into three (3) categories:

- Recommendation could be accomplished with existing resources.
- Recommendation could be partially accomplished with existing resources.
- Recommendation could not be accomplished with existing resources.

<u>Recommendations That Could Be Accomplished With Existing Resources</u>

1. ***Recommendation: Seek partners and coordinate efforts to have additional BMPs approved by the EPA.*** Staff believes that this is an important effort that could lead to pollution reduction credit for existing BMPs, particularly in the areas of conservation easements and alternative onsite sewage disposal systems. Land conservation is recognized as an important component of protecting water quality. However, conservation easements are not recognized as an approved BMP. Additionally, there are several types of alternative onsite sewage disposal systems that are known to reduce the amount of nitrogen in sewage effluent. However, there are only a few types of alternative onsite sewage disposal systems that are approved as BMPs. Existing staff from several departments could support this effort.

2. ***Recommendation: Explore coordination with other water quality improvement efforts that are related to the Chesapeake Bay Total Maximum Daily Load (TMDL).*** There are many existing water quality improvement efforts and programs that are taking place in the County. For example, the Healthy Waters Foundation will seek to set a model for riparian buffer enhancement which could result in voluntary implementation of BMPs on properties along the Potomac River. Leveraging programs to meet local pollution reduction goals would be beneficial to the County. Existing staff from the Departments of Building and Development and General Services could support this effort.

3. ***Recommendation: Request that the state of Virginia develop a system that makes it possible for smaller volunteer and community efforts to be accounted for and tracked.*** This recommendation could be accomplished with minimal effort and staff time.

4. ***Recommendation: Collaborate with other localities to request that the state of Virginia and federal governments significantly increase cost-share funding to localities.*** The current level of state agricultural cost-share funding is not sufficient to support the level of effort necessary to meet local pollution reduction goals. In Loudoun County, an estimated $14,000,000 in additional cost-share funding through 2025 would be necessary to fund cost-share BMPs (in 2012 dollars). Existing staff from General Services and Building Development could support this effort, preferably, through the County's legislative program. These departments currently support the County's legislative program concerning environmental legislation.

5. ***Recommendation: Coordinate and disseminate information to the public on the Chesapeake Bay TMDL including the role of the community, impacts to the community, and the importance of local efforts to improve the water quality of the Chesapeake Bay and local streams.*** The Health Department, Department of General Services, Department of Building and Development, and the Soil and Water Conservation District have education and awareness programs associated with improving water quality. Staff believes that existing programs could be modified to support this recommendation and that this recommendation could be implemented using existing resources from several departments.

<u>Recommendations That Could Be Partially Accomplished With Existing Resources</u>

6. ***Recommendation: Identify and report all Bay TMDL BMPs in the County.*** Staff believes this is an important effort that could lead to pollution reduction credit for existing BMPs. However, identifying all BMPs in the County is not possible with current resources. In addition, identifying and reporting small BMPs like rain barrels is not likely to result in significant pollution reduction credit. Existing staff from various departments can work towards identifying substantial BMPs in the County.

7. ***Recommendation: Encourage and support programs, initiatives, and pilot projects that support the water quality improvement efforts of the Chesapeake Bay TMDL, including:***
    - ***An education and outreach program.***
    - ***Demonstration projects.***
    - ***A program to identify and remove barriers to BMP implementation.***
    - ***Recognition and award programs.***
    - ***Facilitation of conservation projects.***

    As discussed under recommendation #5, an education and outreach campaign can be accomplished with existing resources. Demonstration projects, new recognition and awards programs, conservation projects, and a program to identify and remove barriers to

BMP implementation could not be accomplished with existing resources. However, staff could attempt to leverage existing programs in these areas to support Phase II WIP pollution reduction efforts.

Recommendations That Could Not Be Accomplished With Existing Resources

8. ***Recommendation: Institute or expand reward and recognition programs for those who are leading efforts to improve water quality, especially targeting key groups such as Homeowners Associations, contractors, and farmers.*** There are insufficient resources to implement this recommendation beyond what currently exists. Please note that there are programs that are similar to this in the County and region such as the Department of Building and Development's Environmental Preservation Awards.

9. ***Recommendation: Incentivize cost-effective BMPs to increase implementation efforts. In addition the County should consider tax exemptions to increase BMP implementation efforts.*** There are insufficient resources to implement this recommendation.

10. ***Recommendation: Pursue partnerships with private industry for grants and other programs for cost share funding.*** There are insufficient resources to implement this recommendation.

The County solicited input from the public throughout the Work Plan process. The County received emails from 43 individuals requesting that the County implement its Phase II Watershed Improvement Plan (Loudoun Scenario) and incorporate efforts similar to those described by the Stakeholder Committee. All 43 emails were similar in language and an example is included as Attachment 2.

Because of the uncertainty of the roles and responsibilities for local governments in meeting Virginia's pollution load allocations, staff does not recommend full implementation of the Loudoun Scenario at this time. Full implementation of the Loudoun Scenario would involve funding the installation and implementation of BMPs.

In order to be in position to react quickly and effectively to possible future mandates, staff recommends that the County remain involved in state, regional, and local efforts related to the Phase II WIP. Staff also recommends that the Board direct staff to implement the Phase II WIP Stakeholder Committee recommendations to the greatest extent possible using existing resources.

ALTERNATIVES:

1. Direct staff to implement the Phase II WIP Stakeholder Committee recommendations to the greatest extent possible using existing resources.

OR

2. Direct staff to not implement the Phase II WIP Stakeholder Committee recommendations.

FISCAL IMPACT:

The full implementation of the Stakeholder Committee recommendations would require additional appropriation and staff resources. However, there is no fiscal impact to the County if the Board directs staff to implement only those recommendations that can be accomplished using existing staff resources in the Department of Building and Development, Department of General Services, Health Department, the Division of Public Affairs and Communications, and the Soil and Water Conservation District. If additional resources are required in the future, staff will return to the Board for approval.

A detailed description of the fiscal impact of the Loudoun Scenario can be found in the April 12, 2013 TLUC item (Attachment 1).

DRAFT MOTIONS:

1. I move that the Board of Supervisors direct staff to implement the Phase II WIP Stakeholder Committee recommendations as presented in the October 2, 2013 staff report, to the greatest extent possible using existing resources.

OR

2. I move that the Board of Supervisors direct staff to not implement the Phase II WIP Stakeholder Committee recommendations, as presented in the October 2,, 2013 staff report.

OR

3. I move an alternative motion.

ATTACHMENTS:

1. April 12, 2013 TLUC item
2. Example Public Comment Email

Date of Meeting: April 12, 2013

BOARD OF SUPERVISORS
TRANSPORTATION AND LAND USE COMMITTEE
INFORMATION ITEM

 # 3

SUBJECT: Update-Phase II Watershed Implementation Plan (WIP)

ELECTION DISTRICT: Countywide

STAFF CONTACT: Alan Brewer, General Services
Richard Pezzullo, General Services

BACKGROUND:

This item is to update the Transportation and Land Use Committee (TLUC) on the development of scenarios and strategies to meet the Phase II WIP local pollution reduction goals.

The Chesapeake Bay (Bay) Total Maximum Daily Load (TMDL) is a "pollution diet" established in December 2010 by the Environmental Protection Agency (EPA) that is intended to limit the amount of phosphorus, nitrogen, and sediment entering the Bay from its watershed. Each state with waters draining into the Bay was required to submit a WIP which proposes how these pollution reduction goals will be met. The Virginia Phase I WIP, submitted in November 2010, identified general strategies in each of several sectors (agriculture, urban stormwater, wastewater, and septic systems) for reducing pollution to the prescribed levels. The Virginia Phase II WIP, submitted in March 2012, provided more specific information that facilitates actions by local partners to control nitrogen, phosphorus, and sediment to achieve the pollution reduction goals as well as milestones that will be used to gauge progress and guide plan changes. As part of the Phase II WIP process, the Virginia Department of Conservation and Recreation (DCR) requested supporting information from localities including scenarios and strategies for meeting local pollution reduction goals. As directed by the Board of Supervisors (Board) on January 17, 2012, a letter was sent from Chairman York to the DCR indicating that Loudoun County would develop scenarios and strategies through a public process.

At their May 15, 2012 meeting, the Board approved (9-0) the Phase II WIP Community Outreach Work Plan (Work Plan) to develop cost-effective, reasonable scenarios and strategies for meeting local pollution reduction goals through a public process. The Work Plan timeline is included as Attachment 1.

ISSUES:

Implementation of the WIP will most likely have a significant impact on the residents of Loudoun County. The Work Plan was designed to engage stakeholders and provide community outreach in an effort to find the most reasonable and cost-effective strategies for meeting the

local pollution reduction goals of the WIP.

The Work Plan provides for input from an Internal Steering Committee, Technical Advisory Committee, Stakeholder Committee, and the community.

Internal Steering Committee:

The role of the Internal Steering Committee (ISC) is to implement Phase II WIP-related directives from the County Administrator and the Board. The ISC provides information and recommendations to the Board and the County Administrator on the technical, financial, and outreach components of the Phase II WIP. The ISC continues to guide the Work Plan process and provide input to the development of local scenarios and strategies.

Community:

The Work Plan allows for three (3) sets of community meetings. The first set of community meetings was held in August 2012. Information on the Phase II WIP and the Work Plan was presented at these meetings.

The second set of community meetings will be held in May 2013. A draft Loudoun Scenario will be presented at these meetings and there will be opportunity for community input. The draft Loudoun Scenario is a mix of EPA-approved Best Management Practices (BMPs) applied to various land uses to meet pollution reduction goals.

The third set of community meetings will be held after the Board has accepted the final Loudoun Scenario. The final Loudoun Scenario will be presented at these meetings.

Technical Advisory Committee:

The role of the Technical Advisory Committee (TAC) is to provide expert technical advice on the scenarios and strategies developed for the Phase II WIP. The TAC met eight (8) times from August 2012 to January 2013. The TAC worked with County staff to develop a cost-effective, reasonable Loudoun Scenario. The TAC reached consensus on a refined version of the draft Loudoun Scenario; specifically that:

- The BMP cost estimates are reasonable and generally consistent with industry practice and local implementation.
- The BMP implementation effort is possible.
- Staff has incorporated the TAC recommendations for various adjustments to scenario components.

The entire TAC report is included as Attachment 2.

Stakeholder Committee:

The role of the Stakeholder Committee (SC) is to provide input (including potential impacts), on scenarios and strategies developed for the Phase II WIP. The SC met four (4) times from November 2012 to March 2013. The SC provided staff with recommendations for modifying the draft Loudoun Scenario, and provided suggestions for implementation. The SC recommendations are included as Attachment 3.

Draft Loudoun Scenario:

Staff, with input from the TAC, developed a reasonable and cost-effective scenario for meeting local pollution reduction goals. The Stakeholder Committee also provided input on the draft Loudoun Scenario. The Loudoun Scenario is essentially a mix of EPA approved Best Management Practices (BMPs) applied to various land uses. The draft Loudoun Scenario:

- Provides a vetted, reasonable and cost-effective scenario for meeting local pollution reduction goals.
- Includes no local mandates beyond what currently exists.
- Accounts for new Small Municipal Separate Storm Sewer Systems (MS4) permit requirements.
- Leverages existing programs and activities (cost share programs, volunteer and voluntary activities, Home Owners Associations, etc.).
- Includes a significant level of effort in the area of agricultural resource management plans.

The draft Loudoun Scenario is included as Attachment 4.

FISCAL IMPACT:

At this time, the MS4 permit requirements are the only mandates to meet local pollution reduction goals. The estimated cost for meeting the Phase II WIP requirements of the County's MS4 permit through the year 2028 (three permit cycles) is $20,000,000 in 2012 dollars. This is the only mandated cost to the County at this time.

As a result of developing a cost-effective Loudoun Scenario, staff was able to estimate the total fiscal impact of meeting the Phase II WIP pollution reduction goals. The Loudoun Scenario could have a fiscal impact on numerous parties outside of Loudoun County Government including: Towns, property owners, state and federal funding partners, volunteers, Home Owners Associations, and nonprofit organizations. An implementation plan that includes information on how, when, where, and who will implement the BMPs in the Loudoun Scenario has not been developed, therefore it is not possible to establish who will bear the cost for implementing specific BMPs. However, staff was able to generally segment the costs into broad groups. The estimated fiscal impact of the draft Loudoun Scenario through the year 2025 is $180,000,000 (in 2012 dollars). This includes not only what many consider to be "true costs" (i.e. cost to install and maintain stream fencing), but also includes the impact of lost production

(i.e. loss of productive crop land because of the fencing). The estimated fiscal impact allocation is:

- $14,000,000 for existing programs and initiatives that would occur regardless of the WIP. For example, septic system pump-outs are required by local ordinance and therefore septic systems would be pumped out regardless of the WIP. Similarly, there will be a certain number of homes served by septic systems that will connect to public sewer; this will occur with or without the WIP.

- $166,000,000 for implementation of BMPs that are the result of the WIP. This includes:

    - $14,000,000 state and federal cost share funding. This is beyond the current level of funding by the state and federal government.

    - $40,000,000 funding by local governments. There are BMPs in the Loudoun Scenario where local governments would likely bear the costs for implementation. The majority of these BMPs are stormwater infrastructure retrofits required under Loudoun County's and Leesburg's MS4 Permits (County portion $20,000,000 as described above). The remainder is made up of staff costs or contract funds to develop resource management plans.

    - $48,000,000 for implementation of BMPs where it has not been determined who would be responsible for the costs. Costs could be borne by property owners, non-profit organizations, volunteers, grants, or local, state, or federal governments. Examples of this include: Horse Pasture Management, Prescribed Grazing, Forest Buffers, Streamside Buffers, Barnyard Runoff Control, Irrigation Water Capture Reuse, Stream Restoration, Stream Access Control with Fencing, Tree Planting, and Wetland Restoration projects which could be accomplished by a number of parties.

    - $64,000,000 of potential lost production for implementation of certain BMPs. For example, a property owner could lose revenue if the installation of fencing to exclude cattle from a stream caused the loss of pasture and a resulting loss in the number of cattle on the property. Staff treated this as a worse-case analysis and the actual impact could be significantly less.

The estimated fiscal impact is preliminary and should not be used for budgeting purposes. Costs could vary significantly depending on how, when, and where BMPs are implemented and who implements them.

ATTACHMENTS:

1. Work Plan Timeline
2. Technical Advisory Committee Report
3. Stakeholder Committee Recommendations
4. Draft Loudoun Scenario
5. Phase II WIP Update Power Point Presentation

PHASE II WIP COMMUNITY OUTREACH WORK PLAN FOR 2012– 2013*

	Feb-Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Develop Community Outreach Strategy																					
Communicate with Public using multiple media sources																					
Work Plan and Outreach Strategy Brought to Transportation and Land Use Committee																					
Work Plan and Outreach Strategy Brought to Board of Supervisors																					
County Staff Prepare Framework for Scenarios and Strategies																					
Determine & Establish Committees– Technical Advisory and Stakeholders																					
Framework for Scenarios and Strategies By Staff Brought to Transportation and Land Use Committee																					
Hold Community Meetings about Phase II WIP Process for Stakeholders & Public																					
Internal Steering Committee Reviews Scenarios & Strategies																					
County Staff Update Scenarios & Strategies																					
Technical Advisory Committee Reviews																					
Stakeholders Committee Reviews Scenarios & Strategies																					
Information Item -Transportation & Land Use Committee																					
Hold Community Meetings on Scenarios & Strategies																					
Internal Steering Committee and Public Committees Review Comments made at Community Meetings																					
County Staff Develop Final Scenarios & Strategies																					
Action Item- Transportation & Land Use Committee																					
Action Item– Board of Supervisors																					
Hold Community Meetings on Adopted Scenarios & Strategies																					

LEGEND

- Community Outreach
- Working Schedule
- Intro Meetings for Committees

* Work Plan updated based on process progress as of 1/3/2013.

Loudoun County Phase II Watershed Implementation Plan (WIP)
Community Outreach Process

Summary Report of the Technical Advisory Committee (TAC)

March 12, 2013

Summary Report of the Technical Advisory Committee (TAC)

March 12, 2013

Prepared by Milton Herd, AICP, Facilitator

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Appendices (under separate cover)

- Appendix 1 - VAST Land Use and BMP Definitions
- Appendix 2 - Phase II WIP Best Management Practices Summary
- Appendix 3 - Estimated Costs for Implementation of BMPs
- Appendix 4 – Implementation Potential of BMPs
- Appendix 5 – TAC Meeting Protocols
- Appendix 6 – TAC Meeting Agendas
- Appendix 7 – TAC Meeting Summary Notes

1. Introduction

Overview

This report summarizes the findings and conclusions of the Technical Advisory Committee (TAC) for the Loudoun County Phase II Watershed Implementation Plan (WIP) Community Outreach Plan, which began formally on May 15, 2012, when the Board of Supervisors directed staff to proceed with it.

The WIP requires that Virginia engage localities in the process of meeting the pollution reduction goals of the Chesapeake Bay TMDL. The Outreach Plan is aimed at engaging stakeholders in order to find the most reasonable and cost effective strategies for the County to meet local pollutant reduction goals. The Outreach Plan includes a series of meetings with the public at large, with an Internal Steering Committee, with a broadly representative Stakeholder Committee, and with the Technical Advisory Committee (TAC).

At present, the Stakeholder Committee meetings are underway, and the first series of public community meetings have been held, with another round planned for the spring of 2013.

This report summarizes the work of the TAC, which finished its initial work on January 7, 2013, by evaluating an initial draft "scenario" (a combination of a range of technical efforts called Best Management Practices or BMPs) for achieving the pollution reduction goals. The TAC will also review a revised version of the "Loudoun Scenario" once the initial draft has been reviewed by the stakeholders, the public and the Board of Supervisors and potential modifications have been made.

Background

The Chesapeake Bay Total Maximum Daily Load (TMDL) is a "pollution diet" established in December 2010 by the Environmental Protection Agency (EPA) that is intended to limit the amount of *phosphorus, nitrogen, and sediment* entering the Bay from its watershed. The EPA indicates that the TMDL is required under the Federal Clean Water Act and responds to consent decrees in Virginia and the District of Columbia from the late 1990's. Each state with waters draining to the Bay is required to submit a Watershed Implementation Plan which proposes how these pollution reduction goals will be met. The Virginia Phase I WIP, submitted in November 2010, identified general strategies in each of several sectors (agriculture, urban stormwater, wastewater, and septic systems) for reducing pollution to the prescribed levels.

The Virginia Phase II WIP, submitted in March 2012, provides more specific information that facilitates actions by local partners to control nitrogen, phosphorus and sediment to achieve the pollution reduction goals as well as milestones that will be used to gauge progress and guide plan changes. The Phase III WIP will be submitted in 2017 and will be based on progress made and the success or failure of various planned strategies.

2. Roles and Responsibilities of Participants

The TAC members were appointed by the County Administrator and charged with providing expert technical advice to the County staff as the staff prepared a draft Loudoun Scenario which at its core, consists of Best Management Practices (BMPs) that could be implemented in the County during the coming years that would be reasonably expected to meet the pollution reduction goals.

The key challenge is to find a combination of BMPs that will meet the goal of being the most reasonable and cost effective while also achieving the required levels of pollution reduction. A computer model, Virginia Assessment Scenario Tool (VAST) provided by the Virginia Department of Conservation and Recreation (DCR) is used to test the effectiveness of the scenario.

The TAC consists of members of the public that have expertise, skills, and historical knowledge about specific areas such as soils, hydrology, onsite sewage systems, agriculture, water systems, storm water systems, and land use.

The charge given to the TAC was to *"provide comments on scenarios and strategies worked on by County Staff to determine if they are technically feasible given their experience in the field, and provide ideas for additional scenarios and strategies to consider where applicable. In addition, the TAC will help identify and recommend BMPs that can be utilized for Loudoun that may not be currently approved by the EPA. Recommendations by the TAC will be provided to the Internal Steering Committee and County Staff. Recommendations and ideas may be incorporated into future scenarios and strategies reviewed by the Stakeholders Committee and presented to the Community…The TAC will work to build consensus on scenarios and strategies."*

The Loudoun Scenario will be reviewed by the Stakeholders Advisory Committee (SAC) consisting of representatives from a broad range of interest groups from throughout the County, including incorporated Towns, the Agricultural industry, the Building and Development industry, Civic Associations, Realtors, Businesses, and Conservation Organizations.

The entire outreach process is supported by an Internal Steering Committee of public staff officials to oversee the work, with a small technical team serving as the key support staff for the various public meetings (TAC, SAC and community meetings). This team is listed along with the TAC members on the following page.

3. Membership of the TAC

The TAC membership was drawn from local experts in the relevant fields, and included many prominent practitioners with extensive experience in Loudoun County and the surrounding region. They were:

William Ackman	Town of Leesburg
Alan Brewer, Co-Chair	County Staff
Chris Hatch	Agricultural Expert
Neely Law	Center for Watershed Protection, Inc.
Benjamin Leigh	Atwill, Troxell & Leigh, P.C.
Mike Lynn	The SES Companies
Kevin Murray	Water Resources Technical Advisory Committee
Joe Paciulli	Paciulli, Simmons, & Associates Ltd.
Mark Peterson	Loudoun Water
Mike Rolband, Co-Chair	Wetland Studies and Solutions, Inc.
Ken Theurich	Loudoun County Public Schools
Chris Van Vlack	Loudoun Soil and Water Conservation District
Larry Wilkinson	Natural Resources Conservation Service
Amy Wyks	Town of Leesburg Wastewater Treatment Plant

Principal Staff support was provided by:

- Alan Brewer, Environmental Program and Policy Administrator, Department of General Services
- Randy Williford, Assistant Director, Department of General Services
- Gwen Kennedy, Environmental Program Specialist, Department of General Services
- Dennis Cumbie, Hydrogeologist, Department of Building and Development
- Kevin Haile, Environmental Program Manager, Department of Building and Development

Milton Herd, AICP, facilitated the meetings.

4. Overview of TAC Process

The TAC met eight times from August 23, 2012 through January 7, 2013. Each meeting was open to the public and was held from 4:00 p.m. to 6:00 p.m. in the Round Hill Room of the Loudoun County Government Center. The summary notes of each meeting are included in the Appendix of this report.

At the beginning of the process, the Committee reviewed preliminary information on its role and the goals of the outreach effort and the WIP II effort. It also selected Mike Rolband as Co-Chair, and established its own operational protocols. These included provisions for naming alternative representatives; expectations for meeting attendance and participation, sharing of information, and staff support; and procedures for decision-making which established a quorum of at least 10 members and decisions by broad consensus (defined as two-thirds) of those present.

In the subsequent meetings it carried out its role of providing expert advice and practical knowledge/experience to the staff regarding the costs and implementation potential of the various BMPs under consideration in Loudoun aimed at meeting the Phase II WIP requirements.

This work included understanding the:

- technical framework for allocating BMPs throughout the County (three "sectors": agricultural land, urban areas, septic systems)
- current levels of effort for BMPs in the County
- structure and basic operation of the state's VAST model for calculating estimates of BMP effectiveness.

It also included critiquing and recommending refinements as necessary to the:

- cost assumptions for implementing each BMP based on local experience, industry practice and research reports
- pollutant removal effectiveness defined for each BMP by the U.S. EPA Chesapeake Bay Program and used in VAST
- implementation potential for each BMP
- proposed draft Loudoun Scenario, including BMP levels of effort, acreage involved, and overall costs of construction and maintenance.

5. TAC Findings and Conclusions

Summary

The TAC achieved its goal of providing recommendations on scenarios for meeting the local pollutant reduction goals. This included recommended refinements to key elements of the staff prepared scenarios as well as reaching broad consensus among the TAC members for its recommendations.

Based upon its expertise and empirical knowledge of the many BMPs, the TAC recommended important refinements to the:

- cost assumptions for implementing the BMPs
- the level of effort for the BMPs
- relative rankings of implementation potential (how practical implementation of each BMP might be in Loudoun County)

Most importantly, the TAC reached consensus on a refined version of the Loudoun Scenario (based on the above information and review), specifically that:

- The BMP cost estimates are reasonable and generally consistent with industry practice and local implementation.
- The BMP implementation effort is possible.
- Staff has incorporated the TAC recommendations for various adjustments to scenario components.

The TAC agreed that the proposed set of BMPs represents a reasonable, cost-effective and practical approach to meeting the pollutant reduction goals.

It is critical to note that the TAC's recommendations included several important caveats that recognize the dynamic nature of this work, and a certain level of uncertainty in both the technical matters as well as the future challenge of implementation:

- *The work of the TAC was reactive in nature, based on available information, and in full acknowledgement of the uncertainties inherent in the model and the available data.*
- *The Loudoun Scenario, as refined and recommended, is aimed at meeting the goal of the Loudoun County Board of Supervisors to meet the pollutant reduction goals in the most cost effective, reasonable manner. The TAC recognizes that there are other scenarios and practices that could be undertaken to reduce pollutants and improve stream quality that are beyond the role of the TAC.*
- *The Loudoun Scenario as refined and recommended is based on current EPA, DCR and VAST guidance, parameters, and BMP efficiencies. Changes in these areas may impact BMP cost effectiveness. For example, according current EPA guidance, the pollutant efficiency of urban stream restoration is relatively low when compared with other BMPs. Therefore the cost effectiveness for this BMP is less desirable than other BMPs in the Loudoun Scenario. However, if the EPA were to increase the efficiency of this BMP, urban stream restoration may become more desirable in the Loudoun Scenario.*
- *All of the pollution reduction calculations are based on the current VAST model as of 1/7/2013.*
- *Cost estimates provided in the scenario are necessary to evaluate the cost effectiveness of various mixes and levels of effort that comprise the scenario. Due to the numerous*

assumptions, estimates and fluidity of the Phase II WIP project; these costs should be viewed as approximations and should not be used for budgeting purposes.

- *As each year goes by, practices can be adjusted based on experience. This scenario is a starting point and should be continually updated when necessitated by events such as, information about new BMPs and/or changes in pollutant removal efficiencies provided by VAST, or the U.S. EPA Chesapeake Bay Program.*
- *The mix of BMPs identified in the Loudoun Scenario do not necessarily reflect the sources of pollutants contributing to water quality conditions in Loudoun County. The mix of BMPs is based on BMP cost, pollutant removal, implementation potential.*

6. Draft Loudoun Scenario

The Loudoun Scenario is a proposed mix of Best Management Practices applied to various land uses in the three Phase II WIP Sectors; agriculture, urban, and septic systems. As directed by the Board of Supervisors, the scenario attempts to meet local pollution reduction goals in a reasonable, cost effective manner. In developing the Loudoun Scenario the following factors were considered:

- The cost effectiveness of the BMP
- The potential to implement the BMP in Loudoun County
- The pollutant removal efficiency of the BMP
- The available land area for the BMP
- The effects of BMPs on one another as it relates to pollutant reduction efficiency
- The current level of effort
- The anticipated level of effort related to re-development in the urban areas of the County.

The Technical Advisory Committee reviewed the Loudoun Scenario and suggested modifications based on their experience and expertise.

The following information provides guidance on how to interpret the Loudoun Scenario Spreadsheet:

BMP Level of Effort Spreadsheet

Column A: BMP Name.
This column contains the name of the BMP as found in the Environmental Protection Agency (EPA) Chesapeake Bay Watershed Model (v. 5.3) documentation. The only exceptions are for the "Cover Crops", where individual crop grains (wheat, barley, etc…) have been replaced by "small grain". This replacement is acceptable, since the relative costs of planting, and the nutrient reduction capabilities vary only slightly among the small grain types. In the Urban Sector, some of the BMP names have been augmented with parenthetical descriptors to show if the BMP is applied within the MS4 area (regulated vs. non-regulated), the type of BMP employed (i.e. cartridge filter for Urban Filtration Practices), or the method of acquiring land for BMP installation (i.e. easement).

Column B: BMP %.
This column shows the percentage of available land use to which a particular BMP is applied. For example, Barnyard Runoff Control can only be applied to the Animal Feeding Operations land use, of which there are 296 acres in Loudoun County. The BMP is to be applied to 50% of those available acres.

Column C: Sector.
This column shows the land use Sector to which the BMP is applied. In the Loudoun Scenario, the only sectors are Agricultural, Urban, Forest and Septic. The Forest Sector is included in the Loudoun Scenario in order to achieve the reduction goals. No additional Forest Sector BMP's are to be applied beyond what is credited in the 2009 Progress Scenario since there are no active Forest Harvesting operations within the County.

Column D: Model Input Acres.
This column is the product of multiplying the available land use by the BMP %. In the Barnyard Runoff example above, the 296.46 available acres are multiplied by 50%, resulting in 148.23 acres of model input. This is the number of acres to be treated by this BMP in the Loudoun Scenario. Note that the BMP's Urban Stream Restoration and Non-Urban Stream Restoration are reported in "linear feet". BMP's in the Septic Sector are reported in "number of systems".

Column E: 2009 Progress Input Acres.
This column shows the amount of credit, in acres, that Loudoun County has been given for existing BMP's in the 2009 Progress Scenario that was supplied by VA DCR. Some of the Urban BMP's acres in this column have been updated from the 2009 Progress to reflect the most recent Urban BMP inventory gathered by the Loudoun County Department of General Services.

Note that the BMP's Urban Stream Restoration and Non-Urban Stream Restoration are reported in "linear feet". BMP's in the Septic Sector are reported in "number of systems".

Column J: BMP Goal Acres.
This column is the difference between the "Model Input" and the "2009 Progress" acres. This is the amount of additional acres beyond current DCR credit that must be treated by a BMP to achieve the Loudoun Scenario reduction goals. A negative number indicates that the number of acres treated currently exceeds the level of effort required, therefore, no additional BMP implementation is required to meet the Loudoun Scenario goals.
Note that the BMP's Urban Stream Restoration and Non-Urban Stream Restoration are reported in "linear feet". BMP's in the Septic Sector are reported in "number of systems".

Column Z: Additional Cost for Implementation.
This column calculates the cost for implementing the BMP to the level of effort as shown in Column J. The costs are in 2012 dollars, and based on the Estimated One-time Costs and the Estimated Annual Costs found in the "ESTIMATED COSTS FOR IMPLEMENTATION OF BMP's" document. This assumes that the BMP's will be implemented over the next 13 years to meet the 2025 Bay TMDL deadline. The values in this column are "$0.00" if there are no additional BMP's to be implemented, if the BMP is already fully funded through an existing

County program, or if the implementation of the BMP results in a net revenue (commodity cover crops).

Column AH: Annual Costs Beyond 2025.
This is the annual costs for maintaining the BMP after full implementation in 2025. These costs are based on the Estimated Annual Costs found in the "ESTIMATED COSTS FOR IMPLEMENTATION OF BMP's" document. All costs are in 2012 dollars.

Column AI: 30 year Annual Costs Beyond 2025.
This is the estimated annual costs for maintaining and replacing (if necessary) the BMP's after full implementation in 2025, based on a projected 30 year life cycle. These costs are based on the Annual Costs (30 yrs or BMP lifespan) found in the "ESTIMATED COSTS FOR IMPLEMENTATION OF BMP's" document. All costs are in 2012 dollars.

Total Cost Spreadsheet

Columns B through D:
Results from VAST calculations using the Loudoun Scenario.

Rows 2 through 5: These cells show the total cost of implementation by 2025 in 2012 dollars separated by land use sector.

Rows 8 and 9: These cells show the amount of nutrient and sediment reduction above the VA DCR goals for Loudoun County that is achieved by the Loudoun Scenario. For example, the Nitrogen reduction achieved by the Loudoun Scenario is 2 pounds greater than the effort prescribed by DCR in the WIP I.

Rows 13 through 21: These cells show the total reductions of nutrients and sediment, by Sector that are achieved by the Loudoun Scenario, discounting those reductions already credited in the 2009 Progress. The cells also calculate the percentage of reductions achieved by each Sector.

Rows 25 through 33: These cells show the total reductions of nutrients and sediment, by Sector that are achieved by the Loudoun Scenario, including those reductions already credited in the 2009 Progress. The cells also calculate the percentage of reductions achieved by each Sector.

Rows 37 through 45: These cells show the final nutrient and sediment edge of stream loads, by Sector generated by the Loudoun Scenario. The cells also calculate the percentage of loads generated by each sector.

Rows 48 through 51: These cells show the annual costs beyond 2025 separated by land use sector for both the "30 year Annual Costs" and the "Annual Costs Beyond 2025 .

Loudoun Scenario Spreadsheet and Summary

On the following page is the Loudoun Scenario Spreadsheet showing the results of the calculations and data described above. Further background data and information is provided in the Appendix to this report.

BMP Level of Effort

	A	B	C	D	E	J	Z	AH	AI
1	Total Cost Estimation for BMP Implementation: Loudoun Scenario V3 (01/15/2013) DRAFT:								
2	BMP Name	BMP (%)	Sector	Model Input (acres)	2009 Progress Input (acres)	BMP Goal (acres)*	Additional cost for implementation	Annual Costs beyond 2025	30 yr Annual Costs beyond 2025
3	Barnyard Runoff Control	50	agriculture	148.23	19.65	128.58	$5,330,000	$108,000	$379,000
4	Commodity Cover Crop Small Grain	22	agriculture	1444.1	292.19	1151.91	$0	$0	$0
5	Conservation Tillage	90	agriculture	4463.78	0	4463.78	$4,530,000	$647,000	$647,000
6	Cover Crop Early Small Grain	16	agriculture	1050.27	205.81	844.46	$650,000	$116,000	$116,000
7	Cover Crop Other Small Grain	20	agriculture	966.43	205.81	760.62	$590,000	$106,000	$106,000
8	Cover Crop Standard Small Grain	20	agriculture	2528.62	590.39	1938.23	$1,490,000	$278,000	$278,000
9	Decision Agriculture Efficiency	10	agriculture	3942.67	0	3942.67	$50,000	$0	$12,000
10	Enhanced Nutrient Management Eff.	90	agriculture	35484.04	0	35484.04	$1,240,000	$177,000	$177,000
11	Forest Buffers	0.5	agriculture	519.96	101.36	418.6	$4,450,000	$270,000	$392,000
12	Grass Buffers; Veg. Open Channel	15	agriculture	13252.89	399.69	12273.2	$51,310,000	$7,135,000	$7,236,000
13	Horse Pasture Management	30	agriculture	10885.2	0	10885.2	$3,490,000	$207,000	$414,000
14	Irrigation Water Capture Reuse	40	agriculture	106.62	0	106.62	$1,200,000	$41,000	$87,000
15	Land Retirement to hay w/o nutr.	20	agriculture	10893.08	8796.16	2096.92	$8,260,000	$6,133,000	$6,133,000
16	Non Urban Stream Restoration	0.19	agriculture	7000	0	7000	$1,780,000	$4,000	$63,000
17	Nutrient Management Eff.	50	agriculture	50	1678.81	-1628.81	$0	$1,000	$1,000
18	Off Stream Watering w/o Fencing	4	agriculture	1453.76	8.99	1444.77	$1,920,000	$48,000	$128,000
19	Prescribed Grazing	65	agriculture	23623.53	6871.4	12752.13	$3,290,000	$255,000	$589,000
20	Soil Cons. and Water Quality Plans	75	agriculture	78775.88	21213.79	54862.09	$6,140,000	$1,217,000	$1,217,000
21	Stream Access Control w/ Fencing	45	agriculture	1299.31	364.38	684.93	$12,510,000	$1,246,000	$2,291,000
22	Streamside Forest Buffers	20	agriculture	1094.86	340	754.86	$6,660,000	$285,000	$540,000
23	Streamside Grass Buffers	80	agriculture	1270.43	1238.02	82.41	$240,000	$515,000	$526,000
24	Tree Planting	1.87	agriculture	1249	1129.94	119.06	$1,270,000	$649,000	$940,000
25	Wetland Restoration	0.22	agriculture	233.95	0	83.95	$5,340,000	$44,000	$212,000
26	Forest Harvesting Practices	28	forest	418.31	418.31	0	$0	$0	$0
27	Septic Connection	6.4	septic	1045.76	0	45.76	$2,330,000	$19,000	$92,000
28	Septic Denitrification	3	septic	458.83	0	58.83	$880,000	$12,000	$38,000
29	Septic Pumping	18	septic	2752.96	0	2752.96	$1,160,000	$165,000	$165,000
30	Abandoned Mine Reclamation	99	urban	1533.7	0.77	1532.93	$0	$0	$0
31	Dry Detention Ponds and Hydro Str (NR)	4	urban	1328.89	1334.22	-5.33	$0	$159,000	$159,000
32	Dry Detention Ponds and Hydro Str (reg)	5	urban	1584.61	7206.35	-5621.74	$0	$190,000	$190,000
33	Dry Extended Detention Ponds (Nr)	22	urban	7875.02	3940.52	3934.5	$36,350,000	$945,000	$5,355,000
34	Dry Extended Detention Ponds (reg)	11	urban	3365.7	3428.27	-62.57	$0	$404,000	$2,289,000
35	Erosion and Sediment Control	100	urban	2039.85	2039.85	0	$0	$0	$0
36	Impervious Urban Surface Reduction	5	urban	362.96	0	362.96	$32,670,000	$0	$1,089,000
37	Street Sweeping acres	4.25	urban	290	23.14	266.86	$1,950,000	$303,000	$303,000
38	Urban Filtering Practices (Nr)	0.01	urban	3.64	171.81	-168.17	$0	$5,000	$9,000
39	Urban Filtering Practices (reg)	5.5	urban	1743.07	165.84	1577.23	$39,590,000	$1,394,000	$7,844,000
40	Urban Infiltration Practices - (Nr)	0.00	urban	0	0	0	$0	$0	$0
41	Urban Infiltration Practices - (reg)	0.00	urban	0	0	0	$0	$0	$0
42	Urban Infiltration Practices-AB soils	0.0	urban	0	0	0	$0	$0	$0
43	Urban Nutrient Management (Nr)	65	urban	18981.42	2042.64	16938.78	$340,000	$0	$133,000
44	Urban Nutrient Management (reg)	65	urban	16117.38	1708.19	14409.19	$290,000	$0	$113,000
45	Urban Stream Restoration	0.23	urban	3000	0	3000	$1,610,000	$15,000	$66,000
46	Urban Tree Planting (easement)	1	urban	256.1	0	256.1	$10,960,000	$102,000	$444,000
47	Wet Ponds and Wetlands (Nr)	26	urban	9451.49	9493.07	-41.58	$0	$416,000	$4,688,000
48	Wet Ponds and Wetlands (reg)	60	urban	18875.82	18941.33	-65.51	-$910,000	$831,000	$9,362,000
49									
50	* A negative number indicates that the number of acres treated currently exceeds the level of effort required.							$24,442,000	$54,823,000

Total Cost and Pollutant Reductions

Total Cost Estimation for BMP Implementation: Loudoun Scenario V3 (01/15/2013) DRAFT:

Sector	Total Cost of Implementation	
agriculture	$121,740,000	
urban	$122,850,000	
septic	$4,370,000	
	$248,960,000	Total

N Excess (lbs)	P Excess (lbs)	S Excess (lbs)
2	43,000	5,360,000

Ag Reduction Nitrogen (lbs)	Urban Reduction Nitrogen (lbs)	Septic Reduction Nitrogen (lbs)
690,000	120,000	2,000
85.4%	14.3%	0.2%
Phosphorus (lbs)	Phosphorus (lbs)	Phosphorus (lbs)
49,000	7,000	0
86.9%	13.1%	0.0%
Sediment (lbs)	Sediment (lbs)	Sediment (lbs)
13,220,000	3,664,000	0
78.3%	21.7%	0.0%

Reduction proportions above do not count already credited practices.

Ag Reduction Nitrogen (lbs)	Urban Reduction Nitrogen (lbs)	Septic Reduction Nitrogen (lbs)
1,067,000	275,000	2,000
78.8%	20.3%	0.1%
Phosphorus (lbs)	Phosphorus (lbs)	Phosphorus (lbs)
84,000	31,000	0
73.0%	26.7%	0.0%
Sediment (lbs)	Sediment (lbs)	Sediment (lbs)
22,843,000	20,100,000	0
52.9%	46.6%	0.0%

Proportions above include credited reductions.

Ag Nitrogen Load (lbs)	Urban Nitrogen Load (lbs)	Septic Nitrogen Load (lbs)
2,023,000	1,034,000	148,000
60.9%	31.2%	4.5%
Phosphorus (lbs)	Phosphorus (lbs)	Phosphorus (lbs)
119,000	61,000	0
58.8%	30.1%	0.0%
Sediment (lbs)	Sediment (lbs)	Sediment (lbs)
32,300,000	28,084,000	0
46.4%	40.3%	0.0%

Above are the total loads by sector from the Loudoun Scenario.

Annual costs by sector:			
Agriculture	Urban	Septic	
$22,480,000	$32,040,000	$295,000	30 year life cycle (column AI)
$19,480,000	$4,760,000	$196,000	2012 Annual Costs (column AH)

APPENDIX

Land Use	Definition	CBP Abbreviation
alfalfa	This category contains only alfalfa hay. This is a dominant hay crop in many areas of the watershed. Alfalfa is a separate hay category because it is a nitrogen-fixing, leguminous crop and receives different nutrient applications than other hay crops.	alf
animal feeding operations	Animal feeding operations allows for the simulation of manure nutrient content runoff from the production areas. The area of animal feeding operations are based on the population of different animal types within a land-segment and accounts for manure generated by multiple animal types. Animal population data are obtained from the U.S. Agricultural Census for 1982, 1987, 1992, 1997, 2002, and 2007 for use in the estimation of both animal feeding operations and the application rates of manure nutrients to cropland and pasture. Animal feeding operations are determined from scenario-year animal populations that are generally projected for each animal type by state agricultural agencies or as trends from existing Agricultural Census animal populations by county. The county animal populations are distributed proportionally to land-segments according to the scenario-year ratio of agricultural acres in a land-segment to agricultural acres in a county. The different animal types are equated through a conversion to animal units which, in turn, defines an animal feeding operations acre.	afo
concentrated animal feeding operations	Concentrated animal feeding operations allows for the simulation of manure nutrient content runoff from confined-animal operation areas. The area of animal feeding operations are based on data from the U.S. Agricultural Census for 1982, 1987, 1992, 1997, 2002, and 2007. State-submitted data of animal populations were used for CAFOs for those states that submitted data.	cfo
CSS construction	Bare ground is considered to be a land cover because of construction. Accordingly, the average yearly change in impervious surface was multiplied by 2.5 to calculate the Phase 5 bare-construction acreage. Although this calculation is static and does not reflect year-to-year changes in construction, it provides a uniform methodology for the entire Phase 5 study area. The area of land that is in a combined sewer system is in this category.	ccn
CSS extractive	The extractive-active and abandoned mines land use is composed of mines, gravel pits, and the like. The area of extracted land that is in a combined sewer system area is in this category.	cex
CSS impervious developed	The area of land in this category represents the combined sewer system areas with impervious surface.	cid
CSS pervious developed	The area of land in this category represents the combined sewer system areas with pervious surface.	cpd
degraded riparian pasture	The degraded riparian pasture land use represents unfenced riparian pasture with an associated stream degraded by livestock. This land use has high nutrient and sediment loads and is treated by riparian buffer BMPs. The area of this land use is arbitrarily set as a percent of the pasture land use.	trp

VAST LAND USE DEFINITIONS

Land Use	Definition	CBP Abbreviation
forest	Forest, woodlots, and wooded land use includes woodlands, woodlots, and usually any wooded area of 30 meters by 30 meters remotely sensed by spectral analysis. The forest, wood lots, and wooded land use is the predominant land use in the Chesapeake watershed. Without the detail of separate wetland categories in Phase 5, the most representative land use category to include forested and emergent nontidal wetlands was in the forest, woodlots, and wooded land use. Accordingly, the low-loading, low-nutrient input land use of wetlands were included in this land use.	for
harvested forest	Harvested forest area is estimated to be about 0.33 percent of the forest, woodlot, and wooded land use everywhere in the Phase 5 domain. The harvested forest sediment export rates are applied in the simulation of the harvested forest area for 3 years, including the first year of forest harvesting, and in subsequent years revert to an undisturbed forest rate of sediment export. To account for the total land use of both harvested forest and land recovering from harvested forest land use, a total of 1 percent of land was set in harvested forest.	hvf
hay with nutrients	Hay with nutrients includes all tame and small grain hay excluding wild hay or alfalfa, which are included in other categories. These crops receive fertilizer and have a high degree of surface cover for most of the year. Failed cropland is also included in this category because they receive fertilizer but are not harvested, a pattern most similar to hay-fertilized.	hyw
hay without nutrients	The hay-unfertilized category includes hay or other herbaceous agricultural areas that do not receive fertilizer and are not harvested, such as wild hay, idle cropland, and fallow land.	hyo
hightill with manure	Conventional tillage with manure contains grain, corn, soybeans, and dry beans. Wheat, corn, and soybeans are the dominant crops in the Chesapeake watershed, often planted in a 2-year rotation on the same parcel of land. Crops in this category receive nutrient inputs from manure application as well as fertilizer. The category name indicates that manure may be applied, not that manure is necessarily applied.	hwm
hightill without manure	The conventional tillage without manure category contains cotton, tobacco, and vegetables. Because most of these crops are grown for direct human consumption, there is generally no manure application. These crops are simulated as only grown with a conventional tillage system. Orchards are also included in this category.	hom
lowtill with manure	The conservation tillage with manure contains grain, corn, soybeans, and dry beans. Wheat, corn, and soybeans are the dominant crops in the Chesapeake watershed, often planted in a 2-year rotation on the same parcel of land. Crops in this category receive nutrient inputs from manure application as well as fertilizer. The category name indicates that manure may be applied, not that manure is necessarily applied.	lwm
nonregulated extractive	The extractive-active and abandoned mines land use is composed of mines, gravel pits, and the like.	nex

VAST LAND USE DEFINITIONS

Land Use	Definition	CBP Abbreviation
nonregulated impervious developed	The area of land in this category represents the non-MS4 areas with impervious surface.	nid
nonregulated pervious developed	The area of land in this category represents the non-MS4 areas with pervious surface.	npd
nursery	The nursery land use represents container nurseries, which typically have a high density of plants (10–100 plants per square meter) and high rates of nutrient applications.	urs
nutrient management alfalfa	This category contains only alfalfa hay that is under a nutrient management plan. This is a dominant hay crop in many areas of the watershed. Alfalfa is a separate hay category because it is a nitrogen-fixing, leguminous crop and receives different nutrient applications than other hay crops.	nal
nutrient management hay with nutrients	Nutrient management hay with nutrients includes all tame and small grain hay excluding wild hay or alfalfa, which are included in other categories that are under a nutrient management plan. These crops receive fertilizer and have a high degree of surface cover for most of the year. Failed cropland is also included in this category because they receive fertilizer but are not harvested, a pattern most similar to hay-fertilized.	nhy
nutrient management hightill with manure	The nutrient management conventional tillage with manure contains grain, corn, soybeans, and dry beans grown under a nutrient management plan. Wheat, corn, and soybeans are the dominant crops in the Chesapeake watershed, often planted in a 2-year rotation on the same parcel of land. Crops in this category receive nutrient inputs from manure application as well as fertilizer. The category name indicates that manure may be applied, not that manure is necessarily applied.	nhi
nutrient management hightill without manure	The nutrient management conventional tillage without manure category contains cotton, tobacco, and vegetables that is under a nutrient management plan. Because most of these crops are grown for direct human consumption, there is generally no manure application. These crops are simulated as only grown with a conventional tillage system. Orchards are also included in this category.	nho
nutrient management lowtill with manure	The nutrient management conservation tillage with manure contains grain, corn, soybeans, and dry beans that is under a nutrient management plan. Wheat, corn, and soybeans are the dominant crops in the Chesapeake watershed, often planted in a 2-year rotation on the same parcel of land. Crops in this category receive nutrient inputs from manure application as well as fertilizer. Manure is not necessarily applied but is likely to be applied if there are animals in the county.	nlo
nutrient management pasture	Nutrient management pasture is pasture that is part of a farm plan where crop nutrient management is practiced.	npa
pasture	The pasture category contains only the pastureland item from the agricultural census. The pasture may receive fertilizer and receives manure from grazing animals. The agricultural census underreports pasture area used for horse grazing because horses are not considered to be agricultural commodities.	pas

VAST LAND USE DEFINITIONS

Land Use	Definition	CBP Abbreviation
regulated construction	Bare ground is considered to be a land cover because of construction. Accordingly, the average yearly change in impervious surface was multiplied by 2.5 to calculate the Phase 5 bare-construction acreage. Although this calculation is static and does not reflect year-to-year changes in construction, it provides a uniform methodology for the entire Phase 5 study area. The area of construction land that is in an MS4 area is in this category.	rcn
regulated extractive	The extractive-active and abandoned mines land use is composed of mines, gravel pits, and the like. The area of extracted land that is in an MS4 area is in this category.	rex
regulated impervious developed	The area of land in this category represents the MS4 areas with impervious surface.	rid
regulated pervious developed	The area of land in this category represents the MS4 areas with pervious surface.	rpd
water	Open water area was estimated directly from the 2000 RESAC land use data. Tidal water is outside the Phase 5 domain, so only nontidal waters were quantified as the Phase 5 open water land use. Unlike other Phase 5 land uses, open water land use has a constant area and is unchanged.	wat

BMP	BMP Short Name	Sector	BMP Description
Animal Waste Management System	AWMS	Agriculture	Practices designed for proper handling, storage, and utilization of wastes generated from confined animal operations. Reduced storage and handling loss is conserved in the manure and available for land application.
Barnyard Runoff Control	BarnRunoffCont	Agriculture	Includes the installation of practices to control runoff from barnyard areas. This includes practices such as roof runoff control, diversion of clean water from entering the barnyard and control of runoff from barnyard areas. Different efficiencies exist if controls are installed on an operation with manure storage or if the controls are installed on a loafing lot without a manure storage.
Biofilters	Biofilters	Agriculture	Ammonia emission reduction that is comprised of housing ventilation systems that pass air through a biofilter media that incorporates a layer of organic material, typically a mixture of compost and wood chips or shreds, that supports a microbial population and reduces ammonia emissions by oxidizing volatile organic compounds into carbon dioxide, water and inorganic salts. Reduced NH3 emission is conserved in the manure available for land application.
Commodity Cover Crop Early Drilled Wheat	ComCovCropEDW	Agriculture	A winter wheat crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Early Other Rye	ComCovCropEOR	Agriculture	A winter rye crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Early Other Wheat	ComCovCropEOW	Agriculture	A winter wheat crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Early-Planting Other Barley	ComCovCropEOB	Agriculture	A winter barley crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.

BMP	BMP Short Name	Sector	BMP Description
Commodity Cover Crop Late-Planting Drilled Wheat	ComCovCropLDW	Agriculture	A winter wheat crop planted after the average first frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Standard Other Rye	ComCovCropSOR	Agriculture	A winter rye crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Standard Other Wheat	ComCovCropSOW	Agriculture	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Standard-Planting Drilled Barley	ComCovCropSDB	Agriculture	A winter barley crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Standard-Planting Drilled Wheat	ComCovCropSDW	Agriculture	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Commodity Cover Crop Standard-Planting Other Barley	ComCovCropSOB	Agriculture	A winter barley crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). A commodity cover crop may receive nutrient applications after March 1 of the following year after establishment.
Conservation Tillage	ConserveTill	Agriculture	Conservation tillage involves planting and growing crops with minimal disturbance of the surface soil. Conservation tillage requires two components, (a) a minimum 30% residue coverage at the time of planting and (b) a non-inversion tillage method. No-till farming is a form of conservation tillage in which the crop is seeded directly into vegetative cover or crop residue with little disturbance of the surface soil. Minimum tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetation cover or crop residue on the surface.

BMP	BMP Short Name	Sector	BMP Description
Continuous No Till - CBP	ContinuousNT	Agriculture	The Continuous No-Till (CNT) BMP is a crop planting and management practice in which soil disturbance by plows, disk or other tillage equipment is eliminated. CNT involves no-till methods on all crops in a multi-crop, multi-year rotation. When an acre is reported under CNT, it will not be eligible for additional reductions from the implementation of other practices such as cover crops or nutrient management planning. Multi-crop, multi-year rotations on cropland are eligible. Crop residue should remain on the field. Planting of a cover crop might be needed to maintain residue levels. Producers must have and follow a current nutrient management plan. The system must be maintained for a minimum of five years. All crops must be planted using no-till methods.
Continuous No Till - VA	ContinuousNTVA	Agriculture	The Continuous No-Till (CNT) BMP is a crop planting and management practice in which soil disturbance by plows, disk or other tillage equipment is eliminated. CNT involves no-till methods on all crops in a multi-crop, multi-year rotation. Virginia's version of CNT allows this BMP to be eligible for additional reductions from the implementation of other practices such as cover crops or nutrient management planning. Multi-crop, multi-year rotations on cropland are eligible. Crop residue should remain on the field. Planting of a cover crop might be needed to maintain residue levels. Producers must have and follow a current nutrient management plan. The system must be maintained for a minimum of five years. All crops must be planted using no-till methods.
Cover Crop Early Drilled Rye	CoverCropEDR	Agriculture	A winter rye crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Early Drilled Wheat	CoverCropEDW	Agriculture	A winter wheat crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Early Other Rye	CoverCropEOR	Agriculture	A winter rye crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.

BMP	BMP Short Name	Sector	BMP Description
Cover Crop Early Other Wheat	CoverCropEOW	Agriculture	A winter wheat crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.
Cover Crop Early-Planting Drilled Barley	CoverCropEDB	Agriculture	A winter barley crop planted at least 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Early-Planting Other Barley	CoverCropEOB	Agriculture	A winter barley crop planted at least 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.
Cover Crop Late Other Wheat	CoverCropLOW	Agriculture	A winter wheat crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.
Cover Crop Late-Planting Drilled Wheat	CoverCropLDW	Agriculture	A winter wheat crop planted after the average first frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Late-Planting Other Rye	CoverCropLOR	Agriculture	A winter rye crop planted after the average first frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.
Cover Crop Standard Drilled Barley	CoverCropSDB	Agriculture	A winter barley crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Standard Drilled Rye	CoverCropSDR	Agriculture	A winter rye crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Standard Drilled Wheat	CoverCropSDW	Agriculture	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a drilled seeding method. The crop may be neither fertilized nor harvested.
Cover Crop Standard Other Barley	CoverCropSOB	Agriculture	A winter barley crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.

BMP	BMP Short Name	Sector	BMP Description
Cover Crop Standard Other Rye	CoverCropSOR	Agriculture	A winter rye crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.
Cover Crop Standard Other Wheat	CoverCropSOW	Agriculture	A winter wheat crop planted no more than 2 weeks prior to the average frost date with a seeding method that is neither drilled nor aerial (e.g. surface broadcast or with stalk chopping or light disking). The crop may be neither fertilized nor harvested.
Cropland Irrigation Management	Cropirrmgmt	Agriculture	Cropland under irrigation management is used to decrease climatic variability and maximize crop yields. The potential nutrient reduction benefit stems not from the increased average yield (20-25%) of irrigated versus non-irrigated cropland, but from the greater consistency of crop yields over time matched to nutrient applications. This increased consistency in crop yields provides a subsequent increased consistency in plant nutrient uptakes over time matched to applications, resulting in a decrease in potential environmental nutrient losses. The current placeholder effectiveness value for this practice has been proposed at 4% TN, 0%TP and 0%TSS, utilizing the range in average yields from the 2002 and 2007 NASS data for irrigated and non-irrigated grain corn as a reference. The proposed practice is applied on a per acre basis, and can be implemented and reported for cropland on both lo-till and hi-till land uses that receive or do not receive manure.

BMP	BMP Short Name	Sector	BMP Description
Dairy Manure Injection	LiquidInjection	Agriculture	The subsurface application of liquid manure from cattle and swine has been demonstrated in research studies to significantly reduce nutrient losses for both surface runoff and ammonia emissions. Recent studies by Pennsylvania State University (PSU) and USDA-ARS indicate that the effectiveness of the practice is dependent on the technology used for injection, and that some systems are not consistent with the USDA-NRCS management requirements for high residue management systems; e.g. Continuous No-Till. This proposed practice is indicative of low disturbance soil injection systems and is not appropriate for tillage incorporation or other post surface application incorporation methods. The current placeholder effectiveness value for this practice has been proposed at 25% TN, 0%TP and 0%TSS, utilizing a conservative estimate in combined nutrient and sediment loss reductions by current university and ARS research as a reference. The proposed practice is applied on a per acre basis, and can be implemented and reported for cropland on both lo-till and hi-till land uses that receive manure, pasture and hay with manure.
Dairy Precision Feeding and/or Forage Management	DairyPrecFeed	Agriculture	Dairy Precision Feeding reduces the quantity of phosphorus and nitrogen fed to livestock by formulating diets within 110% of Nutritional Research Council recommended level in order to minimize the excretion of nutrients without negatively affecting milk production.
Decision Agriculture	DecisionAg	Agriculture	A management system that is information and technology based, is site specific and uses one or more of the following sources of data: soils, crops, nutrients, pests, moisture, or yield for optimum profitability, sustainability, and protection of the environment.
Dirt & Gravel Road Erosion & Sediment Control - Driving Surface Aggregate + Raising the Roadbed	DirtGravelDSA	Agriculture	Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and raising road elevation to restore natural drainage patterns.
Dirt & Gravel Road Erosion & Sediment Control - Outlets only	DirtGravelnoDSA	Agriculture	Reduce the amount of sediment runoff from dirt and gravel roads through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).

BMP	BMP Short Name	Sector	BMP Description
Dirt & Gravel Road Erosion & Sediment Control - with Outlets	DirtGravelDSAOut	Agriculture	Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).
Enhanced Nutrient Management	EnhancedNM	Agriculture	Based on research, the nutrient management rates of nitrogen application are set approximately 35% higher than what a crop needs to ensure nitrogen availability under optimal growing conditions. In a yield reserve program using enhanced nutrient management, the farmer would reduce the nitrogen application rate by 15%. An incentive or crop insurance is used to cover the risk of yield loss. This BMP effectiveness estimate is based on a reduction in nitrogen loss resulting from nutrient application to cropland 15% lower than the nutrient management recommendation. The effectiveness estimate is based on conservativeness and data from a program run by American Farmland Trust.
Forest Buffers	ForestBuffers	Agriculture	Agricultural riparian forest buffers are linear wooded areas along rivers, stream and shorelines. Forest buffers help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width for riparian forest buffers (agriculture) is 100 feet, with a 35 feet minimum width required.
Grass Buffers; Vegetated Open Channel - Agriculture	GrassBuffers	Agriculture	Agricultural riparian grass buffers are linear strips of grass or other non-woody vegetation maintained between the edge of fields and streams, rivers or tidal waters that help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width for riparian forests buffers (agriculture) is 100 feet, with a 35 feet minimum width required. Vegetated open channels are modeled identically to grass buffers.
Horse Pasture Management	HorsePasMan	Agriculture	Stabilizing overused small pasture containment areas (animal concentration area) adjacent to animal shelters or farmstead.

BMP	BMP Short Name	Sector	BMP Description
Irrigation Water Capture Reuse	CaptureReuse	Agriculture	This practice involves the collection of runoff water from container nursery operations where runoff of irrigation water and leachate from plant containers grown on plastic or in greenhouses is routed to lined return ditches or piped to lined holding ponds. Ponds would be designed to retaining all excess irrigation water runoff or leachate and capturing the first one-half to one-inch of stormwater runoff. Water would be recirculated for irrigation in nursery and greenhouse operations or irrigated at the proper times of year on other vegetation capable of trapping nutrients at agronomic rates, such as cool season grasses.
Lagoon Covers	LagoonCovers	Agriculture	Permeable and impermeable covers of lagoons to prevent volatilization of ammonia. A cover can be, and is applied, to various species including swine and dairy.
Land Retirement to hay without nutrients (HEL)	LandRetireHyo	Agriculture	Converts land area to hay without nutrients. Agricultural land retirement takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses, and/or trees. Agricultural agencies have a program to assist farmers in land retirement procedures.
Land Retirement to pasture (HEL)	LandRetirePas	Agriculture	Converts land area to pasture. Agricultural land retirement takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses, and/or trees. Agricultural agencies have a program to assist farmers in land retirement procedures.
Loafing Lot Management	LoafLot	Agriculture	The stabilization of areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, surfacing with suitable materials, and/or installing needed structures. This does not include poultry pad installation.
Mortality Composters	MortalityComp	Agriculture	A physical structure and process for disposing of dead livestock. Composted material is combined with poultry litter and land applied using nutrient management plan recommendations.
Non Urban Stream Restoration	NonUrbStrmRest	Agriculture	A collection of site specific engineering techniques used to stabilize an eroding streambank and channel. These are areas not associated with animal entry.

BMP	BMP Short Name	Sector	BMP Description
Nutrient Management	NutMan	Agriculture	Nutrient management plan (NMP) implementation (crop) is a comprehensive plan that describes the optimum use of nutrients to minimize nutrient loss while maintaining yield. A NMP details the type, rate, timing, and placement of nutrients for each crop. Soil, plant tissue, manure and/or sludge tests are used to assure optimal application rates. Plans should be revised every 2 to 3 years.
Off Stream Watering Without Fencing	OSWnoFence	Agriculture	This BMP requires the use of alternative drinking water sources away from streams. The BMP may also include options to provide off-stream shade for livestock, and implementing a shade component is encouraged where applicable. The hypothesis on which this practice is based is that, given a choice between a clean and convenient off-stream water source and a stream, cattle will preferentially drink from off-stream water source and reduce the time they spend near and in streams and streambanks. Alternative watering facilities typically involves the use of permanent or portable livestock water troughs placed away from the stream corridor. The source of water supplied to the facilities can be from any source including pipelines, spring developments, water wells, and ponds. In-stream watering facilities such as stream crossings or access points are not considered in this definition. The modeled benefits of alternative watering facilities can be applied to pasture acres in association with or without improved pasture management systems such as prescribed grazing or PIRG.

BMP	BMP Short Name	Sector	BMP Description
Poultry Litter Injection	PoultryInjection	Agriculture	The subsurface injection of poultry manure has been demonstrated in university and USDA-ARS research studies to significantly reduce nutrient losses for both surface runoff and ammonia emissions. Recent studies by universities and USDA-ARS indicate that dry manure injection is feasible and effective by utilizing current research technology. These systems are also consistent with the USDA-NRCS management requirements for high residue management systems; e.g. Continuous No-Till. This proposed practice is indicative of low disturbance soil injection systems and is not appropriate for tillage incorporation or other post surface application incorporation methods. The current placeholder effectiveness value for this practice has been proposed at 25% TN, 0%TP and 0%TSS, utilizing a conservative estimate in combined nutrient and sediment loss reductions by current university and ARS research as a reference. The proposed practice is applied on a per acre basis, and can be implemented and reported for cropland on both lo-till and hi-till land uses that receive manure, pasture and hay with manure.
Poultry Litter Treatment (alum, for example)	Alum	Agriculture	Surface application of alum, an acidifier, to poultry litter to acidify poultry litter and maintain ammonia in the non-volatile ionized form (ammonium).
Poultry Phytase	PoultryPhytase	Agriculture	Phytase is an enzyme added to poultry-feed that helps poultry absorb phosphorus. The addition of phytase to poultry feed allows more efficient nutrient uptake by poultry, which in turn allows decreased phosphorus levels in feed and less overall phosphorus in poultry waste. The use of phytase is a best management practice (BMP). No poultry automatically have the phytase feed additive.

BMP	BMP Short Name	Sector	BMP Description
Precision Intensive Rotational Grazing	UpPrecIntRotGraze	Agriculture	This practice utilizes more intensive forms pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas of the upland pastures. PIRG can be applied to pastures intersected by streams or upland pastures outside of the degraded stream corridor (35 feet width from top of bank). The modeled benefits of the PIRG practice can be applied to pasture acres in association with or without alternative watering facilities. They can also be applied in conjunction with or without stream access control. This practice requires intensive management of livestock rotation, also known as Managed Intensive Grazing systems (MIG), that have very short rotation schedules. Pastures are defined as having a vegetative cover of 60% or greater.
Prescribed Grazing	PrecRotGrazing	Agriculture	This practice utilizes a range of pasture management and grazing techniques to improve the quality and quantity of the forages grown on pastures and reduce the impact of animal travel lanes, animal concentration areas or other degraded areas. PG can be applied to pastures intersected by streams or upland pastures outside of the degraded stream corridor (35 feet width from top of bank). The modeled benefits of prescribed grazing practices can be applied to pasture acres in association with or without alternative watering facilities. They can also be applied in conjunction with or without stream access control. Pastures under the PG systems are defined as having a vegetative cover of 60% or greater.
Soil Conservation and Water Quality Plans	ConPlan	Agriculture	Farm conservation plans are a combination of agronomic, management and engineered practices that protect and improve soil productivity and water quality, and to prevent deterioration of natural resources on all or part of a farm. Plans may be prepared by staff working in conservation districts, natural resource conservation field offices or a certified private consultant. In all cases the plan must meet technical standards.

BMP	BMP Short Name	Sector	BMP Description
Sorbing Materials in Ag Ditchs	DitchFilter	Agriculture	The University of Maryland and the USDA Agricultural Research Service (ARS) have demonstrated through an existing research project at the University of Maryland-Eastern Shore the application of "Phosphorus-sorbing" materials to absorb available dissolved phosphorus in cropland drainage systems for removal and reuse as an agricultural fertilizer. These in-channel engineered systems can capture significant amounts of dissolved phosphorus in agricultural drainage water by passing them through phosphorus-sorbing materials, such as gypsum, drinking water treatment residuals, or acid mine drainage residuals. The proposed practice is applied on a per acre basis, and can be implemented and reported for cropland on both lo-till and hi-till land uses that receive or do not receive manure.
Stream Access Control with Fencing	PastFence	Agriculture	Stream access control with fencing involves excluding a strip of land with fencing along the stream corridor to provide protection from livestock. The fenced areas may be planted with trees or grass, or left to natural plant succession, and can be of various widths. To provide the modeled benefits of a functional riparian buffer, the width must be a minimum of 35 feet from top-of-bank to fence line. The implementation of stream fencing provides stream access control for livestock but does not necessarily exclude animals from entering the stream by incorporating limited and stabilized in-stream crossing or watering facilities. The modeled benefits of stream access control can be applied to degraded stream corridors in association with or without alternative watering facilities. They can also be applied in conjunction with or without pasture management systems such as prescribed grazing or PIRG. Alternative watering facilities typically involves the use of permanent or portable livestock water troughs placed away from the stream corridor. The source of water supplied to the facilities can be from any source including pipelines, spring developments, water wells, and ponds. In-stream watering facilities such as stream crossings or access points are not considered in this definition.
Streamside Forest Buffers	ForestBuffersTrp	Agriculture	Converts streamside areas to forest. Should be used with Stream Access Control with Fencing to convert degraded riparian areas to forest.
Streamside Grass Buffers	GrassBuffersTrp	Agriculture	Converts degraded riparian pasture to hay without nutrients

BMP	BMP Short Name	Sector	BMP Description
Streamside Wetland Restoration	WetlandRestoreTrp	Agriculture	Converts degraded riparian pasture to forest.
Swine Phytase	SwinePhytase	Agriculture	This interim BMP considers a reduction in phosphorus from an enzyme added to feed. The enzyme increases the amount of phosphorus absorbed by the hog. This results in less phosphorus added to the feed, and less phosphorus in the manure.
Tree Planting	TreePlant	Agriculture	Tree planting includes any tree planting, except those used to establish riparian forest buffers, targeting lands that are highly erodible or identified as critical resource areas.
Water Control Structures	WaterContStruc	Agriculture	Installing and managing boarded gate systems in agricultural land that contains surface drainage ditches.
Wetland Restoration	WetlandRestore	Agriculture	Agricultural wetland restoration activities re-establish the natural hydraulic condition in a field that existed prior to the installation of subsurface or surface drainage. Projects may include restoration, creation and enhancement acreage. Restored wetlands may be any wetland classification including forested, scrub-shrub or emergent marsh.
Dirt & Gravel Road Erosion & Sediment Control - Driving Surface Aggregate + Raising the Roadbed	DirtGravelDSA	Forest	Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and raising road elevation to restore natural drainage patterns.
Dirt & Gravel Road Erosion & Sediment Control - Outlets only	DirtGravelnoDSA	Forest	Reduce the amount of sediment runoff from dirt and gravel roads through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).
Dirt & Gravel Road Erosion & Sediment Control - with Outlets	DirtGravelDSAOut	Forest	Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).
Forest Harvesting Practices	ForHarvestBMP	Forest	Forest harvesting practices are a suite of BMPs that minimize the environmental impacts of road building, log removal, site preparation and forest management. These practices help reduce suspended sediments and associated nutrients that can result from forest operations.

BMP	BMP Short Name	Sector	BMP Description
Septic Connection	SepticConnect	Septic	This is when septic systems get converted to public sewer. This reduces the number of systems because the waste is sent into the sewer and treated at a wastewater treatment plant.
Septic Denitrification	SepticDenitrify	Septic	Septic denitrification represents the replacement of traditional septic systems with more advanced systems that have additional nitrogen removal capabilities. Traditional septic systems usually consist of a large tank designed to hold the wastewater allowing grits and solids time for settling and decomposition. Wastewater then flows to the second component, the drainfield. An enhanced septic system like that shown can provide further treatment of nitrogen through processes that encourage denitrification of the wastewater.
Septic Pumping	SepticPump	Septic	Septic systems achieve nutrient reductions through several types of management practices, including frequent maintenance and pumping. On average, septic tanks need to be pumped once every three to five years to maintain effectiveness. The pumping of septic tanks is one of several measures that can be implemented to protect soil absorption systems from failure. When septic tanks are pumped and sewage removed, the septic system's capacity to remove settable and floatable solids from wastewater is increased.
Abandoned Mine Reclamation	AbanMineRec	Urban	Abandoned mine reclamation stabilizes the soil on lands mined for coal or affected by mining, such as wastebanks, coal processing, or other coal mining processes.
Bioretention/raingardens	BioRet	Urban	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants.
Bioswale	BioSwale	Urban	With a bioswale, the load is reduced because, unlike other open channel designs, there is now treatment through the soil. A bioswale is designed to function as a bioretention area.
Dirt & Gravel Road Erosion & Sediment Control - Driving Surface Aggregate + Raising the Roadbed	DirtGravelDSA	Urban	Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and raising road elevation to restore natural drainage patterns.

BMP	BMP Short Name	Sector	BMP Description
Dirt & Gravel Road Erosion & Sediment Control - Outlets only	DirtGravelnoDSA	Urban	Reduce the amount of sediment runoff from dirt and gravel roads through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).
Dirt & Gravel Road Erosion & Sediment Control - with Outlets	DirtGravelDSAOut	Urban	Reduce the amount of sediment runoff from dirt and gravel roads through the use of driving surface aggregates (DSA) such as durable and erosion resistant road surface and through the use of additional Drainage Outlets (creating new outlets in ditchline to reduce channelized flow).
Dry Detention Ponds and Hydrodynamic Structures	DryPonds	Urban	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
Dry Extended Detention Ponds	ExtDryPonds	Urban	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.
Erosion and Sediment Control	EandS	Urban	Erosion and sediment control practices protect water resources from sediment pollution and increases in runoff associated with land development activities. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams.
Erosion and Sediment Control on Extractive	EandSext	Urban	Erosion and sediment control practices on extractive land uses, such as mining, protect water resources from sediment pollution and increases in runoff associated with land development activities. By retaining soil on-site, sediment and attached nutrients are prevented from leaving disturbed areas and polluting streams.

BMP	BMP Short Name	Sector	BMP Description
Forest Conservation	ForestCon	Urban	This BMP in Maryland is the implementation of the Maryland Forest Conservation Act that requires developers to maintain at least 20% of a development site in trees (forest condition). This is actually a preventative type of BMP which alters the rate of urban conversion. The acreage is calculated from the annual urban increase (population based). The 20% is specific to the Maryland Act and could be different for each jurisdiction or various locations within a jurisdiction.
Impervious Urban Surface Reduction	ImpSurRed	Urban	Reducing impervious surfaces to promote infiltration and percolation of runoff storm water.
Permeable Pavement - no sandveg with underdrain with AB soils	PermPavNoSV	Urban	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain.
Permeable Pavement - with sandveg with underdrain with AB soils	PermPavWSV	Urban	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. When sand and vegetation are present, high reduction efficiencies can be achieved.

BMP	BMP Short Name	Sector	BMP Description
Street Sweeping Feet	StreetSweepFt	Urban	Street sweeping measured by the linear unit of feet. May be converted from miles to feet by multiplying by 5,280. Street sweeping and storm drain cleanout practices rank among the oldest practices used by communities for a variety of purposes to provide a clean and healthy environment, and more recently to comply with their National Pollutant Discharge Elimination System stormwater permits. The ability for these practices to achieve pollutant reductions is uncertain given current research findings. Only a few street sweeping studies provide sufficient data to statistically determine the impact of street sweeping and storm drain cleanouts on water quality and to quantify their improvements. The ability to quantify pollutant loading reductions from street sweeping is challenging given the range and variability of factors that impact its performance, such as the street sweeping technology, frequency and conditions of operation in addition to catchment characteristics. Fewer studies are available to evaluate the pollutant reduction capabilities due to storm drain inlet or catch basin cleanouts.
Street Sweeping Mechanical Monthly	StreetSweep	Urban	Street sweeping conducted on a monthly basis. This has the highest effectiveness because of the regularity of the street sweeping. Street sweeping and storm drain cleanout practices rank among the oldest practices used by communities for a variety of purposes to provide a clean and healthy environment, and more recently to comply with their National Pollutant Discharge Elimination System stormwater permits. The ability for these practices to achieve pollutant reductions is uncertain given current research findings. Only a few street sweeping studies provide sufficient data to statistically determine the impact of street sweeping and storm drain cleanouts on water quality and to quantify their improvements. The ability to quantify pollutant loading reductions from street sweeping is challenging given the range and variability of factors that impact its performance, such as the street sweeping technology, frequency and conditions of operation in addition to catchment characteristics. Fewer studies are available to evaluate the pollutant reduction capabilities due to storm drain inlet or catch basin cleanouts.

BMP	BMP Short Name	Sector	BMP Description
Street Sweeping Pounds	StreetSweepLbs	Urban	Street sweeping measured by the weight of street residue collected. Street sweeping and storm drain cleanout practices rank among the oldest practices used by communities for a variety of purposes to provide a clean and healthy environment, and more recently to comply with their National Pollutant Discharge Elimination System stormwater permits. The ability for these practices to achieve pollutant reductions is uncertain given current research findings. Only a few street sweeping studies provide sufficient data to statistically determine the impact of street sweeping and storm drain cleanouts on water quality and to quantify their improvements. The ability to quantify pollutant loading reductions from street sweeping is challenging given the range and variability of factors that impact its performance, such as the street sweeping technology, frequency and conditions of operation in addition to catchment characteristics. Fewer studies are available to evaluate the pollutant reduction capabilities due to storm drain inlet or catch basin cleanouts.
Urban Filtering Practices	Filter	Urban	Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.
Urban Forest Buffers	ForestBufUrban	Urban	An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals.
Urban Grass Buffers	UrbGrassBuffers	Urban	This BMP changes the land use from pervious urban to pervious urban. Therefore, there is no change and no reduction from using this BMP.
Urban Infiltration Practices - no sand\veg no underdrain	Infiltration	Urban	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration.

BMP	BMP Short Name	Sector	BMP Description
Urban Infiltration Practices - with sandveg no underdrain	InfiltWithSV	Urban	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration. Design specifications require infiltration basins and trenches to be build in good soil, they are not constructed on poor soils, such as C and D soil types. Engineers are required to test the soil before approved to build is issued. To receive credit over the longer term, jurisdictions must conduct yearly inspections to determine if the basin or trench is still infiltrating runoff.
Urban Nutrient Management	UrbanNutMan	Urban	Urban nutrient management involves the reduction of fertilizer to grass lawns and other urban areas. The implementation of urban nutrient management is based on public education and awareness, targeting suburban residences and businesses, with emphasis on reducing excessive fertilizer use. This does not account for the recent laws passed to remove P from fertilizer.
Urban Stream Restoration Or Regenerative Stormwater Conveyance	UrbStrmRest	Urban	Stream restoration in urban areas is used to restore the urban stream ecosystem by restoring the natural hydrology and landscape of a stream, help improve habitat and water quality conditions in degraded streams.
Urban Tree Planting; Urban Tree Canopy	UrbanTreePlant	Urban	Urban tree planting is planting trees on urban pervious areas at a rate that would produce a forest-like condition over time. The intent of the planting is to eventually convert the urban area to forest. If the trees are planted as part of the urban landscape, with no intention to covert the area to forest, then this would not count as urban tree planting
Vegetated Open Channel - Urban	VegOpChan	Urban	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils.

BMP	BMP Short Name	Sector	BMP Description
Wet Ponds and Wetlands	WetPondWetland	Urban	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.

Phase II WIP Best Management Practices Summary

Best Management Practice	Cost per Pound of Reduction: Nitrogen	Cost per Pound of Reduction: Phosphorus	Cost per Pound of Reduction: Sediment	Implementation Potential	Reduction Potential: Nitrogen	Reduction Potential: Phosphorus	Reduction Potential: Sediment
AGRICULTURAL SECTOR							
Barnyard Runoff Control	Medium	Medium	Medium	Fair	Low	Low	Fair
Commodity Cover Crop Small Grain	Low	NA	NA	Good	Low	Low	NA
Conservation Tillage	Medium	NA	Low	Good	Fair	Fair	Good
Cover Crop Early Small Grain	Low	Medium	Medium	Good	Low	Low	Fair
Cover Crop Standard Small Grain	Low	Medium	Medium	Good	Low	Low	Fair
Decision Agriculture	Low	Low	NA	Good	Good	Good	NA
Enhanced Nutrient Management	Low	Low	NA	Good	Good	Good	NA
Irrigation Water Capture Reuse	Low	Low	NA	Fair	Low	Low	Fair
Nutrient Management	Medium	Low	NA	Good	Good	Fair	NA
Prescribed Grazing	Medium	Low	Low	Good	Fair	Good	Fair
Soil Conservation and Water Quality Plan	Medium	Low	Low	Good	Low	Fair	Good
Streamside Grass Buffers	Low	Low	Low	Fair	Fair	Fair	Good
Grass Buffers; Vegetated Open Channel	Low	Medium	Medium	Good	Good	Good	Good
Non Urban Stream Restoration	Medium	Low	Low	Fair	Fair	Low	Good
Off Stream Watering Without Fencing	Medium	Medium	High	Fair	Fair	Fair	Fair
Stream Access Control with Fencing	Low	Low	Low	Fair	Fair	Good	Good
Streamside Forest Buffers	Medium	Medium	Medium	Low	Fair	Fair	Fair
Wetland Restoration	High	High	High	Low	Good	Fair	Fair
Forest Buffers	Medium	Medium	Medium	Fair	Good	Good	Fair
Land Retirement to hay without nutrients	Medium	Medium	Medium	Low	Good	Fair	Good
Tree Planting	Medium	Medium	Medium	Low	Good	Fair	Fair
Horse Pasture Management	NA	Low	Low	Fair	NA	Fair	Fair
SEPTIC SECTOR	**Nitrogen**	**Phosphorus**	**Sediment**		**Nitrogen**	**Phosphorus**	**Sediment**
Septic Connection	High	NA	NA	Fair	Fair	NA	NA
Septic Denitrification	Medium	NA	NA	Low	Low	NA	NA
Septic Pumpout	Medium	NA	NA	Good	Good	NA	NA
URBAN SECTOR	**Nitrogen**	**Phosphorus**	**Sediment**		**Nitrogen**	**Phosphorus**	**Sediment**
Urban Nutrient Management	Low	Low	NA	Good	Good	Fair	NA
Abandoned Mine Reclamation	Low	Low	Low	Low	Fair	Fair	Good
Urban Filtering Practices (sand)	High	Medium	Medium	Fair	Good	Fair	Fair
Urban Filtering Practices (cartridge)	High	Medium	Medium	Fair	Good	Fair	Fair
Urban Filtering Practices (Bioretention filter)	High	Medium	High	Fair	Good	Fair	Fair
Urban Tree Planting (Land Purchase)	High	High	High	Fair	Good	Fair	Fair
Urban Tree Planting (Land Easement)	High	High	High	Fair	Good	Fair	Fair
Urban Tree Planting (Free Land)	High	High	High	Fair	Good	Fair	Fair
Urban Infiltration Practices	High	High	High	Low	Good	Fair	Fair
Wet Ponds & Wetlands	High	Medium	Medium	Low	Good	Fair	Good
Dry Detention & Hydrodynamic Structures	High	High	High	Low	Fair	Low	Fair
Dry Extended Detention Ponds (New-Land Easement)	High	High	Medium	Good	Good	Fair	Good
Dry Extended Detention Ponds (New-Land Purchase)	High	High	Medium	Good	Good	Fair	Good
Dry Extended Detention Ponds(New-Free Land)	Medium	Medium	Medium	Good	Good	Fair	Good
Dry Extended Detention Ponds (Retrofit)	Medium	Medium	Medium	Good	Good	Fair	Good
Impervious Surface Reduction	High	High	High	Good	Good	Fair	Fair
Street Sweeping (25 times/yr)	High	High	High	Low	Low	Low	Fair
Urban Stream Restoration	Medium	Medium	Low	Fair	Low	Low	Fair
Erosion & Sediment Control	Low	Low	Low	Good	Fair	Fair	Good
	High (>$250/lb)	High (>$4000/lb)	High (>$5/lb)	Low	Low (<10k lbs)	Low (<400 lbs)	Low (<200k lbs)
	Medium ($20-$250/lb)	Medium ($300-$4000/lb)	Medium ($1-$5/lb)	Fair	Fair (10k-40k lbs)	Fair (400-5k lbs)	Fair (200k-2M lbs)
	Low (<$20/lb)	Low (<$300/lb)	Low (<$1/lb)	Good	Good (>40k lbs)	Good (>5k lbs)	Good (>2M lbs)

Implementation Potential is a subjective value based on knowledge of the difficulty of BMP implementation, regulative authority, land use, and practical experience.

Nitrogen, Phosphorous, and Sediment Reduction Potentials are calculated based on land use availablity in acres multiplied by the reduction efficiency of each BMP in lbs/acre.
These values show the reduction amounts possible, not attainable.

"NA" indicates that there is no reduction credited for application of BMP.

ESTIMATED COSTS FOR IMPLEMENTATION OF BMPs

BMP	Estimated Capital Cost/Acre Treated ($2012)	Estimated Annual Cost/Acre ($2012)	Life Cycle of BMP (years)	Annual Cost (BMP lifespan)	Annual Cost (30 yrs or BMP lifespan)
Barnyard Runoff Control	$36,333	$727	20	$2,544	$2,544
Commodity Cover Crop Small Grain	$0	($430)	1	-$430	-$430
Conservation Tillage	$0	$145	1	$145	$145
Cover Crop Small Grain	$0	$110	1	$110	$110
Decision Agriculture	$12.50	$0	5	$3	$3
Enhanced Nutrient Management	$0	$5	3	$5	$5
Forest Buffers	$7,000	$520	75	$613	$753
Grass Buffers; Vegetated Open Channel-Agriculture	$240	$563	75	$566	$571
Horse Pasture Management	$188	$19	10	$38	$38
Irrigation Water Capture Reuse	$8,570	$385	20	$814	$814
Land Retirement to hay without nutrients (HEL)	$0	$563	75	$563	$563
Non-Urban Stream Restoration **(cost per linear foot)**	$250	$1	75	$4	$9
Nutrient Management	$0	$16	3	$16	$16
Off Stream Watering Without Fencing	$1,100	$33	20	$88	$88
Prescribed Grazing	$167	$13	10	$30	$30
Soil Conservation and Water Quality Plans	$0	$16	3	$16	$16
Stream Access Control with Fencing	$9,960	$1,187	10	$2,183	$2,183
Streamside Forest Buffers	$7,000	$260	75	$353	$493
Streamside Grass Buffers	$240	$390	75	$393	$398
Tree Planting	$7,000	$520	75	$613	$753
Wetland Restoration	$60,000	$520	30	$2,520	$2,520
Septic Connection **(cost per unit)**	$48,000	$414	75	$1,054	$2,014
Septic Denitrification **(cost per unit)**	$13,500	$200	30	$650	$650
Septic Pump-Out **(cost per unit)**	$0	$60	5	$60	$60
Dry Extended Detention Pond (New Pond)- Land Purchased	$25,200	$120	75	$456	$960
Dry Extended Detention Pond (New Pond)- Easement	$16,800	$120	75	$344	$680
Dry Extended Detention Pond (New Pond)- Free Land	$13,200	$120	75	$296	$560
Dry Extended Detention Pond (Retrofit of Dry Pond)	$8,400	$120	75	$232	$400
Impervious Surface Reduction (Replace with Pervious Concrete)	$550,000	$800	30	$19,133	$19,133
Impervious Surface Reduction (Replace with Pervious Asphalt)	$480,000	$800	20	$24,800	$24,800
Impervious Surface Reduction (No Replacement)	$90,000	$0	75	$1,200	$3,000
Street Sweeping	$0	$1,045	1	$1,045	$1,045
Urban Filtering Practices (sand filter)	$29,000	$1,500	30	$2,467	$2,467
Urban Filtering Practices (bioretention filter)	$30,000	$2,500	15	$4,500	$4,500
Urban Filtering Practices (Cartridge System)	$19,500	$800	30	$1,450	$1,450
Urban Nutrient Management	$20	$0	3	$7	$7
Urban Stream Restoration **(cost per linear foot)**	$500	$5	75	$12	$22
Urban Tree Planting- Land Purchased	$110,000	$400	75	$1,867	$4,067
Urban Tree Planting- Easement	$40,000	$400	75	$933	$1,733
Urban Tree Planting- Free Land	$10,000	$400	75	$533	$733
Wet Pond	$13,556	$44	75	$225	$496

ESTIMATED COSTS FOR IMPLEMENTATION OF BMP's
01/03/2013

SECTOR: AGRICULTURE

Barnyard Runoff Control:

Estimated one-time cost/acre - $36,333
Estimated annual cost/acre – $727
Life of BMP is estimated to be 20 years
Note: There is no cost-share program for this BMP.

Capital Cost Documentation:

Construction Costs	**How calculated: [**(Cost of roof gutter)(100 ft.) + (Cost of French Drain)(100 ft.) + (Cost of 8" curb) (300 ft.)]/0.3 acres]. According to the ***Virginia Animal Operations Database,*** Loudoun County has 17 registered animal feed lots. The average number of animals per operation is 69 animals (mostly cattle). Proper barnyard sizing (USDA-NRCS) recommends 70 sq. ft. per animal for cattle (upper end of range). This would result in an average barnyard size in Loudoun of (68*70) 4780 sq. ft., or 0.11 acres. Barnyard size for horses is considerably larger, expanding the average barnyard to 0.3 acres. For each 0.3 acre barnyard treated, 100 ft. of roof gutter at $16/ft. (divert water from structure), 100 ft. of French drain at $21/f (divert or capture lot drainage), and 300 ft. of 8" minimum curb to channel fluid to French drain at $24/ft.
	Source of numbers: Curb cost from Life Cycle Cost Comparison. 2006 cost of $18/ft calculated to 2012 costs = $24/ft. *GRANITE AND PRECAST CURBING*, Updated by Dr. John Collura, P.E., Department of Civil Engineering, University of Massachusetts at Amherst. Guttering and French Drain costs from Kentucky Farm Service Administration Animal Operations Budget Guide, 2010, adjusted to 2012 costs.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (0.02)(One-time costs). Annual costs are for maintenance of runoff control structures.
	Source of numbers: estimated by USDA/NRCS to average 2% of initial investment per year.

Commodity Cover Crop Small Grain:

Estimated one-time cost/acre - $0
Estimated annual cost/acre -$(430)
Life of the BMP is estimated to be 1 year
Note: Virginia SWCD offers $25/acre cost share for BMP implementation. There is a state tax credit available for the purchase of low-till equipment such as the seed drill used here.

Annual Cost Documentation:
Total annual income per acre= Harvest sale- Planting and harvesting costs

Annual Costs	**How calculated:** Application of this BMP would result in a net income gain of $430/acre. The cost of planting the commodity wheat crop is approximately $145/acre, including seed, equipment, fuel, labor, fertilizers, pesticides, herbicides, repairs, crop insurance, and renting the seed drill ($10/acre). The harvesting costs total $28.75 including labor, fuel, repairs and hauling. Total planting and harvesting costs = $173/acre. Receipts from the harvest sale, using an average of the current (11/14/2012) and May 2013 futures price = $8.62/bushel * 70 bushels/acre = $603/acre. Total annual income per acre = $603 - $173 = $430
	Source of numbers: Virginia Cooperative Extension publication 446-047-125 (2007) with prices adjusted to 2012 dollars using a 2.3% CPI. Rental price for seed drill is estimated from Piedmont SWCD web site, accessed 11/15/12.

Conservation Tillage:

Estimated one-time cost/acre - $0
Estimated annual cost/acre -$145
Life of the BMP is estimated to be 1 year
Note: Virginia SWCD offers $50/acre cost share for BMP implementation. The above costs assume that the crop is single-cropped. There is a state tax credit available for the purchase of low-till equipment such as the seed drill used here.

Annual Cost Documentation:

Annual Costs	**How calculated:** Annual costs are for planting using conservation tillage, including seed, equipment, fuel, labor, fertilizers, pesticides, herbicides, repairs, crop insurance, and renting the seed drill ($10/acre).
	Source of numbers: Virginia Cooperative Extension publication 446-047-125 (2007) with prices adjusted to 2012 dollars using a 2.3% CPI. Rental price for seed drill is estimated from Piedmont SWCD web site, accessed 11/15/12.

Cover Crop Small Grain:

Estimated one-time cost/acre - $0
Estimated annual cost/acre -$110
Life of the BMP is estimated to be 1 year
Note: Virginia SWCD offers $25/acre cost share for BMP implementation. There is a state tax credit available for the purchase of low-till equipment such as the seed drill used here.

Annual Cost Documentation:

Annual Costs	**How calculated:** Annual costs are for planting using conservation tillage, including seed, equipment, fuel, labor, repairs, crop insurance, and renting the seed drill ($10/acre). The annual cost does not include fertilizer costs, as the BMP implies nutrient fixation by the cover crop.
	Source of numbers: Virginia Cooperative Extension publication 446-047-125 (2007) with prices adjusted to 2012 dollars using a 2.3% CPI. Rental price for seed drill is estimated from Piedmont SWCD web site, accessed 11/15/12.

Decision Agriculture:

Estimated one-time cost/acre – $12.50
Estimated annual cost/acre – $0
Life of BMP is estimated to be 5 years

Capital Cost Documentation:

One-time costs	**How calculated:** The one-time cost reported above is for 1 computer ($1000), 1 printer ($100), and software ($150) needed to track data. The total amount ($1250) is then divided by the average acreage (100 acres per farm, 2007 USDA Ag Census). ($1250/100 = $12.50 per acre). The life expectancy for the computer and printer is typically 5 years.
	Source of numbers: Computer, printer and software prices were from Best Buy accessed on 11/28/12.

Annual Cost Documentation:

Annual Costs	**How calculated:** Annual costs can be held to zero if BMP is limited to tracking field data such as seed application, nutrient application rate, production yield. Annual costs can become very high if specialized equipment and databases are employed to track field data.
	Source of numbers: Not Applicable

Enhanced Nutrient Management:

Estimated one-time cost/acre – none
Estimated annual cost/acre - $5.35
Life of BMP is estimated to be 3 years
Note: Virginia SWCD has a cost-share of $5/acre for implementation of this BMP.

Annual Cost Documentation:

Annual Costs	**How calculated:** = [Total cost of two certified planners/total acreage to be covered by three "plan writing" BMPs (this is equivalent to the level of effort for WIP I)]-[Cost savings from reduced nutrients]. The annual cost of implementing this BMP would be to pay for at least two individuals to write the plans. The plans have to be written by certified plan writers; plan writers would be responsible for writing the Enhanced Nutrient Management plans, the Nutrient Management Plans, and the Soil Conservation/Water Quality plans that would be part of the scenario. The total cost for the three shared tasks is ~$158,000 per year, and the total cost per acre is the total annual FTE costs spread out over the total acreage to be covered by the three "plan writing" BMPs (acreage is equivalent to the level of effort for WIP I).
	Source of numbers: Conversations with County Extension and Loudoun SWCD staff pertaining to the FTE requirements.
Cost Savings	**How calculated:** The costs are offset by $10.35 based on the 15% reduction of nutrients being applied as required by this BMP.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Forest Buffers:

Estimated one-time cost/acre - $7,000
Estimated annual cost/acre – $520 ($260-900 for crops, $390 for livestock)
Life of BMP is exceeds 75 years
Note: There is no cost-share available. There is probability of volunteer labor and/or grant funding for these types of projects.

Capital Cost Documentation:

Construction Costs	**How calculated:** This cost is for planting trees is $7,000 per acre.
	Source of numbers: 2010 Loudoun County/LSWCD tree planting project.

Annual Cost Documentation:
[(Annual loss of crop revenue- Savings from nutrients no longer applied) + (Annual Cost for Removal of Animals- Savings from not having to produce livestock)]

Annual Costs Loss of Crop Revenue	**How calculated:** Assumes an annual loss of crop revenue equal to 65 bales/acre * 2 cuttings per year at $7.00/bale alfalfa, $4.00/bale for hay with nutrients, and $2.00/bale for hay without nutrients. For row crops, assuming crop is corn, cost is calculated as total revenue, or receipts minus costs, $448 per acre of corn.
	Source of numbers: Corn loss pricing calculated from Virginia Cooperative Extension 446-047-106, all adjusted to 2012 dollars at 2.3% cpi. Alfalfa and hay prices originate from County Extension and Loudoun SWCD staff.
Cost Savings Nutrients Applied	**How calculated:** For land uses other than *hightill without manure*, $10.35 is subtracted from the crop loss total to account for nutrients no longer applied.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Grass Buffers; Vegetated Open Channel:

Estimated one-time cost/acre - $240
Estimated annual cost/acre - $563 ($260-910 for crops, $520 for livestock)
Life of BMP exceeds 75 years
Note: Virginia SWCD offers $175/acre cost-share for grass filter strips.

Capital Cost Documentation:

Construction Costs	**How calculated:** This cost is for planting a grass buffer. Cost includes seed, equipment maintenance, fuel, labor, rental of seed drill, if needed.
	Source of numbers: Virginia Cooperative Extension publication 446-047-157, prices adjusted to 2012 dollars.

Annual Cost Documentation:
[(Annual loss of crop revenue- Savings from nutrients no longer applied) + (Annual Cost for Removal of Animals- Savings from not having to produce livestock)]

Annual Costs Loss of Crop Revenue	**How calculated:** Assumes an annual loss of crop revenue equal to 65 bales/acre * 2 cuttings per year at $7.00/bale alfalfa, $4.00/bale for hay with nutrients, and $2.00/bale for hay without nutrients. For row crops, assuming crop is corn, cost is calculated as total revenue, or receipts minus costs, $448 per acre of corn.
	Source of numbers: Corn loss pricing calculated from Virginia Cooperative Extension 446-047-106, all adjusted to 2012 dollars at 2.3% cpi. Alfalfa and hay prices originate from County Extension and Loudoun SWCD staff.
Cost Savings Nutrients Applied	**How calculated:** For land uses other than *hightill without manure*, $10.35 is subtracted from the crop loss total to account for nutrients no longer applied.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Horse Pasture Management:

Estimated one-time cost/acre: $188
Estimated annual cost/acre: $19
Life of BMP is estimated to be 10 years
Note: There is no cost-share program for this BMP.

Capital Cost Documentation:

One-Time Costs	**How calculated:** [(Cost of Fencing per 100 acres)+ (Cost of additional equipment, sampling, and seed per 100 acres)] Assuming that a 100 acre livestock operation already has perimeter fencing, it would take 2063 linear feet of fencing to break the field into two 50 acre pastures for rotation (assuming a square). The one-time cost for 2063 feet of fencing at $6/linear foot of three plank horse fencing would be $12,340. The cost per acre would be $12,340/100 acres = **$123.40 per acre**. Additional costs of $5,500 ($55/acre) would be needed for feed and water equipment for alternate pasture, initial soil sampling, lime and grass seed for erodible soil stabilization. (This estimate would not address the need for removal of livestock to reach sustainable stocking levels.)
	Source of numbers: Virginia Extension Service

Annual Cost Documentation:

Annual Costs	**How calculated:** This cost is based on maintenance of constructed BMP components at a rate of 8% per year (most maintenance will be on installed fencing), plus additional annual costs for soil sampling and reseeding of erosion control areas.
	Source of numbers: 2010 publication by the Iowa State Extension Service and the USDA on Livestock Fencing Cost Planning.

Irrigation Water Capture Reuse:

Estimated one-time cost/acre - $8,570
Estimated annual cost/acre – $385
Life of BMP is estimated to be 20 years.
Note: There is no cost-share program for this BMP.

Capital Cost Documentation:

Construction Costs	**How calculated:** (Construction costs of ponds + irrigation system equipment costs). A low estimate of costs for building capture ponds is $8,000 per acre of drainage (data from irrigation management industry, includes only cost of building ponds). The irrigation system initial costs are estimated to be $570/acre for stationary spray irrigation. The cost includes intake, pump head, piping and equipment depreciation over 20 years.
	Source of numbers: Arkansas Cooperative Extension publication FSA28, adjusted to 2012 dollars.

Annual Cost Documentation:

Annual Costs	**How calculated:** Annual costs are for maintenance and repair of ponds and irrigation system at 4.5% of initial investment.
	Source of numbers: Arkansas Cooperative Extension publication FSA28, adjusted to 2012 dollars.

Land Retirement to hay without nutrients:

Estimated one-time cost/acre – none
Estimated annual cost/acre – $563 **($260-910 for crops, $520 for livestock)**
Life of BMP exceeds 75 years
Note: There is no cost-share program for this BMP.

Annual Cost Documentation:
[(Annual loss of crop revenue- Savings from nutrients no longer applied) + (Annual Cost for Removal of Animals- Savings from not having to produce livestock)]

Annual Costs Loss of Crop Revenue	**How calculated:** Assumes an annual loss of crop revenue equal to 65 bales/acre * 2 cuttings per year at $7.00/bale alfalfa, $4.00/bale for hay with nutrients, and $2.00/bale for hay without nutrients. For row crops, assuming crop is corn, cost is calculated as total revenue, or receipts minus costs, $448 per acre of corn.
	Source of numbers: Corn loss pricing calculated from Virginia Cooperative Extension 446-047-106, all adjusted to 2012 dollars at 2.3% cpi. Alfalfa and hay prices originate from County Extension and Loudoun SWCD staff.
Cost Savings Nutrients Applied	**How calculated:** For land uses other than *hightill without manure*, $10.35 is subtracted from the crop loss total to account for nutrients no longer applied.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Non-Urban Stream Restoration:

Estimated one-time cost/linear foot - $250
Estimated annual cost/linear foot - $1
Life of this BMP exceeds 75 years
Note: There is currently no cost-share for this BMP. There is good potential for volunteer work and grant funding for these types of projects.

Capital Cost Documentation:

Construction Costs	**How calculated:** One-time cost for stream restoration estimated at $200/linear foot. Adding the additional maintenance for the first two years, the total cost would be [($200/linear foot) + (2*$25/linear foot)]= $250/linear foot
	Source of numbers: Current Loudoun County Stream Restoration project Bond Estimate.

Annual Cost Documentation:

[(Annual Cost for Removal of Animals- Savings from not having to produce livestock)/(acres converted to linear feet)]

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012). The total annual cost per acre, minus savings, equals $390/acre. To convert to linear feet, 42,560 sq ft/acre /70' buffer width (both sides of stream) = 608 linear feet. $390/acre divided by 608 linear feet = $0.67/linear foot. This has been rounded up to $1/foot.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Total Annual Costs	**How calculated:** Total Annual Cost is the cost per acre of the removal of animals from pasture minus the Annual Cost Savings, then converted to costs per linear foot. To convert to linear feet, 42,560 sq ft/acre /70' buffer width (both sides of stream) = 608 linear feet. $390/acre divided by 608 linear feet = $0.67/linear foot. This has been rounded up to $1/foot.

Nutrient Management:

Estimated one-time cost/acre – none
Estimated annual cost/acre - $15.70
Life of BMP is estimated to be 3 years
Note: Virginia SWCD has a cost-share of $5/acre for implementation of this BMP.

Annual Cost Documentation:

Annual Costs	**How calculated:** = [Total cost of two certified planners/total acreage to be covered by three "plan writing" BMPs (this is equivalent to the level of effort for WIP I)]-[Cost savings from reduced nutrients]. The annual cost of implementing this BMP would be to pay for at least two individuals to write the plans. The plans have to be written by certified plan writers; plan writers would be responsible for writing the Enhanced Nutrient Management plans, the Nutrient Management Plans, and the Soil Conservation/Water Quality plans that would be part of the scenario. The total cost for the three shared tasks is ~$158,000 per year, and the total cost per acre is the total annual FTE costs spread out over the total acreage to be covered by the three "plan writing" BMPs (acreage is equivalent to the level of effort for WIP I).
	Source of numbers: Conversations with County Extension and Loudoun SWCD staff pertaining to the FTE requirements.

Off Stream Watering without Fencing:

Estimated one-time cost/acre: $1,100
Estimated annual cost/acre: $33
Life of BMP is estimated to be 20 years
Note: Virginia SWCD offers a cost-share program for implementation of this BMP.

Capital Cost Documentation:

Construction Costs	**How calculated:** These costs assume the drilling of two wells, construction of three cisterns, and associated pumping, electrical and plumbing systems to serve ~75 acres. These costs could be considerably less per acre if well drilling is not needed.
	Source of numbers: Costs are estimated based on the VaDCR, VaDEQ publication, Big Otter IP Steering Committee. 2006. Big Otter Watershed TMDL Implementation Plan Summary. Virginia Department of Environmental Quality, Virginia Department of Conservation and Recreation. Available at: http://www.deq.virginia.gov/Portals/0/DEQ/Water/TMDL/ImplementationPlans/otterip.pdf , adjusted to 2012 dollars.

Annual Cost Documentation:

Annual Costs	**How calculated:** Annual costs are for maintenance of well systems (pump, controller, water lines at 4.5%), and annual power costs.
	Source of numbers: Maintenance costs and power costs from Univ. of Arkansas Extension publication FSA-28, adjusted to 2012 dollars.

Prescribed Grazing:

Estimated one-time cost/acre: $167
Estimated annual cost/acre: $13
Life of BMP is estimated to be 10 years (fencing)

Capital Cost Documentation:

Construction Costs	**How calculated:** Assuming that a 100 acre livestock operation already has perimeter fencing, it would take 4174 linear feet of fencing to break the field into quarters for rotation (assuming a square). The one-time cost for 4174 feet of fencing at $4/linear foot of high tensile wire (or barbed wire, or woven wire) would be $16,696. The cost per acre would be $16,696/100 acres = **$167 per acre**. The addition of more fencing for stream exclusion, or adding hard crossings would drive these costs substantially higher.
	Source of numbers: Fencing cost source from SWCD, County Extension, and Iowa State Extension.

Annual Cost Documentation:

Annual Costs	**How calculated:** Prescribed grazing, in some situations, can be effective by utilizing rotational grazing. The annual costs are for fencing maintenance. If fencing and hard crossings are required to allow passage of livestock from pasture to pasture, the costs can run as high as those of Stream Fencing BMP's. Maintenance is expected to be 8% of initial investment = 0.08*$167 = $13
	Source of numbers: 2010 publication by the Iowa State Extension Service and the USDA on Livestock Fencing Cost Planning.

Soil conservation/water quality plans:

Estimated one-time cost/acre – none
Estimated annual cost/acre - $15.70
Life of BMP is estimated to be 3 years
Note: Virginia SWCD has a cost-share of $5/acre for implementation of this BMP.

Annual Cost Documentation:

Annual Costs	**How calculated:** = [Total cost of two certified planners/total acreage to be covered by three "plan writing" BMPs (this is equivalent to the level of effort for WIP I)]-[Cost savings from reduced nutrients]. The annual cost of implementing this BMP would be to pay for at least two individuals to write the plans. Plan writers would be responsible for writing the Enhanced Nutrient Management plans, the Nutrient Management Plans, and the Soil Conservation/Water Quality plans that would be part of the scenario. The total cost for the three shared tasks is ~$158,000 per year, and the total cost per acre is the total annual FTE costs spread out over the total acreage to be covered by the three "plan writing" BMPs (acreage is equivalent to the level of effort for WIP I).
	Source of numbers: Conversations with County Extension and Loudoun SWCD staff pertaining to the FTE requirements.

Stream Access Control with Fencing:

Estimated one-time cost/acre - $9,960
Estimated annual cost/acre -$1,187
Life of BMP is estimated to be 10 years
Note: Virginia SWCD offers 75% cost share for livestock exclusion, often including alternative water sources.

Capital Cost Documentation:

Construction Costs	**How calculated:** (cost of fence/linear foot) (1245 linear feet/1 acre). The one-time cost for fence installation and off-site watering would be $8/linear foot.
	Source of numbers: VA Cooperative Extension estimates $2.50-5.00/foot for fencing costs. Loudoun SWCD reports show that adding alternate watering source structures raises average per linear foot costs to 8.00/foot.

Annual Cost Documentation:
[(Annual Cost for Removal of Animals- Savings from not having to produce livestock) + (Maintenance cost of fencing)]

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Maintenance Cost Fencing	**How calculated:** Maintenance is expected to be 8% of initial investment = 0.08*9,960 = $797.
	Source of numbers: 2010 publication by the Iowa State Extension Service and the USDA on Livestock Fencing Cost Planning.

Streamside Forest Buffers:

Estimated one-time cost/acre - $7,000
Estimated annual cost/acre - $260
Life of this BMP exceeds 75 years
Note: There is no cost-share available. There is probability of volunteer labor and/or grant funding for these types of projects.

Capital Cost Documentation:

Construction Costs	**How calculated:** This cost is for planting trees is $7,000 per acre.
	Source of numbers: 2010 Loudoun County/LSWCD tree planting project.

Annual Cost Documentation:
[(Annual loss of crop revenue- Savings from nutrients no longer applied)]

Annual Costs Loss of Crop Revenue	**How calculated:** Assumes an annual loss of crop revenue equal to 65 bales/acre * 2 cuttings per year at $7.00/bale alfalfa, $4.00/bale for hay with nutrients, and $2.00/bale for hay without nutrients. For row crops, assuming crop is corn, cost is calculated as total revenue, or receipts minus costs, $448 per acre of corn.
	Source of numbers: Corn loss pricing calculated from Virginia Cooperative Extension 446-047-106, all adjusted to 2012 dollars at 2.3% cpi. Alfalfa and hay prices originate from County Extension and Loudoun SWCD staff.
Cost Savings Nutrients Applied	**How calculated:** For land uses other than *hightill without manure*, $10.35 is subtracted from the crop loss total to account for nutrients no longer applied.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Streamside Grass Buffers:

Estimated one-time cost/acre - $240
Estimated annual cost/acre - $390
Life of this BMP exceeds 75 years
Note: Virginia SWCD offers $175/acre cost-share for grass filter strips**.**

Capital Cost Documentation:

Construction Costs	**How calculated:** This cost is for planting a grass buffer. Cost includes seed, equipment maintenance, fuel, labor, rental of seed drill, if needed.
	Source of numbers: Virginia Cooperative Extension publication 446-047-157, prices adjusted to 2012 dollars.

Annual Cost Documentation:

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Tree Planting:

Estimated one-time cost/acre - $7,000
Estimated annual cost/acre – $520 ($260-900 for crops, $390 for livestock)
Life of BMP exceeds 75 years
Note: There is no cost-share available**.** There is probability of volunteer labor and/or grant funding for these types of projects.

Capital Cost Documentation:

Construction Costs	**How calculated:** This cost is for planting trees is $7,000 per acre.
	Source of numbers: 2010 Loudoun County/LSWCD tree planting project.

Annual Cost Documentation:
[(Annual loss of crop revenue- Savings from nutrients no longer applied) + (Annual Cost for Removal of Animals- Savings from not having to produce livestock)]

Annual Costs Loss of Crop Revenue	**How calculated:** Assumes an annual loss of crop revenue equal to 65 bales/acre * 2 cuttings per year at $7.00/bale alfalfa, $4.00/bale for hay with nutrients, and $2.00/bale for hay without nutrients. For row crops, assuming crop is corn, cost is calculated as total revenue, or receipts minus costs, $448 per acre of corn.
	Source of numbers: Corn loss pricing calculated from Virginia Cooperative Extension 446-047-106, all adjusted to 2012 dollars at 2.3% cpi. Alfalfa and hay prices originate from County Extension and Loudoun SWCD staff.
Cost Savings Nutrients Applied	**How calculated:** For land uses other than *hightill without manure*, $10.35 is subtracted from the crop loss total to account for nutrients no longer applied.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

Wetland Restoration:

Estimated one-time cost/acre - $60,000
Estimated annual cost/acre – $520 ($260-900 for crops, $390 for livestock)
Life of the BMP is estimated to be 30+ years
Note: There is no cost-share available. Wetland restoration efforts may be incentivized through wetland banking efforts.

Capital Cost Documentation:

Construction Costs	**How calculated:** The one-time cost for wetland restoration would be $60,000/acre.
	Source of numbers: Wetland restoration costs from 2011 bond estimate for current Loudoun County project.

Annual Cost Documentation:
[(Annual loss of crop revenue- Savings from nutrients no longer applied) + (Annual Cost for Removal of Animals- Savings from not having to produce livestock)]

Annual Costs Loss of Crop Revenue	**How calculated:** Assumes an annual loss of crop revenue equal to 65 bales/acre * 2 cuttings per year at $7.00/bale alfalfa, $4.00/bale for hay with nutrients, and $2.00/bale for hay without nutrients. For row crops, assuming crop is corn, cost is calculated as total revenue, or receipts minus costs, $448 per acre of corn.
	Source of numbers: Corn loss pricing calculated from Virginia Cooperative Extension 446-047-106, all adjusted to 2012 dollars at 2.3% cpi. Alfalfa and hay prices originate from County Extension and Loudoun SWCD staff.
Cost Savings Nutrients Applied	**How calculated:** For land uses other than *hightill without manure*, $10.35 is subtracted from the crop loss total to account for nutrients no longer applied.
	Source of numbers: The nutrient application offset price is based on Virginia Cooperative Extension 446-047, adjusted to 2012 dollars.

Annual Costs Removal of animals from pasture	**How calculated:** Cost for removal of animals from pasture = number of acres (after conversion from linear feet with 35' buffer width) * 7 animals (cattle)/15 acre *$1200/animal (from VADACS estimates for beef cattle, TAC committee member input, Oct. 2012).
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.
Cost Savings	**How calculated:** Loss of livestock will be offset by no longer having to feed or care for the lost livestock. Savings = 7 animals/15 acres * $364/head/year.
	Source of numbers: Virginia Cooperative Extension 446-046, 2011, Pasture Finished Beef.

SECTOR: SEPTIC

Septic Connection:

Estimated one-time cost/system- $48,000
Estimated annual cost/connection- $414
Life of BMP is exceeds 75 years
Note: There are currently no requirements or incentives for this BMP.

Capital Cost Documentation:
(Project Costs/connection + Septic Tank Abandonment/connection)

Project costs including Availability Fees	**How calculated:** The estimate cost for connecting an on-site user to central sewer service is ~**$47,000.** This estimate is based on the Loudoun County Water/Wastewater Needs Assessment. In that document, it was estimated that 1024 targeted septic systems could be connected to central sewer systems at a cost of $30-66 million. The midpoint, per system cost would be $47,000. This includes availability fees of $16,000 per lots which includes $2,000/lot for service lines.
	Source of numbers: Project Costs are based on estimates by Loudoun Water for 36 communities as identified in the Water and Waste Water Needs Assessment.
Septic Tank Abandonment	**How calculated:** Existing septic abandonment is estimated to cost $1,000.
	Source of numbers: Estimates are from Loudoun County Health Department.

Annual Cost Documentation:
(Maintenance Costs + Septic Pump-out Cost Savings)

Maintenance Costs	**How calculated:** Annual costs for septic connection are for payments to central sewer system. Current Loudoun Water rates are $27.99/quarter basic charge, plus $4.02/1,000 gallons wastewater, based on metered water usage, and capped at 3,000 gallons above quarterly winter usage. So, for an average quarter of 22,500 gallons (250 gal/day*30 days*3 months), the wastewater charge would be $90.45/quarter. Total annual costs would be $474 ($90.45 + $27.99 * 4 quarters).
	Source of numbers: Loudoun Water-Water and Wastewater Rates for 2012 Loudoun Water water/sewer rates for 2012. (LoudounWater.org)
Cost Savings	**How calculated:** This cost would be offset by not having to pay the $60/year septic pump out charge. This cost does not include savings of inspections and maintenance of abandoned alternative systems.
	Source of numbers: Costs are based on local industry estimates.

Septic Denitrification

Estimated one-time cost/system- $13,500
Estimated annual cost/connection- $150-250, average $200/system
Life of BMP is estimated to be 30 years

Capital Cost Documentation

Construction Costs	**How calculated:** The cost of converting a conventional system to a denitrifying system is **$13,500**. The actual installation of a new system would be $15,000 to $20,000, but this BMP implies conversion of conventional systems.
	Source of numbers: Costs are based on industry estimates.

Annual Cost Documentation:

Maintenance and Inspection Costs	**How calculated:** Annual costs are for inspections and maintenance, usually as part of one contract. Annual costs do not include extra power requirements of system blowers and alarms.
	Source of numbers: Estimated by the Loudoun County Health Department, and the Jefferson Co., WV Health Waste Water Management Commission.

Septic Pumpout:

Estimated one-time cost/pump-out- $0
Estimated annual cost/pump-out- $60
Note: There is no cost share or incentive for this program.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** Chapter 1066 of the Loudoun County codified Ordinances requires septic tanks to be pumped out once every five years. The annual cost to the homeowners of **$60** calculated by using the average system pump out cost ($300 per system) and dividing by 5 (years per required pump out).
	Source of numbers: Costs are based on local industry estimates.

SECTOR: URBAN

Abandoned Mine Reclamation:

Estimated one-time cost/acre- $0
Estimated annual cost/acre- $0

Capital Cost and Annual Cost Documentation: Capital Cost and Annual Cost Documentation: This BMP will be implemented through quarries within the County. The total level of effort is equal to the VPDES permit area of the quarries. Therefore, this BMP is fully implemented. No additional resources are needed to implement the BMP.

Dry Extended Detention Pond (New Pond, Land Purchased):

Estimated one-time cost/acre - $25,200
Estimated annual cost/acre - $120
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated:** [(Land costs +construction costs)/acres treated]. Assumed a 0.75-acre pond site treats a 12.5 acre drainage basin. This is the median size for such ponds in Loudoun County. Land cost for this BMP is $150,000 (0.75 acres @ $200,000 per acre) with an estimated construction cost of $165,000. Construction cost consists of $65k for excavating, filling, and compaction; $20k for the control structure; $15k for clearing & grubbing; and $65k for design, mobilization, riprap, and seeding. Cost per acre treated is $25,200 ($325k/12.5 acres).
	Source of numbers: Construction costs are from Loudoun County bond estimate sheet, adjusted upward based on input from the Technical Advisory Committee.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (Estimated maintenance costs/acres treated). Estimated an annual maintenance cost of $1,500. The number of acres treated is 12.5 acres.
	Source of numbers: Costs derived from Loudoun General Services' maintenance experience.

Dry Extended Detention Pond (New Pond, Easement Purchased):

Estimated one-time cost/acre - $16,800
Estimated annual cost/acre - $120
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated:** [(Easement costs +construction costs)/acres treated]. Assumed a 0.75-acre pond site treats a 12.5 acre drainage basin. This is the median size for such ponds in Loudoun County. Easement cost for this BMP is $45,000 (30% of $150,000 land purchase price) with an estimated construction cost of $165,000. Construction cost consists of $65k for excavating, filling, and compaction; $20k for the control structure; $15k for clearing & grubbing; and $65k for design, mobilization, riprap, and seeding. Cost per acre treated is $16,800 ($210k/12.5 acres).
	Source of numbers: Construction costs are from Loudoun County bond estimate sheet, adjusted upward based on input from the Technical Advisory Committee.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (Estimated maintenance costs/acres treated). Estimated an annual maintenance cost of $1,500. The number of acres treated is 12.5 acres.
	Source of numbers: Costs derived from Loudoun General Services' maintenance experience.

Dry Extended Detention Pond (New Pond, Free Land):

Estimated one-time cost/acre - $13,200
Estimated annual cost/acre - $120
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated: (C**onstruction costs/acres treated). Assumed a 0.75-acre pond site treats a 12.5 acre drainage basin. This is the median size for such ponds in Loudoun County. Estimated construction cost of $165,000. Construction cost consists of $65k for excavating, filling, and compaction; $20k for the control structure; $15k for clearing & grubbing; and $65k for design, mobilization, riprap, and seeding. Cost per acre treated is $13,200 ($165k/12.5 acres).
	Source of numbers: Construction costs are from Loudoun County bond estimate sheet, adjusted upward based on input from the Technical Advisory Committee.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (Estimated maintenance costs/acres treated). Estimated an annual maintenance cost of $1,500. The number of acres treated is 12.5 acres.
	Source of numbers: Costs derived from Loudoun General Services' maintenance experience.

Dry Extended Detention Pond (Retrofit of Dry Pond):

Estimated one-time cost/acre - $8,400
Estimated annual cost/acre - $120
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction Costs	**How calculated:** (Construction cost/acres treated). Assumed a 0.75-acre pond site treats a 12.5 acre drainage basin. This is the median size for such ponds in Loudoun County. The estimated construction cost is $105,000. Construction cost consists of $15k for modifications to the control structure, $50k for hydrologic analysis and design, and $40k for mobilization, berm construction, and site restoration. Cost per acre treated is $8,400 ($105k/12.5 acres).
	Source of numbers: Construction costs are from Loudoun County Job Order Contracting book adjusted upward based on input from the Technical Advisory Committee.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (Estimated maintenance costs/acres treated). Annual maintenance cost is $1,500. The number of acres treated is 12.5 acres.
	Source of numbers: This cost is derived from Loudoun General Services' maintenance experience.

Erosion and Sediment Control:

Estimated one-time cost/acre- $0
Estimated annual cost/acre- $0

Capital Cost and Annual Cost Documentation: This BMP will be implemented through an existing County Program on erosion and sediment control. The Chesapeake Bay TMDL does not necessitate any additional resources for implementation of this BMP.

Impervious Surface Reduction (Replace with Pervious Concrete):

Estimated one-time cost/acre - $550,000
Estimated annual cost/acre – $800
Life of BMP is 30 years

Capital Cost Documentation:

Construction Costs	**How calculated:** (Construction costs/1 acre installation). Land cost is assumed to be $0 as this BMP will be installed in place of existing impervious surfaces. Estimated construction cost is $550,000 per acre. Based on a one-acre installation, construction cost consists of $100k for removing and disposing of existing pavement and subgrade; $80k for import and placement of new subgrade material; $10k for installation of underdrain system; and $360k for installing pervious concrete.
	Source of numbers: Costs are from the Loudoun County Job Order Contracting book for site work.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** Annual maintenance consists of vacuum sweeping four times per year at a cost per acre of $800.
	Source of numbers: Costs are from the Loudoun County Job Order Contracting book for site work.

Impervious Surface Reduction (Replace with Pervious Asphalt):

Estimated one-time cost/acre - $480,000
Estimated annual cost/acre – $800
Life of BMP is 20 years

Capital Cost Documentation:

Construction Costs	**How calculated:** (Construction costs/1 acre installation). Land cost is assumed to be $0 as this BMP will be installed in place of existing impervious surfaces. Estimated construction cost is $480,000 per acre. Based on a one-acre installation, construction cost consists of $100k for removing and disposing of existing pavement and subgrade; $80k for import and placement of new subgrade material; $10k for installation of underdrain system; and $290k for installing pervious asphalt.
	Source of numbers: Costs are from the Loudoun County Job Order Contracting book for site work.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** Annual maintenance consists of vacuum sweeping four times per year at a cost per acre of $800.
	Source of numbers: Costs are from the Loudoun County Job Order Contracting book for site work.

Impervious Surface Reduction (No Replacement):

Estimated one-time cost/acre - $90,000
Estimated annual cost/acre – $0
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction Costs	**How calculated:** (Construction costs/1 acre installation). This BMP is simply the removal of asphalt and replacing it with grass. Based on a one-acre installation, construction cost consists of $65k for removing and disposing of the existing pavement, $15k for furnishing and placing four inches of topsoil, and $10k for planting grass cover.
	Source of numbers: Costs are from the Loudoun County Job Order Contracting book for site work.

Street Sweeping:

Estimated one-time cost/acre - $0
Estimated annual cost/acre – $1,045
Life of BMP is estimated to be 1 year

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (Total Cost/Total Feet swept)(Feet/Acre). This BMP is applied to existing paved surfaces, i.e., parking lots and streets, so there is no land cost. Assuming this service is contracted, there is no equipment purchase cost. Based on a $950 cost to sweep a 7.5-foot swath one mile long 25 times in a year, the cost to sweep one acre, 25 times per year, is $1,045.
	Source of numbers: Costs are from the August 2009 EPA report *Preliminary Data Summary of Urban Storm Water Best Management Practices* and are inflated to 2012 dollars.

Urban Filtering Practices (One-acre treatment—Sand Filter):

Estimated one-time cost/acre – $29,000
Estimated annual cost/acre – $1,500
Life of BMP is estimated at 30 years

Capital Cost Documentation:

Construction Costs	**How calculated:** This BMP requires about 2000 square feet of land at an estimated cost of $10,000. The construction costs would be $19,000.
	Source of numbers: Construction costs from actual supplier proposals.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** The annual maintenance cost is $1,500.
	Source of numbers: This cost is derived from Loudoun General Services' maintenance experience.

Urban Filtering Practices (One-acre treatment—Bioretention Filter):

Estimated one-time cost/acre – $30,000
Estimated annual cost/acre – $2,500
Life of BMP is estimated to be 15 years

Capital Cost Documentation:

Construction Costs	**How calculated:** This BMP requires about 2000 square feet of land at an estimated cost of $10,000. The construction costs would be $20,000.
	Source of numbers: Construction costs from actual supplier proposals.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** The annual maintenance cost is $2,500.
	Source of numbers: This cost is derived from Loudoun General Services' maintenance experience.

Urban Filtering Practices (Ten acres treatment—Cartridge System):

Estimated one-time cost/acre – $19,500
Estimated annual cost/acre – $800
Life of BMP is estimated to be 30 years

Capital Cost Documentation:

Construction Costs	**How calculated:** [(Land costs + Construction Costs)/acres treated]. This BMP requires about 2000 square feet of land at an estimated cost of $10,000. Construction costs would be $185,000. Cost per acre treated is $19,500 ($195k/10 acres).
	Source of numbers: Construction costs are from Contech, the supplier.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** [(Cost/Filter)(Filters/Acre)/2]. Each Filter is replaced every two years at a cost of $200/filter. There are approximately 80 filters for each 10-acre system. The annual maintenance cost is $800.
	Source of numbers: Costs are from Contech, the supplier.

Urban Nutrient Management:

Estimated one-time cost/acre - $20
Estimated annual cost/acre - $0
Life of BMP is estimated to be 3 years
Note: Generally, this would be impractical for small tracts because, regardless of size, there are enforcement and reporting requirements.

Capital Cost Documentation:

Construction Costs	**How calculated:** Land cost is $0 for this BMP as it will be used on existing turf areas. The cost to develop a property-specific nutrient management plan for a large area of managed turf is $20 per acre.
	Source of numbers: This cost was obtained from a Commonwealth of Virginia publication *Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the Shenandoah and Potomac River Basins* (March, 2005) and was inflated to 2012 dollars.

Urban Stream Restoration:

Estimated one-time cost/linear foot – $500
Estimated annual cost/linear foot – $5
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction Costs	**How calculated: (Cost/linear foot)** Land cost is assumed to be $0 as this BMP will be installed in existing streams. Costs include measures taken to restore streams to a more natural state while also accommodating the increased flow from development. Urban stream restoration is estimated at $500/linear foot.
	Source of numbers: These costs came directly from Wetlands Studies and Solutions based on actual projects in the local area. They are about 60% higher than costs that were obtained from a Commonwealth of Virginia publication *Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the Shenandoah and Potomac River Basins* (March, 2005) and inflated to 2012 dollars.

Annual Cost Documentation

Maintenance Costs	**How calculated:** (Cost/linear foot). This number reflects approximately 10-20% of the original installation cost for periodic repairs as natural growth takes its form.
	Source of numbers: Costs are from Wetlands Solutions and Studies project experience.

Urban Tree Planting (Land Purchased):

Estimated one-time cost/acre- $110,000
Estimated annual cost/acre- $400
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated: [(Land cost + planting cost)/1 acre installation]** Urban developable land is assumed to be valued at $200,000/acre. Land to be used for urban forest, that is not riparian, is proposed to include 50% developable land and 50% non-developable land. Labor, material and overhead to plant an acre to a forest-like condition would be $10,000.
	Source of numbers: The source of these costs is *Costs of Stormwater Management Practices in Maryland Counties* (October, 2011). The costs used are one-third of those given in the study for treatment of one acre of impervious surface, assuming an average ratio of two acres of pervious for each acre of impervious.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** Annual maintenance cost is $400/acre.
	Source of numbers: The source of these costs is *Costs of Stormwater Management Practices in Maryland Counties* (October, 2011). The costs used are one-third of those given in the study for treatment of one acre of impervious surface, assuming an average ratio of two acres of pervious for each acre of impervious.

Urban Tree Planting (Easement Purchased):

Estimated one-time cost/acre- $40,000
Estimated annual cost/acre- $400
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated: [(Easement cost + planting cost)/1 acre installation]** Easement costs are assumed to be 30% of land purchase costs (see purchase cost above). Labor, material and overhead to plant an acre to a forest-like condition would be $10,000.
	Source of numbers: The source of these costs is *Costs of Stormwater Management Practices in Maryland Counties* (October, 2011). The costs used are one-third of those given in the study for treatment of one acre of impervious surface, assuming an average ratio of two acres of pervious for each acre of impervious.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** Annual maintenance cost is $400/acre.
	Source of numbers: The source of these costs is *Costs of Stormwater Management Practices in Maryland Counties* (October, 2011). The costs used are one-third of those given in the study for treatment of one acre of impervious surface, assuming an average ratio of two acres of pervious for each acre of impervious.

Urban Tree Planting (Free Land):

Estimated one-time cost/acre- $10,000
Estimated annual cost/acre- $400
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated: (Planting cost/1 acre installation)** Labor, material and overhead to plant an acre to a forest-like condition would be $10,000.
	Source of numbers: The source of these costs is *Costs of Stormwater Management Practices in Maryland Counties* (October, 2011). The costs used are one-third of those given in the study for treatment of one acre of impervious surface, assuming an average ratio of two acres of pervious for each acre of impervious.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** Annual maintenance cost is $400/acre.
	Source of numbers: The source of these costs is *Costs of Stormwater Management Practices in Maryland Counties* (October, 2011). The costs used are one-third of those given in the study for treatment of one acre of impervious surface, assuming an average ratio of two acres of pervious for each acre of impervious.

Wet Pond:

Estimated one-time cost/acre - $13,556
Estimated annual cost/acre - $44
Life of BMP exceeds 75 years

Capital Cost Documentation:

Construction and Land Costs	**How calculated:** [(Land Cost + Construction Costs)/Acres treated]. Assumed a 2.2-acre pond site treats a 45 acre drainage basin. This was the median size for wet ponds in Loudoun County. Land cost for this BMP is $440,000 (2.2 acres @ $200,000 per acre) with an estimated construction cost of $170,000. Construction cost consists of $100k for excavating, filling, and compaction; $20k for the control structure; $27k for clearing & grubbing and seeding; and $23k for mobilization and riprap. Cost per acre treated is $13,556 ($610k/45 acres).
	Source of numbers: Costs are from Loudoun County bond estimate sheet.

Annual Cost Documentation:

Maintenance Costs	**How calculated:** (Estimated maintenance costs/acres treated). Estimated an annual maintenance cost of $2,000. The number of acres treated is 45 acres.
	Source of numbers: This cost is derived from Loudoun General Services' maintenance experience.

IMPLEMENTATION POTENTIAL OF BMP's 12/21/2012

(Changes include input from TAC)

Implementation potential is a descriptive value based on knowledge of the difficulty of BMP implementation, regulatory authority, land use, existing and proposed programs, incentives, and practical experience. It is important to note that implementation potential is a non-quantitative value that estimates the ease of implementing a Best Management Practice and can be used as one of many tools to build a scenario to meet local Chesapeake Bay TMDL Goals. Implementation potential of a BMP is determined independent of the BMP's implementation cost or pollution reduction potential.

The information in this draft document is based on discussions with Federal, State and Local agencies and organizations including: the Environmental Protection Agency, Virginia Department of Conservation and Recreation, Virginia Department of Environmental Quality, Virginia Department of Health, Loudoun Water, Loudoun County Health Department, Loudoun Soil and Water Conservation District, Extension Services, Metropolitan Washington Council of Governments, Northern Virginia Regional Commission, Virginia Municipal Stormwater Association, Virginia Association of Counties, Loudoun County Towns, and the Loudoun County Phase II WIP Technical Advisory Committee. The document is also based on staff research of federal programs and laws, state codes and regulations, local ordinances, policies and procedures, Virginia and Maryland locality Phase II WIP submissions, state Phase I and II WIP submissions, and various other articles, research papers, studies and other documents.

Implementation Potential Ratings:

Good	There are significant opportunities and only minor barriers to implementing the BMP.
Fair	There are some opportunities but also some barriers to implementing the BMP.
Low	There are significant barriers and little opportunities to implementing the BMP.

The implementation potential of a BMP is ranked as Good, Fair or Low based on a combination of factors. These factors include:

- Are there existing mandates requiring implementation of the BMP?
- Are there significant financial incentives available for implementation of the BMP?
- Is the implementation of the BMP a widely accepted practice by landowners/and or the community?
- Is there a proposed or existing program that facilitates implementation of the BMP?
- Is there an opportunity for significant volunteer participation and community involvement in the implementation of the BMP?
- Is there local authority to mandate implementation of the BMP?

SECTOR: AGRICULTURE

Barnyard Runoff Control: Fair

If applied to barns only, and not to round ring feeders and/or loafing lots, this BMP may be useful. Efficiency is less for loafing lot areas as opposed to application to barnyard with manure storage. Implementation of this BMP is currently voluntary, with some cost-share incentives for loafing lot management.

Commodity Cover Crop Small Grain: Good

This BMP is a widely accepted practice. This practice implies the use of no-till techniques. Cost-share is available through VASWCD.

Conservation Tillage: Good

This BMP is a widely accepted practice. This BMP is no-till by definition. Cost-share is available through VASWCD.

Cover Crop Early Small Grain: Good

This BMP is a widely accepted practice. This practice implies the use of no-till techniques. Cost-share is available through VASWCD.

Cover Crop Standard Small Grain: Good

This BMP is a widely accepted practice. This practice implies the use of no-till techniques. Cost-share is available through VASWCD.

Decision Agriculture: Fair

By virtue of having a broad definition with few specifics, this BMP has potential for widespread applicability. This includes many practices that are already in place. Since this is mutually exclusive with Nutrient Management and Enhanced Nutrient Management, and has a lower efficiency than Enhanced Nutrient Management, the implementation potential is slightly lower.

Enhanced Nutrient Management: Good

The programmatic infrastructure for administering the implementation of this BMP exists within County Government. This BMP provides only a small ($5/acre) cost share to incentivize a voluntary effort that could result in a reduction of income. Although loss of income would be small, further incentives may be needed for a higher level of implementation. This BMP will ultimately be part of the Commonwealth's "Resource Management Plans" (rules being finalized).

Forest Buffers: Fair

Currently, implementation of this practice is voluntary. Some cost-share is available for certain types of hardwoods. This BMP can offer opportunities for grant funding and volunteer work.

The County has authority from state to require this BMP through "Chesapeake Bay Preservation Act"(CBPA), however there are no efforts to adopt the CBPA at this time.

Grass Buffers; Vegetated Open Channel: Good

Currently, implementation of this BMP is voluntary. Implementation of this BMP will result in loss of income due to loss of crop production. Cost-share is available for application of grass filter strips through the VASWCD at a rate of $175/acre. The County has authority from the state to require this BMP through "Chesapeake Bay Preservation Act" (CBPA), however, there are no efforts to adopt the CBPA at this time.

Horse Pasture Management: Fair

Currently, implementation of this BMP is voluntary and widespread implementation is doubtful without a great amount of funding or regulatory requirement. This practice would be most commonly used by small operations.

Irrigation Water Capture Reuse: Fair

This BMP would be difficult to implement without regulation and funding. Most retail operations do not have excess land available to construct ponds, etc. The County has no authority to require this BMP.

Land Retirement to hay without nutrients: Low

This does not appear to be a practical BMP. Land retired to hay without nutrients will, over time, not be able to produce a marketable hay crop, as vegetative cover will decrease, erosion will increase, and invasive species will take over the field. Unless the property is in a conservation easement, there is no incentive for the property owner to keep land in this use. The County has no authority to require this BMP.

Non-Urban Stream Restoration: Fair

Currently, implementation of this BMP is voluntary and widespread implementation is doubtful without a great amount of funding or regulatory requirement. Although the state guidelines are not expected to be completed soon, there is potential for this BMP's use in Nutrient Trading practices. The County has no authority to require this BMP.

Nutrient Management: Good

The programmatic infrastructure for administering the implementation of this BMP exists within County Government. Farms that participate voluntarily in certain cost-share programs are required to have Nutrient Management Plans. Additionally, any new farming operation started within the Limestone Overlay District is required to file a plan. All other Nutrient Management Planning is voluntary, so additional requirements may be needed for widespread applicability. This BMP will ultimately be part of the Commonwealth's "Resource Management Plans" (rules being finalized). Cost-share is available from VASWCD for writing, implementation and record keeping.

Off Stream Watering Without Fencing: Fair

The programmatic infrastructure for administering the implementation of this BMP exists within County Government. Current efforts are mostly voluntary, so additional requirement may be needed for widespread applicability. Cost-share is available from VASWCD.

Prescribed Grazing: Good

This BMP is easy to implement, and includes practices that are already in use by many operations.

Soil conservation/water quality plans: Good

The programmatic infrastructure for administering the implementation of this BMP exists within County Government. Current efforts are mostly voluntary, so additional requirement may be needed for widespread applicability. This BMP will ultimately be part of the Commonwealth's "Resource Management Plans" (rules being finalized).

Stream Access Control with Fencing: Fair

Current cost-share program has been progressing, but a regulatory requirement may be needed for additional expansion. Since the program is voluntary, finding additional participants may become more difficult over time. This BMP results in loss of revenue as livestock reduction. The County has no authority to require this BMP

Streamside Forest Buffers: Low

Implementation of this BMP is currently voluntary, and will result in revenue loss due to crop loss or livestock reduction. The County has no authority to require this BMP. Some cost-share funding is available for certain types of hardwoods. This BMP would most often be used in conjunction with Stream Access Control With Fencing, and may offer opportunities for grant funding and volunteer work.

Streamside Grass Buffers: Fair

Implementation of this BMP is currently voluntary, and will result in revenue loss due to crop loss or livestock reduction. Cost-share is available for application of grass filter strips through the VASWCD at a rate of $175/acre. The County has authority from the state to require this BMP through the "Chesapeake Bay Preservation Act" (CBPA), however there are no efforts to adopt the CBPA at this time.

Tree Planting: Low

Currently, implementation of this practice is voluntary. It does not include establishment of forested buffers, and must be identified as highly erodible land or critical resource areas. The County has no authority to require this BMP. Some cost-share funding is available for certain types of hardwoods. This BMP can offer opportunities for grant funding and volunteer work.

Wetland Restoration: Low

Currently, implementation of this BMP is voluntary. Implementation will result in revenue loss due to crop loss, since restoration on agricultural land requires the removal of surface or subsurface drainage systems. The County has no authority to require this BMP. This BMP can offer opportunities for grant funding and volunteer work. Although the state guidelines are not expected to be completed soon, there is potential for this BMP's use in Nutrient Trading practices.

SECTOR: SEPTIC

Septic Connection: Fair

This BMP represents connecting a home or facility served by an onsite sewage disposal system to a public sewer system. From 2006 to mid-2011, 35 onsite sewage systems were abandoned due to connection to public sewer. Typically, connections occur when an onsite sewage disposal system fails and public sewer is available to the impacted property. In 2010, the County completed the Loudoun County Water and Wastewater Needs Assessment. This report identifies communities that have or are at risk of having failing or inadequate sewage systems. Staff is currently preparing a work plan that would facilitate solutions to community wastewater problems. Many of the solutions will involve replacement of onsite sewage systems with community or public sewer systems. Due to these efforts, the implementation potential for this BMP should improve in the future.

Septic Denitrification: Low

This BMP represents the replacement of a conventional onsite sewage disposal with a specific type of alternative onsite sewage disposal system meeting NSF International Standard 245 certification requirements. The County does not have the authority to require owners to replace conventional onsite sewage disposal systems with de-nitrification systems. The County would need enabling legislation to mandate conventional system replacement with denitrification systems. It is unlikely that voluntary implementation of this BMP would be successful. From 2006 through mid-2011 there were ninety-four (94) Standard 245 systems installed in the County. Will be required for new construction starting 2014, and for replacement of failed systems if alternative system must be used.

Septic Pumpout: Good

Conventional septic systems are required to be pumped out once every five years in accordance with Chapter 1066 of the Codified Ordinances of Loudoun County. Alternative onsite sewage disposal systems are required to be inspected once per year in accordance with Chapter 1067 of the Codified Ordinances of Loudoun County. These alternative onsite sewage disposal system inspections may result in a system pumpout. The program infrastructure, enforcement, and reporting requirements exist and are administered by the Loudoun County Health Department.

SECTOR: URBAN

Abandoned Mine Reclamation: Low

This BMP will be implemented through existing quarries within the County. The total level of effort is equal to the VPDES permit area of the quarries. Therefore, this BMP is fully implemented; there is no opportunity to implement this BMP beyond what currently exists.

Dry Detention & Hydrodynamic Structures: Low

Both of these BMPs get rather minimal credit for pollution reduction. Although they are available for consideration, they are not proposed in Virginia's Phase I WIP and are unlikely to be cost effective.

Dry Extended Detention Ponds: Good

Currently, there are over 170 dry ponds in the County that were constructed for flood control. Most of these can likely be converted to extended detention dry ponds by replacing the control structure and raising berm heights to increase flood control volume. The ponds are already within stormwater management easements which permit modifications, so no land purchase is required. It is likely that many such projects could be completed, but the pollution reduction credit given for such a retrofit is fairly small. Where there is currently no treatment, existing stormwater systems for a given development do not drain to a central point. This makes creating new ponds to treat large drainage areas unlikely and extremely expensive. Nevertheless, untreated areas should be examined for opportunities.

Erosion & Sediment Control: Good

The County Erosion and Sediment Control Program is already implemented on all significant land disturbances within the County.

Impervious Surface Reduction: Low

There are few situations throughout the County where impervious surface is in excess of what is either desired or required. A survey should be undertaken to identify any excess parking pavement, however, the County has no authority to force reductions. Therefore, the only reasonable possibility is to replace impervious pavement and concrete with pervious alternatives. The cost of these modifications usually exceeds $200k per acre. It is likely the most expensive BMP permitted.

Street Sweeping: Good

Outside of the Towns of Leesburg and Purcellville, there are over 1600 lane miles of paved road that are maintained by VDOT. It is unclear whether VDOT or the County could implement the practice on those roads. There are also a few hundred lane miles of privately owned streets and acres of parking lots throughout the County that could be considered. The County would have no authority to require sweeping on private property, but success through incentives may be possible. The best opportunity for this BMP is at schools and other publicly owned facilities.

Urban Filtering Practices: Fair

The difficulty with urban filtering practices as a retrofit is that most of these practices only treat very small acreages. Only the manufactured cartridge filter systems have the capacity to treat larger areas. With each existing dry pond, there is the potential to add flow splitters and sand filters within existing easements just prior to the stormwater flow reaching the pond, but the capacity will be limited. Large manufactured filter systems are expensive to construct, expensive to maintain, and require land beyond existing easements. There are opportunities for numerous small systems, especially tree boxes or small bioretention sites at individual inlet boxes, but the cost is generally high and the cumulative impact relatively low.

Urban Infiltration Practices: Low

In eastern Loudoun County, where the urbanized areas are, soil conditions do not lend themselves to infiltration. It would be risky, from a flooding perspective, to construct an infiltration BMP of any size without providing an under drain system to remove excess water that the soil cannot absorb. The Chesapeake Bay TMDL rules would then define the system as a filtering practice.

Urban Nutrient Management: Good

The cost to develop urban nutrient management plans is low, usually only requiring a soil test and minimal analysis, and the result is generally beneficial to the property owner. There will likely be a requirement for monitoring and annual reporting on the plans, so this will likely be pursued primarily on large tracts of managed grass. With several thousand acres of lawns in the urban area managed by HOAs, government, and golf courses, potential for nutrient management is good.

Urban Stream Restoration: Fair

The implementation potential of this BMP is based primarily on cost and risk. With the credit for pollution reduction that is being given under the current Bay Model, the cost per pound reduction is relatively high. This may change however. Additionally, there is some risk in investing in a costly plan that might be destroyed by some of the observed flood disasters of the past. High quality design can mitigate that risk to acceptable levels.

Urban Tree Planting: Fair

The intent of urban tree planting is to eventually convert an urban area to forest. This would require identifying properties that are currently in some passive use, such as managed grass, and turning them into forest with perhaps hiking trails. Adding trees as a part of urban landscaping does not qualify for BMP credit.

Wet Ponds & Wetlands: Low

There is a small potential for creating wet ponds or wetlands in some of the older urbanized areas where there is either no treatment or the treatment is an existing dry pond. Where there is no treatment, existing stormwater systems for a given development do not drain to a central point, making treatment of large drainage areas unlikely and extremely expensive. Where a

development is treated by a dry, flood control pond, retrofitting to a wet pond would require more volume and a water source to support a permanent pool. Extended detention dry ponds would be the preferred retrofit in those situations. This BMP is highly effective and the urban area should be examined for opportunities, but the potential is very low.

Protocols For The Technical Advisory Committee (TAC)

Affirmed by TAC 8-23-12; Revised and Affirmed by TAC 11-5-12

Purpose of the rules: To ensure that each participant has a full and fair opportunity to participate, and to achieve the most effective and productive use of everyone's time and energy.

Participation:

1. *Keep comments brief*, courteous, and respectful, and direct them to the facilitator.

2. *Refrain from side conversations* when another person is speaking; *listen closely* and learn from the viewpoints and knowledge of others.

3. *The TAC will enforce its affirmed protocols* through the facilitator.

4. *Alternate TAC Representatives* – TAC members may assign membership powers to any alternate representatives; however, TAC members must make any such assignment by October 15, 2012.

5. *Participation of TAC Representatives* via telephone call-in will not be permitted. Comments from the public in attendance at a meeting will be permitted, subject to the person being recognized by the facilitator, and only for the purpose of providing technical information to the TAC, not for stating opinions.

Procedures:

6. *Review materials* and complete any assignments prior to the meeting.

7. *TAC members will attend meetings on time*. Meetings will begin and end promptly on schedule. Members will notify the staff co-Chair in advance if unable to attend a meeting. TAC may extend or truncate a meeting by broad consent in accord with #11.

8. *Members will submit information they wish to share with the full TAC*, to the staff co-Chair in advance (48 hours prior to the meeting), to allow for dissemination via e-mail. Correspondence between members, and between members and staff on TAC matters, will be shared via a group e-mail address list, to include TAC members and alternates, project support staff, and the facilitator.

9. *In any public communications on TAC matters*, members will use the same tone of courtesy and respect for fellow members as in the TAC meetings, and will make it clear that they speak only for themselves and not the TAC as a whole. Members will not use the news media to lobby for their own viewpoints. Any inquiries from the news media will be forwarded to the two co-chairs who will decide jointly how to respond.

10. *Keep all cell phones on a silent setting* during the meetings; if it is necessary to make or take a cell phone call, leave the room.

11. *A summary of each meeting will be provided* prior to the next meeting, and the staff co-Chair will post relevant materials on the County website. *All meeting announcements and materials will be posted* on the County website and will be open to the public.

Decisions:

12. *TAC decisions on substance and procedures will reflect the broad consensus* of the representatives present, defined as at least two-thirds of members present.

    Decisions may only be taken if a quorum is present. A quorum is defined as 10 or more members. Meetings may be held without a quorum but no decisions may be made unless a quorum is present.

    The test for each member's decision about an issue is not "do I like it?" but rather "can I live with it?" Members who did not participate in a particular discussion need not be part of the consent agreement on that particular issue.

    Multiple viewpoints may be put forth as viable alternatives if a clear consensus on a particular issue is impossible to reach within the time constraints of the process.

    The official record of input from TAC members will be forwarded to the Board of Supervisors upon completion of the TAC's portion of the outreach process.

13. *The TAC members may amend the protocols by broad consensus agreement, as per #12.*

Phase II WIP Technical Advisory Committee Meeting

Date: August 23, 2012
Time: 4:00 p.m.
Place: Round Hill Room, Government Center, 3rd Floor
1 Harrison Street, S.E. , Leesburg, VA 20177

Meeting Agenda

Meeting Objectives:

- Provide background information on the Phase II Watershed Implementation Plan (WIP) and the Chesapeake Bay Total Maximum Daily Load (TMDL) to the Technical Advisory Committee (TAC).
- Establish procedures, role, and meeting schedule for the TAC.

4:00 **1. Introductions** ……. Alan Brewer, Co-Chair

4:15 **2. Meeting Agenda and Process Overview** …… Milt Herd

4:20 **3. Background Phase II WIP**…….. Randy Williford

Randy Williford, Assistant Director of General Services, will deliver a powerpoint presentation on the Phase II WIP, the Chesapeake Bay TMDL, the Loudoun County Work Plan, and the role and purpose of the TAC

4:40 **4. Phase II WIP Best Management Practice Information**…. Dennis Cumbie

Dennis Cumbie, Hydrogeologist, Department of Building and Development, will present information on land use and best management practices including an overview of the 2009 progress data, phase I WIP level of effort, and a business as usual scenario.

5:15 **5. Meeting Procedures and Protocols** …….. Milt Herd

5:30 **6. Meeting Schedule**…… Milt Herd

5:45 **7. Selection of Co-Chair**…….. Committee Members

6:10 **8. Adjourn**…… Alan Brewer, Co-Chair

Phase II WIP Technical Advisory Committee Meeting

Date: **Monday, October 1, 2012**
Time: 4:00 p.m.
Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E. , Leesburg, VA 20177

Meeting Agenda

Meeting Objectives:

- Affirm procedures, role, and meeting schedule for the TAC.
- Achieve TAC understanding and input on the framework of the scenarios. Achieve consensus that the framework is an appropriate method to meet the County Phase II WIP Goal.
- Achieve TAC understanding and input on the "Business as Usual" (BAU) BMPs and level of effort.

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:15 **2. Review and Affirm Procedures, Role, Schedule and Agenda**… Milt Herd
TAC will review and affirm; opportunity to raise and resolve any procedural issues to date.

4:30 **3. Review Goal, Scenarios, Strategies, and Framework**…….. Staff with TAC
Staff will present County Goal and Working Definition of "Local Scenarios and Strategies" and will present framework for meeting County goal. TAC will react and work toward consensus.

5:00 **4. Review and Discuss BAU**……. Staff with TAC
Staff will lead a line-by-line BMP review with input from TAC.

5:45 **5. Review Materials to be covered in upcoming meetings**…. Staff with TAC

6:00 **6. Adjourn**…… Co-Chairs

Phase II WIP Technical Advisory Committee Meeting

Date: Monday, October 15, 2012

Time: 4:00 p.m. to 6:00 p.m.

Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E. , Leesburg, VA 20177

Meeting Agenda

Meeting Objective:

- Review in detail the Methodology and Cost Assumptions underlying the "Business as Usual" (BAU) BMPs and level of effort, to achieve solid understanding.

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:10 **2. Review Procedures and Re-Cap October 1 Meeting**…….. Milt Herd
Opportunity for TAC members to raise and resolve any procedural issues to date; and Milt will briefly touch on the highlights of the previous meeting.

4:20 **3. Review Objectives for this Meeting** …….. Co-Chairs
The Co-chairs will review the major objectives for this meeting in the context of the overall TAC mission and the meeting schedule.

4:30 **4. Review BMP Methodology**…….. Staff
Staff will present an explanation of the methodology used in calculating the BAU scenario and its relationship to the WIP I level of effort and the 2009 progress. Opportunity for Q & A with TAC.

5:00 **5. Review Cost Assumptions used for BMPs** …….. Staff
Staff will present an explanation of the assumptions made in calculating the costs for implementing each type of BMP. Opportunity for Q & A with TAC.

5:50 **6. Review Expectations for Upcoming Meetings**…….. Staff

6:00 **7. Adjourn**…… Co-Chairs

Phase II WIP Technical Advisory Committee Meeting

Date: Monday, November 5, 2012

Time: 4:00 p.m. to 6:00 p.m.

Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E. , Leesburg, VA 20177

Meeting Agenda

Meeting Objective:

- Review and *reach consensus* on the Cost Assumptions underlying the "Business as Usual" (BAU) BMPs and gain understanding of implementation and reduction potentials of each BMP.

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:10 **2. Review Procedures and Re-Cap October 15 Meeting**…….. Milt Herd

Opportunity for TAC members to raise and resolve any procedural issues to date; and Milt will briefly touch on the highlights of the previous meeting.

4:20 **3. Review Objectives for this Meeting** …… Co-Chairs

The Co-chairs will review the major objectives for this meeting in the context of the overall TAC mission and the meeting schedule.

4:30 **4. Review BMP Cost Assumptions**…….. Staff

Staff will continue the explanation of the cost assumptions made in calculating the average or typical costs for implementing each type of BMP. Opportunity for Q & A with TAC.

5:15 **5. Review Implementation Reduction Potential for BMPs**…….. Staff

Staff will present an explanation of the methods used in calculating the effectiveness of each type of BMP. Opportunity for Q & A with TAC.

5:50 **6. Review Expectations for Upcoming Meetings**…….. Staff

6:00 **7. Adjourn**…… Co-Chairs

Phase II WIP Fifth Technical Advisory Committee Meeting

Date: Monday, November 19, 2012

Time: 4:00 p.m. to 6:00 p.m.

Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E. , Leesburg, VA 20177

Meeting Agenda

Meeting Objective:

- Review and gain understanding of reduction potentials of each BMP.
- TAC to provide input on implementation potential of each BMP

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:10 **2. Review Any Procedural Issues** …… Milt Herd

Opportunity for TAC members to raise and resolve any procedural issues to date; and brief recap of the procedural issues resolved at the previous meeting.

4:15 **3. Review Objectives for this Meeting**; **Re-Cap November 5 Mtg** Co-Chairs

The Co-chairs will:

- review the major objectives for this meeting in the context of the overall TAC mission and the meeting schedule;
- re-cap progress made at previous meeting
- provide update on Stakeholders Committee meeting November 13.

4:45 **4. Review Reduction and Implementation Potential for BMPs** …….. Staff

Staff will present an explanation of the methods used in calculating the effectiveness of each type of BMP, and potential for implementation. Opportunity for Q & A with TAC.

5:45 **5. Review Expectations for Upcoming Meetings**…….. Staff

6:00 **6. Adjourn**…… Co-Chairs

Phase II WIP Sixth Technical Advisory Committee Meeting

Date: Monday, December 3, 2012

Time: 4:00 p.m. to 6:00 p.m.

Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E., Leesburg, VA 20177

Meeting Agenda

Meeting Objective:

- Reach Consensus on Cost Assumptions for BMPs.
- Affirm Consensus on Implementation Potential for BMPs.

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:05 **2. Review Any Procedural Issues** …… Milt Herd
Opportunity for TAC members to raise and resolve any procedural issues to date.

4:15 **4. Present and Discuss Revised Cost Assumptions for BMPs**……. Staff and TAC
Staff will present updated information on BMP cost data and assumptions as follow-up to previous TAC discussions. TAC will discuss to reach consensus on "working" cost assumptions.

4:30 **5. Affirm Consensus on Implementation Potential for BMPs**…… Staff and TAC
At the previous meeting, the TAC reached consensus on implementation potentials but was one member short of a quorum.

5:45 **5. Review Expectations for Upcoming Meetings**…….. Staff

6:00 **6. Adjourn**…… Co-Chairs

Phase II WIP Seventh Technical Advisory Committee Meeting

Date: Monday, December 10, 2012

Time: 4:00 p.m. to 6:00 p.m.

Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E., Leesburg, VA 20177

Meeting Agenda

Meeting Objective:

- Understand and Discuss Draft Loudoun Local Scenario.

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:05 **2. Review Any Procedural Issues** …… Milt Herd
Opportunity for TAC members to raise and resolve any procedural issues to date.

4:15 **3. Present and Discuss Draft Loudoun Scenario**…….. Staff and TAC
Staff will present the draft Loudoun Local Scenario, including BMP levels of effort, acreage, load reductions, and annual cost per pound of removal. TAC will discuss and engage in Q & A.

5:45 **4. Review Expectations for Upcoming Meetings**…….. Staff

6:00 **5. Adjourn**…… Co-Chairs

Phase II WIP Eighth Technical Advisory Committee Meeting

Date: Monday, January 7, 2013

Time: 4:00 p.m. to 6:00 p.m.

Place: Round Hill Room, Loudoun County Government Center, 3rd Floor
1 Harrison Street, S.E., Leesburg, VA 20177

Meeting Agenda

Meeting Objective:

- Reach Broad Consensus on Draft Loudoun Local Scenario.

4:00 **1. Welcome** …… Alan Brewer and Mike Rolband, Co-Chairs

4:05 **2. Update on SAC Process** …….. Alan Brewer and Mike Rolband, Co-Chairs
The Co-Chairs will brief TAC regarding the second meeting of the Stakeholders Advisory Committee (SAC) held January 3, and any related procedural or substantive issues.

4:10 **3. Review Any Procedural Issues** …… Milt Herd
Opportunity for TAC members to raise and resolve any procedural issues to date.

4:20 **4. Present & Discuss Refinements to Draft Loudoun Scenario**….. Staff & TAC
Staff will present the refined draft Loudoun Local Scenario. TAC will discuss and engage in Q & A to work to broad consensus.

5:45 **5. Review Expectations for Next Steps**…….. Staff & TAC

6:00 **6. Adjourn**…… Co-Chairs

Notes from First Meeting of the Technical Advisory Committee (TAC)
8-23-12

Prepared by Milt Herd, Facilitator

Co-Chair Alan Brewer opened the meeting at 4:00 pm.

Q & A following staff technical presentations:

Q 1: Are you using WIP I as the target?
A: WIP I prescribed a list of BMPs which, if done on a statewide average, would meet EPA goals. At the same time, the state indicated that local jurisdictions could use different combinations of BMPs to reach the same pollutant reduction goals. We have translated the WIP I BMPs into numerical reductions for each of the pollutants and will be looking for the best combination of BMPs to reach those reductions.

Q 2: Is there any actual water quality testing to know which watersheds are the real problems?
A: -The science is good for determining loads from land uses
- *Efficiencies of BMPs are known*
- *Water quality data is only used for model runs (done every few years); it's used to calibrate the model*
- *State puts out an impairment list – Bay model is not detailed enough to designate status of each watershed in the County*
- *We're not aware of any "hot spots" in the County*

Q 3: Is "nutrient banking" a potential tool?
A: It's probably two years away, but it's in play for our consideration as a tool.

Q 4: Are there any plans for monitoring stations?
A: We don't plan any; it would be a separate effort.

Q 5: What land use scenario are we using?
A: The Bay model forecasts future land use in a linear projection, which probably is favorable to Loudoun, given our historic growth rates.

Business Items:

Procedures and Protocols

The TAC affirmed the Proposed Procedures and Protocols with the following changes, agreed to by unanimous consent of the members present.

- Decisions of the group will be made by consensus, which will be defined as two-thirds of the TAC members present (which may included designated alternates)

- Decisions may only be taken if a quorum is present. A quorum will be defined as 10 or more members.
- Meetings may be held without a quorum but no decisions may be made unless a quorum is present.
- Alternate members function with the full authority of the member who appointed them but the alternate must be the same person throughout, and must be designated prior to the second meeting of the TAC (set for October 1, 2012)
- News media inquiries will be forwarded to the two co-chairs who will decide jointly how to respond.
- Correspondence between members, and between members and staff on TAC matters, will be shared via group e-mail address list. (The e-mail address list should include all TAC members, designated alternates, County project support staff, and the facilitator).

Meeting Schedule

- TAC Meetings will be held from 4:00 pm to 6:00 pm, in accord with the following schedule (eight meetings are programmed, with 10 dates identified in case of weather problems):

  Monday, October 1
  Monday, October 15
  Monday, October 29
  Monday, November 5
  Monday, November 19
  Monday, December 3
  Monday, December 10
  Monday, January 7
  Monday, January 14
  Monday, January 21

Co-Chair

The facilitator asked the TAC members for nominations for Co -Chair and Mike Rolband was the sole nominee. After a brief discussion, the TAC chose Mike as Co-Chair by unanimous acclimation.

Alan Brewer adjourned the meeting at about 5:45 pm.

Notes from Second Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

10-1-12

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chairs Alan Brewer and Mike Rolband opened the meeting a minute after 4:00 pm.

2. Review and Affirm Procedures, Role, Schedule and Agenda

TAC members and alternates reintroduced themselves and Milton Herd briefly reviewed the procedural protocols that the TAC amended and approved at the first meeting. He asked for and received affirmation from members. He specifically noted that the deadline for naming alternates is today and asked if anyone had alternates to name, and there were none. He noted that the first item on each agenda will be a "check-in" to see if there are any procedural or process issues to address before proceeding with the substance of the meeting. Today the TAC had none.

3. Review Goal, Scenarios, Strategies, and Framework

Staff presented an overview of the County Goal and Working Definition of "Local Scenarios and Strategies" as well as a proposed "framework" for meeting the County goal. TAC discussion included:

TAC Q1 – Where does the number of acres fit into the scenarios and strategies?

Staff: Preliminary numbers are "behind" each element in the spreadsheet. We will explore in detail later.

TAC Q2 – The three parameters are key (cost per pound of nutrient or sediment removed; implementation potential for each BMP; pollutant reduction potential for each BMP). Ancillary benefits may also be important – these should be an additional, fourth column in the framework.

TAC: If we do that, we would also need to change the goal.
[Further discussion on this issue occurred later in the meeting, and it is shown as follows]

The TAC discussed whether to amend the goal (which was endorsed by the Board of Supervisors) and whether to add "ancillary benefits" as a fourth column in the framework. Concern was expressed about the subjective nature of this factor, while the TAC also recognized the actual value of intangible benefits that are not easily quantified. After substantial constructive discussion, the consensus conclusion of the group was to not formally change the goal, but rather to recognize that in interpreting the goal, several key considerations would be factors:

- *The scenarios can include a mixture of either EPA / DCR measures or new ones based on the best available scientific information. Think about the need for pursuing additional state legislation for new tools/strategies.*
- *That "ancillary benefits" would be an informal, non-quantitative factor in assessing the scenarios, and function as a kind of "tie breaker" or additional consideration in judging a given scenario.*
- *The "practicality" of a tool would also be a factor under the "implementation potential" criteria column of the framework. Implications of "voluntary" vs. "regulatory" and similar issues would be considered.*

TAC Q3 – Several practices may be amended in terms of ratings/efficiencies, and therefore could staff could make potential changes known?

- *TAC: How stable or reliable are such changes?*
- *TAC: How should TAC deal with "moving targets"?*
- *Staff: Staff could run (calculate) alternative scenarios if only two elements are at variance.*

TAC Q4 – Where did the numbers/ratings and the list of BMPs come from?

- *Staff: The list came from EPA, Phase I WIP*
- *Staff: Ratings/evaluations were done by staff with input from SWCD, Health Dept. and other agencies.*

TAC Q5 – Can we add scenarios, or must we only use EPA-approved ones?

- *Staff: We can add our own and then pursue approval of them.*
- *The TAC discussed and agreed that scenarios could be a mixture of either EPA, DCR guidance or based on best scientific information. [The TAC will consider that an operational interpretation of the overall project goal.]*

TAC Q6 – What does "decision agriculture" mean?

- *Staff: It is when you use nutrient management plan to make choices on crops, etc.*
- *Alan Brewer quoted from the EPA – "management system….."*

TAC Q7 – Maybe add "precision" agriculture to the BMP list (nitrogen injection).

TAC Q8 – How would we document success?

- *Staff recommended, and the TAC agreed, that this issue will tackled at a future meeting.*

TAC Q9 – Why is mining under "urban sector"?

- *Staff: It pertains to our quarries, which are the closest thing we have to coal mining, which is the original intent of the mining category. The allocation for quarries should already be counted.*

TAC Q10 – The WIP plan is done on the basis of 2-year milestones, so adjustment is possible and expected.

Conclusion – with the adjustments and nuances noted above, the TAC reached consensus on the framework as proposed.

4. Review and Discuss BAU

Staff presented an overview of the "Business as Usual" approach with slides and handouts of the spreadsheet showing the analysis/results/expectations.

TAC Q1 – Has the County verified the acreages allocated to each BMP?

- *Staff: We've submitted some corrections to the EPA/DCR. For this analysis, we're using DCR's numbers. Where the County had information or data that was different from the EPA and DCR data, we provided them with it. We did not verify data where we did not have access to the data or where the source would have been the same as used by the state – for example the agricultural census.*

TAC Q2 – Why is there no acreage tally at the end?

- *Staff: Because there is some double-counting and overlap; and some effects are not expressed in acres, but rather in linear feet, etc.*

TAC Q3 – What happens when you find "you can't get there" in terms of benefits from a land use?

- *Staff: We can shift from another category, or*
- *Staff: Use other, new techniques.*

TAC Q4 – Will our work end up focusing on just a few key land uses?

- *Staff: No – it will require more, from lots of categories.*

TAC Q5 – Need to know cost per pound per BMP.

- *Staff: Staff can provide.*

TAC: Q6 – Should we add Wastewater Treatment Plants to the BMP list? We should look at getting credit for Leesburg's unused discharge.

- *TAC member Amy Wyks indicated she would research that question. The Town may have some concerns about changing its discharge allocation.*

TAC Q7 – Add Wastewater Treatment Plant factors to the urban BMPs. Can we add to bullets for the next meeting?

Staff:

- *We can't calculate such reductions using the VAST Tool.*
- *Would have to be based on trading of credits – would need to know the price.*
- *We need to research this further.*

5. Review Materials to be covered in upcoming meetings

Staff reviewed the outline of upcoming meeting topics and discussed with the TAC. No specific changes were made, but it was recognized that topics and agenda items would be adjusted as needed as the TAC moves forward. A "budget" of eight TAC meetings is the goal.

As noted in the previous summary, TAC Meetings will be held from 4:00 pm to 6:00 pm, on the following dates (eight meetings are programmed, with 10 dates identified in case of weather problems). All meetings will be in the Round Hill room on the 3rd floor of the County Government Center.

Monday, October 1
Monday, October 15
Monday, October 29
Monday, November 5
Monday, November 19
Monday, December 3
Monday, December 10
Monday, January 7
Monday, January 14
Monday, January 21

6. Adjourn

The Co-Chairs adjourned the meeting a few minutes after 6:00 pm.

Notes from Third Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

10-15-12

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chair Alan Brewer opened the meeting at 4:05 pm.

2. Review Procedures and Re-cap October 1 Meeting

Milton Herd asked for any procedural issues from TAC members and there were none. He raised two issues that emerged since the last meeting: Whether to allow appointment of alternates past the agreed-upon October 1 deadline, and whether to allow attendance via telephone call-in. The TAC discussed these but did not take action due to the lack of a quorum. Later in the meeting, when a quorum was achieved, the TAC reached agreement on these issues. (Detailed agreements are listed at the end of this summary, with the other action items approved by the TAC).

3. Review Objectives of this Meeting

Co-Chair Alan Brewer briefly reviewed the objectives.

4. Review BMP Methodology

Staff presented an explanation of the methodology used in calculating the Business As Usual scenario and its relationship to the WIP I target level of effort and 2009 progress.

TAC Q1 – Any challenge to the target levels?

- *Staff: No opportunity to do so until the re-run in 2017, long after we've picked a scenario.*

TAC Q2 – Were land use numbers verified?

- *Staff: There was no time frame to correct these, but we did submit suggestions for adjustments, but these won't be applied until 2017.*

TAC Q3 – We want to hit our total minimum reductions – that's the key thing.

TAC Q4 – Why is the Wastewater Treatment Plant allocation issue off the table?

- *Staff: Anything with a discharge permit such as wastewater treatment allocations, has already been factored in.*

TAC Q5 – It's important to factor in maintenance costs for each BMP.

- *Staff: We did project out 13 years – this is shown in the spreadsheet handout – it shows a range of relative costs.*

BAU Scenario:

- *Staff: There are some technical issues in the Bay model which cause problems with phosphorous loads – the model will be corrected in the 2017 run – they gave us a "fix" to use in the meantime.*
- *Staff: Staff will get a new model run out to the TAC – we just received it this past Friday.*
- *Staff: No extra credit is given for exceeding targets in any one category.*
- TAC: That would require a "trading" process which has not yet been established.

TAC Q6 – Was the change in state law regarding fertilizer factored in to this?

- *Staff: Not yet – the state will define how to do it.*

There were no further questions on methodology.

5. Review Cost Assumptions Used for BMPs

Staff reviewed the list of BMPs and the underlying assumptions regarding cost elements for using each type.

Agricultural Sector - Enhanced Nutrient Management:

- *Staff: Costs include to County, landowners, etc.*

TAC Q7 – The allocation of cost is outside of our charge / purview.

- *Staff: Allocation might affect ability to implement or the method of implementation.*

TAC Q8 – Assume government does the nutrient management plans, then compare to the cost of the private sector doing it.
TAC Q9 – Just express cost as "two people" for example, as a budget, not naming whether it's public or private sector people.
TAC Q10 – Assume if it's voluntary, government will do it, and if it's a requirement, private sector will do it.
TAC Q11 – Let's stay out of the question of "who pays".
TAC Q12 – Yes, but we should come back to that, because that affects the practicality of implementation. TAC affirmed by consensus to do so.

[After an extensive discussion of the first BMP on the list, the facilitator raised the question of how best to cover all of this material in the time frame available. Staff suggested that the TAC come back with proposed corrections to each of these BMPs. After some discussion – and now with a quorum present – the TAC agreed that each member would provide comments on each of the BMPs to the staff via e-mail, by Monday, October 22. The Co-Chair also raised the issue of how to address the Wastewater Treatment Plant allocations, and recommended a small work group be established to work offline and come back to the full TAC with recommendations. The TAC agreed with this approach.]

6. Review Expectations for Upcoming Meetings.

The co-chair opened a discussion of the process and timeline.

In summary, the TAC reached consensus (with a quorum) on the following items:

- **Each TAC member will provide any comments on each of the BMPs to the staff via e-mail, by Monday, October 22.**
- **At the next meeting (October 29), TAC will reach consensus on BMP cost assumptions and will discuss the reduction potential of each BMP.**
- **The alternate member appointments requested by Ms. Law and Mr. Hatch will be accepted, but no further alternate appointments will be permitted.**
- **No member participation during meetings via telephone call-in will be permitted.**
- **The question of "who pays" for implementing a particular BMP will be taken up during our process.**
- **A small work group is named to analyze the issue of using wastewater treatment plant allocations in meeting the WIP targets, and will report back with findings to the full TAC by the November 19 TAC meeting. The work group will be:**
  - **Amy Wyks**
  - **Mark Peterson**
  - **Mike Lynn**
  - **Alan Brewer**
  - **Mike Rolband**

7. Adjourn

The Co-Chair adjourned the meeting at 5:55 pm.

Notes from Fourth Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

11-5-12

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chairs Alan Brewer and Mike Rolband opened the meeting at 4:05 pm.

2. Review Procedures and Re-cap October 15 Meeting

Milton Herd asked for any procedural issues from TAC members and there were none. He then raised one issue that emerged after the previous meeting, which was whether to allow input from the general public during TAC meetings, and if so, how best to manage it. After some discussion the TAC members present (nine of 10 required for quorum – a 10th member arrived later in the meeting), agreed that the the TAC protocols would be refined to provide that input from the public in attendance at a meeting will be permitted, subject to the person being recognized by the facilitator, and only for the purpose of providing technical information to the TAC, not for stating opinions and the like.

Herd also notified the TAC that Ken Theurich, the TAC member representing the School Board, has notified the staff that he is no longer an employee of the County School system, and thus, the County staff will ask School officials how they prefer to be represented on the TAC, whether by a new appointment, or by the designated alternate, or some other suitable approach. The staff will apprise the TAC of any decisions on that issue.

The Co-Chairs also reported on the progress of the designated working group for wastewater treatment allocation issues that was established at the previous TAC meeting. The group met earlier this day to begin exploring the potential of using extra WWTP allocations for credit in the WIP, although they believe it is unlikely that such allocations can be used in that way. However, the working group will draft a formal question to DCR regarding this issue. A final recommendation will be presented to the TAC for consideration.

3. Review Objectives of this Meeting

Co-Chair Alan Brewer briefly reviewed the objectives for the meeting.

4. Review BMP Cost Assumptions

Alan Brewer noted that staff was looking for input on the accuracy of the cost assumptions in terms of relative “orders of magnitude”.

TAC Q1 – We need better than literal “order of magnitude” level of precision.
TAC Q2 – Impervious definition has a separate formal definition from permeable surface.

TAC Q3 – Need a broader review of costs so elements are consistent from one BMP to another.
TAC Q4 – Need to distinguish cost to government vs. cost to landowner. Bill Ackman proposed cost groups/categories (#25 on the e-mail input list from TAC). This could be allocated over maybe a 30-year time frame.
TAC Q5 – Use capitalized costs and relative costs.
TAC Q6 – The real question is: what is the total cost to society? Then we ask "who pays?"
TAC Q7 – Maybe add a column for policy guidance on cost allocation.
TAC Q8 – Can't separate cost from allocation of cost for the TAC to recommend.

The TAC discussed this basic issue at length, and recognized that the total cost was technically independent from the allocation question, but that for most people, it is not easy to separate the two.

TAC Q9 – How should costs be expressed? E.g.: Capitalize value of maintenance?

- *Staff: We can attempt to provide a cost breakdown for each BMP, except for annual lost revenue to the County.*

TAC Q10 – Acknowledge all cost factors even if they are imprecise or have to be expressed as a range or average – the key is relative cost.

- *Alan Brewer proposed that staff will respond to the suggestions of input item #25 by breaking down:*
  1) Costs to the County: Intitial costs and annual costs, and
  2) Costs to the land owner: Initial costs, annual costs and annual lost revenue costs. Alan Brewer indicated that annual lost revenue cost to the County in the form of taxable land lost may be too variable and predictive. He also indicated that staff could provide a cost range for some BMPs and could prepare information on whether or not the BMPs and land use changes could be voluntary, incentivized or mandated.

TAC Q11 – Are costs shown correct?

After some discussion, a general proposal emerged that staff offered to refine and present back to the TAC. The concept is that costs for each BMP would be organized to show costs for:

- Capital cost
- Maintenance costs (capitalized over 20 or 30 years, to be determined).
- Life-cycle cost
- Commentary on how the cost impact might best be allocated between public and private sectors.

TAC Q12 – How about using "high, medium, low" for future maintenance costs?
TAC Q13 – How about using "past trend, today, and future"?
TAC Q14– How about using "low and high over a given time period?

After some discussion about how to capture the best estimate of costs that vary from year to year, the TAC agreed that for commodity prices, today's price would be averaged with the July 2013 futures price to arrive at the estimated price. For other factors, today's costs or prices would be used. This provides a "snapshot" estimate of cost, rather than attempting to forecast the future or to replicate the past trend. This approach recognizes that these data will updated on an ongoing basis.

The TAC then reviewed the staff responses to the 25 items raised by TAC members through e-mail correspondence subsequent to the previous meeting, as agreed to at the last meeting.

#1. It may be helpful to the committee members to state the total life expectancy of each BMP and to have a total life cycle cost developed for each BMP in the summary text.

Resolution:
TAC agreed to use a 30-year period – adjusted where appropriate or necessary – to get to an "equivalent annual cost". The "King" report will be referenced.

#2 – It may be helpful to the committee members to state the efficiency of each BMP in the summary text.

Resolution:
TAC agreed to defer to a later staff presentation on this issue.

#3 – It may be helpful to the committee members to state a cost range of each BMP in the summary text. (This would give consistency to the text as the current version has only a few BMP's with a cost range.)

Resolution:
Staff can attempt to provide a cost range, yes. Current analysis for most BMPs uses a mid-point. Avoid using a range when possible. Provide documentation of numbers.

#4 – My overall comment on the BMP cost data for urban practices largely focuses on the ability to compare 'apples to apples' to the extent practical. That is, information on the cost of practice implementation and maintenance should be presented using similar types of information from the literature as well incorporating examples from 'as built' practices in Loudoun County. Each development site will differ in the design of the BMP that will affect the total cost. I would like to recommend that the costs for the BMP be standardized as a unit cost (e.g. cost/ impervious acre treated or other metric). I recognize that this may not be possible for all practices such as ESC, street sweeping or urban nutrient management, but is possible with other engineered practices.

Resolution:
This is based on average 30% impervious surface for urban areas. TAC accepted this, and noted that "equivalent cost" will work.

#5 – There are two reports that I think may be helpful in the assessment of BMP costs. I am having trouble attaching them as I am off-site today. They are: an extensive review of BMP cost information by King and Hagan as an example about this type of analysis was completed and a cost analysis of LID-type practices from North Carolina State University. The NC report is not as in-depth as King and Hagan but is useful to illustrate how the cost of practices differs based on how you crunch the numbers. I agree that it is beyond the scope of the TAC to do this analysis, but do think it would be possible to use the information that is available to provide a more direct comparison between urban BMPs.

Resolution:
Document numbers.

#6 – Because the agricultural BMP's cannot be required by State Code, we have only an incentive program to get participation. Therefore, we strongly support the Loudoun County Staff positions called for to create Nutrient Management and Water Quality Plans. If folks have to pay the private sector for this service, the probability of the small farmer going this route may decrease dramatically. If the service is promoted and free, the probability of all types of farmers utilizing this service would likely increase.

Resolution:
Okay with staff response: *Staff agrees. Keep in mind that the estimate for these BMP's is for preparing the plans. There may actually be costs associated with implementation of the plans, depending on the needs for the individual operator. In some cases, a nutrient management plan will prescribe implementation of several other Bay approved BMP's. Other plans may actually encourage* ***more*** *nutrient application.*

#7 –"Septic Pump Out" cost seems a bit low. Based upon personal experience, by the time you have your tank pumped, and screens cleaned, the cost is more like $500. Plus, every year, the screens need to be cleaned at a cost of approximately $100. Adding a range from $300 to $500 for initial pump out and a range from $160 to $200 per year for the annual cost to include the $100 screen cleaning would appear to be more accurate.

Resolution:
Septic pump-out – Okay as proposed.

#8 – Add a BMP for "Basic System Upgrade" to replace leaking tanks, valves and pipes. Initial cost would be $10,000 to $12,000 plus future pumping and screen maintenance.

Resolution:
TAC agreed to keep new BMPs "on the side" as we go through the process.

#9 – Street sweeping cost seems low. I have asked our Public Works Division to give me an actual cost per mile that we experience here in Leesburg.

Resolution:
Okay with staff response: *The costs for street sweeping come from the EPA document Preliminary Data Summary of Urban Storm Water Best Management Practices (August, 2009). They are said to be variable with sweeper type. The costs include purchasing of equipment, operation and maintenance, and disposal of swept materials. The study included information from Milwaukee, Winston-Salem, San Francisco, Champaign, and San Jose. The County has no actual experience in street sweeping, so a reality check from Leesburg would be helpful.*

#10 – The pond construction numbers appear low. We have a current estimate for a retrofit construction only of a 4 acre wet pond for $800,000. This estimate assumes we have all easements and land development rights in place.

Resolution:
Agreed with staff cost assumptions. Based mainly on new construction.

#11 and #12 –

I checked in with VADACS this afternoon, livestock Marketing division, and they came up with a price somewhere between 1000 1200 dollars minimum.

All BMP's with a recurring cost impact on animals due to lost land area should reflect a more accurate valuation of those animals. Assuming cattle are the reference animal, the loss of 1 animal unit is far more costly than the $145/animal listed. For example, the loss of the ability to birth and sell one calf at today's market prices for feeder calves would more likely be in the range of $700 to $850. Just another comparison on the livestock impact. I referenced the feeder calf lost revenue. Loudoun is also producing finished (full grown) beef cattle, some for the grass-fed beef market and some a blend of grass and grain feeding. Current market prices would indicate those full grown animals would have a lost income of $1,560 per animal, however that would be spread out over an 18 to 20 month growth cycle, so annualized the lost income would be around $900 per animal. Certainly there are other operating expenses that effect the potential net income, but the $145 per animal still seems low. I think the $145 per animal may come from a net profit projection for a feedlot scenario, not from an open grazing production scenario.

Resolution:
Revised in accord with input from TAC.

#13 and #14 –

Loss of crop revenue attributable to hay (not alfalfa) appears low at the quoted $2/bale. Hay prices vary depending on quality, supply (drought vs non-drought years), and demand, however, the $2/bale is extraordinarily low. Market price for hay mixed grass hay is easily $4/bale and for second cutting orchard grass hay we're commonly seeing $6 to $7 per bale.

Corn prices also seem low at $3.30/bushel. USDA projections for this fall harvest are exceeding $8/bushel.

Resolution:
Commodity prices resolved – use average of today's prices with the future prices of July 2013. Use tonnage not bales: $/ton.

#15 – *Additional documentation would be appreciated for the wetland restoration cost. The BMP description indicates it may include any wetland classification, some of which would be significantly more expensive to create than others.*

Resolution:
TAC agreed to use $60,000.

#16 – *Barnyard Runoff Control: Have we verified the "average" size of a barnyard is 5 acres? It seems to me that installing 200 feet of gutter and 100 feet of French drain would not likely adequately protect a 5 acre area. At best, this level of treatment might protect 1 to 1.5 acres. As such, the cost per acre is more appropriately $3,500 to $5,300 per acre.*

Resolution:
Staff will research this issue further and report back to TAC.

#17 – *Stream Access Control with Fencing: The description should include what type of fence is budgeted. There's quite a difference between barbed wire, high tensile wire, and board fencing.*

Resolution:
Staff recommends using existing program provisions. After some discussion, TAC agreed to that approach but asked for an explanatory footnote and to document the assumptions more completely, and to include maintenance costs (some TAC members noted maintenance would be a small amount anyway).

#18 – *Non-Urban Stream Restoration: The restoration figure of $32/foot seems very low. Please provide survey data for review. The Urban Stream Restoration cost at $300 per linear foot seems more appropriate.*

Resolution:
TAC agreed with staff proposal for Mike and Dennis to work "off line" to prepare a proposal on this matter for the full group.

#19 – *Irrigation Water Capture Reuse: Shouldn't there be some annual maintenance costs for ponds, similar to the urban detention pond maintenance?*

Resolution:

TAC agreed with staff proposal to document and footnote the explanations and to split out tap fees from other costs.

#20 – *Septic Connection: Does the cost of $47,000 per connection include service/tap fees charged by the utility provider?*

Resolution:
Okay with staff response: *These costs do include service/tap fees.*

#21 – *Street Sweeping cost versus vacuum sweeping cost in the impervious surface reduction quote: The Impervious Surface Reduction cost includes $160 per acre for vacuuming 4 times per year, while the Street Sweeping quotes $1,045 per acre for vacuuming 25 times per year. Is there that much savings by increasing the frequency of vacuuming?*

Resolution:
Agreed with staff response.

#22 – *Urban Filtering Practices: The cost for cartridge units seems ok if the land area treated is 10 acres or more. However, the cost per acre goes up rapidly for smaller sites. We need to evaluate whether most sites are going to be larger than 10 acres or, include an increased cost adjustment for the percentage of sites that are less than 10 acres and will have much higher per/acre implementation costs.*

Resolution:
TAC agreed with staff proposal for Kevin Murray and Randy to work offline to prepare an explanation and resolution of this issue, maybe by breaking it into two categories. Better documentation will also be provided.

#23 – *Urban Nutrient Management: My feeling is that the plan preparation cost is higher, more likely $100 to $200 per acre assuming moderately sized parcels.*

Resolution:
Better documentation will also be provided; recognize that there will be strategy discussions.

#24 – *Wet Pond: Do most of our wet ponds treat 45 acres or more? If not, the cost per acre to implement this practice is higher.*

Resolution:
Okay with staff response: *Loudoun County has about 200 wet ponds. The median-size drainage basin in 45 acres; the mean is much larger. Perhaps some sensitivity analysis to determine the higher relative cost of smaller ponds is in order.*

#25 – It may be helpful to the committee members to have the costs broken out in the following categories in the summary text:
- *Costs to the County*
- *Costs to the Land Owner (initial, annual, lost revenue)*

Resolution:
Resolved as noted above (TAC Q11 on page 2 of this summary). Provide better documentation on imperious vs. permeable surfaces.

5. Review Implementation Reduction Potential for BMPs

The TAC did not take up this item due to time constraints.

6. Review Expectations for Upcoming Meetings.

The TAC did not take up this item due to time constraints.

7. Adjourn

The Co-Chairs adjourned the meeting at 6:20 pm.

NOTE: The next TAC meeting will be Monday November 19 (not November 12)

Notes from Fifth Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

11-19-12

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chairs Alan Brewer and Mike Rolband opened the meeting at 6:10 pm.

2. Review Procedures

Milton Herd re-capped the refinement to the protocols agreed to at the previous meeting, which would permit input from the public in attendance at a meeting, subject to the person being recognized by the facilitator, and only for the purpose of providing technical information to the TAC, not for stating opinions.

3. Review Objectives of this Meeting; Re-cap November 5 Meeting

Co-Chair Alan Brewer reported that the Stakeholders Advisory Committee (SAC) met on November 13 for its organizational meeting. It set a schedule of meeting on the first Thursday of each month beginning on January 3. Alan suggested that it would be beneficial if a member of the TAC could make a brief report to the SAC at its next meeting. Co-chair Mike Rolband volunteered to do so, subject to confirming his availability. Mike also noted that there is no response yet from the state on the question of wastewater treatment credit.

4. Review Reduction and Implementation Potential of BMPs

Dennis Cumbie gave a slide presentation (and handout) in which he reviewed the reduction potential considerations, noting that the reductions for each BMP are driven by the model.

TAC Q – What is the definition of “perennial” stream?

- *Staff: Defined by U.S.G.S. (and thus understated)*

TAC Q – Clarify the issue of sequencing of BMPs.

- *Staff: The explanations are published in the Bay Act documentation. Staff will send out to the TAC.*

TAC Q – Are all efficiencies in the VAST model?

- *Staff: They will be in the next iteration.*

Alan Brewer reviewed the implementation potential of each BMP (in accord with handout dated 11-14-12). *[Note that while the nine TAC members present reached full consensus on various adjustments to the rankings of implementation potential, the committee was one member short of a quorum needed for formal action]*

Discussion of Ag BMPs 1-4

1-Commodity Cover Crop Early Drilled Wheat: Good
2-Conservation Tillage: Good
3-Cover Crop Early Drilled Wheat: Good
4-Cover Crop Standard Drilled Wheat: Good

TAC Q1 – Are all agricultural BMPs no-till? (items 1 thru 4)

- *Staff: We believe so. We will footnote this for clarity.*

TAC Q2 – Weather conditions will sometimes determine the choice of agricultural BMPs.

TAC Q3 – Are all agricultural BMPs voluntary?

- *Staff and TAC: Yes, for now, by and large.*

TAC Q4 – Are all percentages accurate?

- *Staff: Data is from the Agricultural Census.*

TAC Q5 – Should we use small grain instead of wheat?

- *Staff: We should probably deal with this issue when we discuss the scenarios.*

TAC Q6 – What does "good" potential mean?

- *Staff: It doesn't address how widely it is used or how much land it is applied to, but rather merely how much potential for effectiveness it has where it is implemented.*

TAC Q7 – Septic denitrification will be a regulatory driver (2014 law)

- *Staff: Should* denitrification be rated "fair" instead of "low"?
- *TAC: Consensus to leave rating as is.*

TAC Q8 – Use "widely accepted practice" rather than "widespread use.

TAC: Ag BMPs 1 – 4 –TAC consensus to accept as shown.

Discussion of Ag BMPs 5-8

5-Enhanced Nutrient Management: Good
6-Nutrient Management: Good
7-Prescribed Grazing: Good
8-Soil conservation/water quality plans: Good

TAC Q9 – Overgrazed horse pasture is a common problem, therefor "Prescribed Grazing" has good potential.

TAC: Ag BMPs 5 – 8 – TAC consensus to accept as shown.

Discussion of Ag BMPs 9-14

9-Barnyard Runoff Control: Fair
10-Decision Agriculture: Fair
11-Grass Buffers; Vegetated Open Channel: Fair
12-Irrigation Water Capture Reuse: Fair
13-Non-Urban Stream Restoration: Fair
14-Stream Access Control with Fencing: Fair

TAC: consensus to change #11 "Grass Buffers; Vegetated Open Channel" from Fair to Good.

Discussion of Ag BMPs 15-19

15-Forest Buffers: Low
16-Land Retirement to hay without nutrients: Low
17-Streamside Grass Buffers: Low
18-Tree Planting: Low
19-Wetland Restoration: Low

TAC: consensus to change #15 "Forest Buffers" and 17 "Streamside Grass Buffers" from Low to Fair. (This is a provisional decision pending more data and further consideration)

TAC Q10 – What about vineyards and orchards. Research these for potential credit.

Discussion of Septic BMPs 1-3

1- Septic Pumpout: Good
2- Septic Connection: Fair
3- Septic Denitrification: Low

The TAC had reviewed these BMPs earlier in the meeting when Alan Brewer used them as examples of how the ratings were made.

TAC: Septic BMPs 1 – 3 – TAC consensus to accept as shown.

Discussion of Urban BMPs 1-10

1-Erosion & Sediment Control: Good
2-Urban Nutrient Management: Good
3-Dry Extended Detention Ponds: Fair
4-Dry Detention & Hydrodynamic Structures: Low
5-Impervious Surface Reduction: Low
6-Street Sweeping: Low
7-Urban Filtering Practices: Low
8-Urban Infiltration Practices: Low
9-Urban Stream Restoration: Low
10-Wet Ponds & Wetlands: Low

TAC Q11 – Add "Urban Tree Planting" BMP (create a forest) to the list and give it "fair" potential.

TAC: consensus to add the urban BMP "Urban Tree Planting: Fair"

TAC: consensus to change Dry Extended Detention Ponds from "fair" to "good"

TAC: consensus to change Street Sweeping from "low" to "good"

TAC: consensus to change Urban Filtering Practices from "low" to "fair"

TAC: consensus to change Urban Stream Restoration from "low" to "fair" with an explanation of the issue of cost vs. risk and the importance of the quality of designs (the fact that the restoration has to be resilient to floods)

5. Review Expectations for Upcoming Meetings.

At the next meeting (December 3), the staff will bring refined cost assumptions and other research requested at the previous TAC meeting and work with the TAC toward final consensus on cost assumptions. At subsequent meetings, the TAC will explore the Loudoun Scenario.

The TAC asked if it could be provided a map or a table of "regulated" vs. "unregulated" areas of the County, by pervious and impervious surfaces. The staff indicated it could provide this data in tabular form.

6. Adjourn

The Co-Chairs adjourned the meeting at 6:05 pm.

NOTE: The next TAC meeting will be Monday, December 3

Notes from Sixth Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

Monday, December 3, 2012

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chairs Alan Brewer and Mike Rolband opened the meeting at 4:05 pm.

2. Review Procedural Issues

Milton Herd asked for any procedural issues that had emerged from the group. There were none. He noted the unusual situation existing today in which Charlie Mumaw is present serving as an alternate to both Amy Wyks and Bill Ackman. Milt suggested a "default" protocol that allowed Charlie to assume two representations, county as two people toward a quorum and two voting rights. None of the TAC members expressed any disagreement with that proposition.

Co-Chair Mike Rolband provided an update on the wastewater credit issue, saying that the state is taking credit for unused wastewater capacity, but its policy has changed and therefore localities are not accountable for the state's loading numbers. Thus, localities don't have to concern themselves with what wastewater treatment plants are doing, in terms of WIP requirements.

3. Present and Discuss Revised Cost Assumptions for BMPs

Staff briefly reviewed the updated BMP cost data it had provided to the TAC, based on its work in response to previous discussions. The TAC raised issues and asked questions regarding specific BMP costs for which they still had concerns.

TAC Q – Non-Urban Stream Restoration – per acre cost?

- *Staff: We will make the numbers consistent – linear feet vs. per acre.*

TAC Q – Prescribed Grazing – concern about how fencing would affect calculations

- *Staff: We assumed fencing was present.*
- *After some discussion later in the meeting, TAC reached consensus to use three times the cost shown.*

TAC Q – Urban Stream Restoration – should have estimated annual cost

- *Mike Rolband volunteered to provide current cost numbers.*

TAC Q – Need to separate impervious surface reduction and pervious concrete/asphalt because the model treats these differently.

- *Staff: We will adjust to match the model.*
- *TAC discussed taking out $50K for pervious surface construction. Staff will check this amount and for asphalt as well.*

[The TAC reached a quorum at this time]

TAC Q – Sometimes there is no land cost for urban reforestation (tree-planting)

- *Staff: We assumed some land cost in accord with the Maryland study that Neely Law provided the TAC earlier.*
- *TAC suggested using 30% of land cost, and after some discussion reached a consensus to break the cost into three categories: with easement purchase, with full land purchase, or with no land purchase. Staff will follow up.*

TAC Q – Dry Pond (new pond) – Often less than a full acre is needed which would lower the cost assumption shown.

TAC Q – Stream Restoration – similar concerns.

- *After some discussion, TAC reached consensus to change to linear feet rather than per-acre cost for both of these BMPs (or itemize either way)*
- *Staff noted that ultimately, we'll calculate the cost per pound of load removed, for all BMPs.*

TAC Q – Septic Denitrification – it shows lower than Maryland's numbers.

- *TAC discussed why this might be, and whether it had to do with assuming replacement or rebuilt system, or new system, etc.*
- *Staff: We will double-check these costs with Mike Lynn.*

TAC Q – Add Widths for Buffers (from the model)

- *Staff: We will add to stream buffers and other BMPs as needed to give context.*

TAC Q – Extended Detention Dry Pond – why show land cost?

- *After some discussion, TAC reached a consensus to also break this cost into three categories: with easement purchase, with land purchase, or with no land purchase.*

TAC Q – Construction Cost for Dry Pond – new and retrofit.

- *After some discussion, TAC reached a consensus that new ponds would be shown as $25K for construction, and retrofits would be shown as $15K.*

TAC Q – Correct initial and annual costs for agricultural nutrient management plans and urban nutrient management plans and make them consistent.

- *TAC and Staff agreed.*

TAC Q – Use "small grain" for cover crop specification, rather than "wheat".

- *TAC and Staff agreed that staff would footnote the fact that wheat is used for the calculations for small grains.*

4. Affirm Consensus on Implementation Potential of BMPs

At the previous meeting, TAC had reached a consensus on various revisions to the rankings of the implementation potential for BMPs, but was one member short of a quorum, so the revised set of rankings was offered for affirmed consensus and/or further discussion as needed.

TAC Q – Are we double-counting costs in the determination of Implementation Potential?

- *Staff described the approach as non-quantitative, in effect answering the question of "what would be easier to implement" in light of the various impediments? Cost was not an explicit factor.*
- *TAC suggested that a matrix would be helpful to show the various factors used in the rankings.*
- *Staff agreed to work on such a matrix, but felt it best to focus this coming week on the preparing the Loudoun Scenario for TAC review.*

TAC Q – Can we define "good, fair, and low" potential?

- *Staff noted that these are not quantitative determinations, and agreed to work on some definitions.*

TAC Q – Present these BMPs in the same sequence as with the list of BMPS used for cost assumptions.

- *Staff agreed.*

5. Review Expectations for Upcoming Meetings.

Staff had previously indicated that at the next meeting it would present the Loudoun scenario.

6. Adjourn

Co-Chair Mike Rolband thanked the staff for all of its work, noting that it was a lot of work in a short amount of time, and was much appreciated by the TAC members.

The Co-Chairs adjourned the meeting at 6:00 pm.

NOTE: The next TAC meeting will be Monday, December 10

Notes from Seventh Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

Monday, December 10, 2012

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chair Alan Brewer opened the meeting at 6:05 pm.

2. Review Any Procedural Issues

Milton Herd asked for any procedural issues that had emerged from the group and raised the general question as to how the TAC thought the process was going so far. The major question raised was in regard to what amount of credence would be put on the TAC's work at then end of its process, and what will the TAC say about it – how will the TAC characterize or describe its conclusions or recommendations? There was a sense among some members that this was a very rapid process and did not allow as thorough a review of the details as would be preferred. Milt suggested that time be allotted at the final meeting to craft appropriate language that accurately describes the nature of the TAC recommendations and what they signify to the members.

Milt then suggested three overarching questions for the TAC to try to answer as it moves toward conclusion of its work:

1. Is the presentation of the analysis, issues and scenario clear and understandable? (Especially for lay people, since the public and elected leaders will review this work closely)

2. Is the proposed combination of BMPs technically sound in terms of meeting the WIP goals?

3. Is the proposed combination of BMPS the "least cost" or "most cost effective" approach within the framework of WIP goals?

TAC members and staff were comfortable with keeping these questions in mind as general guideposts for the remaining work.

3. Present and Discuss Loudoun Scenario

Staff presented the draft Loudoun Local Scenario, including BMP levels of effort, acreage, load reductions, and annual cost per pound of removal. The TAC engaged in Q & A throughout the presentation. [Shortly after the staff presentation began, the TAC reached a quorum of 10 members present.]

TAC Q – What is the time frame?

- *Staff: Total acres needed by 2025 – this includes the 2009 progress credits*
- *Urban BMPs are listed twice to differentiate between regulated and unregulated areas – we will footnote this.*

TAC Q – Need to differentiate between existing and new tools/acreage and what all the acre numbers mean.

- *Staff: We will show 2009 progress numbers to contrast with future implementation needs.*

TAC Q – Where do the mining numbers come from?

- *Staff: Quarry* permit area, *not the actual area of land disturbance. Already considered in current calculations since quarries all possess VPDES permits, and are not included in the Bay Model as "insignificant dischargers" – so we consider it "done".*

TAC Q – What does "percentage" really mean?

- *Staff: It's the percent of acreage available, how much area is expected to use the BMP.*

TAC Q – Some agricultural techniques are difficult to check/monitor/enforce.

- *Staff: It's a plan for the next 13 years – so we need to identify the tools that need to be incentivized due to cost efficiency, enforcement issues, etc.*

TAC Q – The measure or test for the plan is whether BMPs are implemented, not actually getting the reductions, right?

- *Staff: Yes.*

TAC comment – If a BMP is a good method, we should do it, regardless of cost issue.

TAC comment – Please reproduce the color BMP summary chart with our numbers.

TAC comment – Clarify existing vs. new efforts/BMPs. Clarify the new vs. old and the current and future issues.

TAC Q – Where is urban tree planting?

- *Staff: we will add it.*

TAC Q – Why is urban filtering only 162 acres?

- *Staff: That's existing (high cost) Need to account for redevelopment for urban BMPs. What percentage of urban land will be redeveloped / retrofitted? We can defend a reasonable percentage number.*

TAC Q – How much latitude do we have in designating what areas are already developed, i.e. eastern Loudoun? All development in eastern Loudoun could be considered to be "redevelopment."

After substantial discussion, the TAC agreed by consensus to assume that 5% of land that is developed in the future will be considered as "redevelopment."

TAC comment – The Board of Supervisors will ask what these BMPs will cost per year, or permit cycle, coming up.

TAC comment – The County might want to emphasize the *staged implementation process* over the coming months and years – that this is really a *"strategic plan"*.

TAC Q – Why is the acreage for streamside forestation so small?

TAC comment – The BMPs that are shown as asterisks, outside of the bar graph, should be expressed in acres so they can be included along with the other BMPs in the bar graph.

- *Staff: We will show asterisk BMPs as acres.*

Co-Chair Alan Brewer noted that staff will make the agreed upon changes and refinements; if any member has other proposed changes in the coming days, submit them to staff within the next two weeks. [Any such proposals will be circulated via email for review and comment by the TAC].

4. Review Expectations for Upcoming Meetings.

TAC comment – Propose that we meet January 7 as scheduled, but come back one more time (January 14) for final review and sign-off.

TAC comment – We need to address the cost issues – total cost and allocation between individuals [private] and the taxpayers at large [public].

- *Staff: We can show total cost, but TAC the issue of cost allocations is more in the territory for the Stakeholders group and the Board to discuss. TAC can say this is*

what we think should be done, and can work on this more at the request of the Board of Supervisors.

- *There was then a discussion about the role of the Committee, and whether or not the TAC should recommend a particular cost allocation for the scenario. There was no consensus on this matter.*

The facilitator proposed that the TAC plan to conclude its work on January 7, but keep the January 14 date open just in case. He also suggested that time be allotted at the end of the agenda to craft a summary statement about the TAC's findings and what they mean and do not mean, so that all TAC members are comfortable with their results. No major objections were expressed to this proposal.

5. Adjourn

Co-Chair Alan Brewer adjourned the meeting at 6:10 pm.

NOTE: The next TAC meeting will be Monday, January 7, 2013.
The intent will be to conclude the TAC effort at this meeting.

Notes from Eighth Meeting of the Technical Advisory Committee (TAC)

In the Round Hill Room of the County Government Center

Monday, January 7, 2013

Prepared by Milt Herd, Facilitator

1. Welcome

Co-Chair Alan Brewer opened the meeting at 4:00 pm.

2. Update on SAC Process

Co-Chairs Alan Brewer and Mike Rolband gave a brief summary of the second Stakeholder Advisory Committee meeting held January 3. They said it went well, with Mike Rolband providing the Committee with an overview of what the TAC had done to date, and the staff providing a lot of information on the various BMPs. They said the SAC will have two more meetings, February 7 and March 7, to complete its review and comment on the Loudoun Scenario.

3. Review of Any Procedural Issues

Committee members had no procedural issues to raise. Milt reviewed the objectives of this final TAC meeting, which are:

1. To reach consensus on the components of the proposed Loudoun Scenario, particularly that:

    - The BMP cost estimates are reasonable and generally consistent with industry practice.
    - The BMP implementation effort is possible, based on available information.
    - Staff has incorporated the TAC recommendations for various adjustments to scenario components.

2. To reach consensus about what key points need to be included in a summary of the TAC's work, including such things as clarifications or disclaimers about the level of uncertainty in the data, etc.

3. Review the process of the WIP outreach effort going forward.

4. Present and Discuss Refinements to Draft Loudoun Scenario

Co-chair Alan Brewer opened the staff presentation by noting that the TAC input has made a significant difference in the quality and nature of the proposed Loudoun Scenario. Dennis

Cumbie presented a summary of the latest draft of the Scenario components, as distributed to the TAC members in advance of the meeting.

Shortly after Dennis began his presentation, a quorum of the TAC was achieved.

TAC Q – Can we include costs beyond the year 2025?

- *Staff: Yes, we can add that in the final version.*

TAC Q – Are there any BMPs that target only sediment – in order to zero out all pollutants?

- *Staff: very few.*

TAC Q – We should show the total amount of N and P removed from each sector as part of the conclusion, in addition to the dollar value.

- *Staff: Yes, we can do that.*

TAC Q – Dry detention ponds – how were these calculated in terms of removal of N, P, and S [nitrogen, phosphorous, and sediment]?

- *Staff: The levels of removal shown for 2009 is like a separate scenario – it shows we've already exceeded our goals in some areas.*

TAC Q – It's odd that there's such a close balance between the Agricultural and Urban sectors. Did this just happen, or was this a target?

- *Staff: This just happened – it was a result of seeking cost effectiveness.*

TAC Q – Could total costs be less by doing more in the Ag sector?

- *Staff: The scenario is based on input from Soil and Water Conservation District, Virginia Cooperative Extension, the TAC, and others concerning the feasibility for the level of effort in each of the Sectors including the ag sector.*

TAC Q – Thus, this is just one possible viable scenario, right?

- *Staff: As long as background data on BMP costs is good , we can use that and we can test or show other combinations of BMP implementation for comparison purposes.*

TAC Q – If you would assume 100% agricultural implementation, then the "delta" is how much money you have to work with to incentivize the ag sector, which would show the theoretical "least cost" scenario (although unrealistic for implementation).

TAC Q – Nutrient management plans in Loudoun won't actually be as effective as the model shows, because in Loudoun they will sometimes call for more nutrients than are currently applied.

- *Staff: We could show dollars per pound by sector for P, N and S for the policy-makers to consider – it would be a de facto "alternate scenario"*

TAC Q – As each year goes by, practices can be adjusted based on experience – this scenario is a starting point and will be continually updated.

*The **TAC agreed** to include this idea in its final summary.*

TAC Q – We are not saying "this scenario is the best one"; rather, we're saying we're comfortable with the numbers. The policy makers will have to choose the percentage of each BMP.

*The **TAC agreed** to include this idea in its final summary.*

- *Staff: We will also **add a disclaimer** that all of these calculations are based on the current VAST model as of "x" date.*

TAC Q – The "3,000 linear feet" for stream restoration – does that reflect us putting our resources where our problems are? It seems like a low number and may falsely signal that we don't have an issue there.

- *Staff: It went up from 1,500 feet from the previous iteration, based on TAC input.*

*The TAC then discussed this and related issues, and **TAC agreed** to note that the scenario is aimed at meeting the requirements set by the state for the WIP, and not necessarily doing the specific things we might like to do as a locality.*

*The **TAC agreed** that a general note should be added that this scenario is based on current (low) model rates and credits, and could be raised with new model numbers We should show the potential effect on cost-efficiency if credits were to change – example is urban stream restoration.*

TAC Q – Will the Stakeholders Committee and the public recognize the benefits of these BMPs and the money spent for them?

TAC Q – We need to add a disclaimer on the implementation potential table.

- *Staff: We will send out the "maximum" alternative scenario for TAC feedback as a follow up.*

TAC Q – We're called a "Technical Advisory Committee" but we're really just commenting on broad ideas – our name implies an exact answer, but we've been reactive.

*The **TAC agreed** that a note about the nature of its work in reviewing the data should be included in a final summary – that it was indeed reactive, based on available information, and in full acknowledgement of the uncertainties inherent in the model and the available data.*

TAC Q – All of the numbers in all the tables and charts should be rounded off so that it doesn't imply that the figures are more precise than they actually are.

*The **TAC and staff agreed** to this.*

*Asked for any additional questions or concerns as to the consensus targets stated at the beginning of the meeting, **no objections were raised by the TAC, provided that** the various refinements and disclaimers noted here are included in the final summary of the TAC work to date.*

TAC Q – The staff has done a great job providing good data in a timely manner; and Milt has done a great job in keeping our discussions moving.

5. Review Expectations for Next Steps.

Staff indicated the following expected schedule for the work products of this process:

- Staff will compile summary report on TAC work and distribute digitally to TAC for any corrective comments
- Stakeholders Advisory Committee will meet two more times (February 7 and March 7)
- Scenario and Strategies will go to the Board of Supervisors' Transportation and Land Use Committee for review
- Scenario and Strategies will then be shared with the public at community meetings
- Scenario and Strategies will be amended based on community input
- Scenario and Strategies will then go back to the TAC and SAC for final comment prior to going to the Board for approval.
- TAC will see an amended Scenario and Strategies in the June/July time frame.

6. Adjourn

Co-Chair Alan Brewer thanked all the TAC members for giving their time and expertise to this important effort.

Co-Chairs Alan and Mike adjourned the meeting at 5:30 pm.

ATTACHMENT 3

Phase II WIP Stakeholder Committee Summary and Recommendations 3/11/2013

Stakeholder Committee affirmations at the March 7, 2013 meeting (a quorum was not present):

Loudoun Scenario

- The Stakeholder Committee (Committee) accepted the revised Loudoun Scenario presented at the March 7, 2013 meeting. This scenario reflected the modifications recommended by the Committee.

- As requested by the Committee, the level of effort for the Best Management Practices (BMPs) associated with re-development in the Loudoun Scenario was reduced to reflect a minimal level of effort through 2025.

- As requested by the Committee, the Loudoun Scenario was modified to include a level of effort for Tree Planting and Urban Tree Planting that could be accomplished by volunteers, citizen groups, and other organizations outside of the government.

Recommendations

- The County should encourage and support programs, initiatives, and pilot projects that support the water quality improvement efforts of the Chesapeake Bay TMDL, including:
    - An education and outreach program
    - Demonstration projects
    - A program to identify and remove barriers to BMP Implementation
    - Recognition and award programs
    - Facilitation of conservation projects

- The County should request that Virginia develop a system that makes it possible for smaller volunteer and community efforts to be accounted for and tracked.

- The County should collaborate with other localities to request that the Virginia and federal governments significantly increase cost share funding to localities.

- The County should pursue partnerships with private industry for grants and other programs for cost share funding.

Stakeholder Committee affirmations at the February 7, 2013 meeting (a quorum was present):

Recommendations

- The County should coordinate and disseminate information to the public on the Chesapeake Bay TMDL including the role of the community, impacts to the community, and the importance of local efforts to improve the water quality of the Chesapeake Bay and local streams.

- The County should institute or expand reward and recognition programs for those who are leading efforts to improve water quality, especially targeting key groups such as Homeowners Associations, contractors, and farmers.

- The County should seek out partners and coordinate efforts to have additional BMPs approved by the EPA.

- The County should explore coordination with other water quality improvement efforts that are related to the Chesapeake Bay TMDL.

- The County should make efforts to identify and report all Chesapeake Bay TMDL BMPs in the County.

- The County should incentivize cost-effective BMPs to increase implementation efforts. In addition, the County should consider tax exemptions to increase BMP implementation efforts.

Total Cost Estimation for BMP Implementation: Loudoun Scenario SAC Version DRAFT:

BMP Name	BMP (%)	Effort Due to WIP	Sector	Landuse	Model Input (acres)	2009 Progress Input (acres)	Nitrogen reduction lbs/acre/yr	Phosphorus reduction lbs/acre/yr	Sediment reduction lbs/acre/yr	BMP Goal (acres)*	Capital Costs per acre	Annual Costs per acre	Additional cost for implementation
Enhanced Nutrient Management Eff.	50	Yes	agriculture	Crop land , non-NM	19,904	0	2.17	0.09	0.00	19888.99	$0	$5	$700,000
Nutrient Management Eff.	50	Yes	agriculture	pasture	38,679	1678.81	0.69	0.08	0.01	36999.7	$0	$5	$1,290,000
Soil Cons. and Water Quality Plans	72	Yes	agriculture	pasture	76,076	21213.79	0.40	0.06	32.00	54862.09	$0	$7	$2,500,000
Commodity Cover Crop Small Grain	22	n/a	agriculture	lowtill with manure	1444.1	292.19	4.70	0.00	0.00	1151.91	$0	$0	$0
Conservation Tillage	93	Yes	agriculture	hightill with manure	4463.78	0	1.40	0.00	192.00	4463.78	$0	$145	$4,530,000
Cover Crop Early Small Grain	16	No	agriculture	lowtill with manure	768	205.81	7.64	0.06	38.77	562.19	$0	$110	$430,000
Cover Crop Other Small Grain	20	No	agriculture		960	205.81	7.64	0.06	38.77	754.19	$0	$110	$580,000
Cover Crop Standard Small Grain	20	No	agriculture	lowtill with manure	960	590.39	7.64	0.06	38.77	369.61	$0	$110	$280,000
Decision Agriculture Efficiency	0	Yes	agriculture	Crop land , non-NM	0	0	1.58	0.09	0.00	0	$13	$0	$0
Horse Pasture Management	29	Yes	agriculture	pasture	10885.2	0	0.00	0.16	71.40	10885.2	$188	$19	$3,490,000
Prescribed Grazing	53	Yes	agriculture	pasture	19623.53	6871.4	0.84	0.19	53.55	12752.13	$167	$13	$3,290,000
Forest Buffers	0.44	Yes	agriculture	Agricultual - all	469	101.36	34.90	1.57	638.54	367.64	$7,000	$520	$3,910,000
Grass Buffers; Veg. Open Channel	14	Yes	agriculture	Agricultual - all	12401	399.69	29.19	1.12	289.59	12001.31	$240	$563	$50,180,000
Land Retirement to hay w/o nutr.	20	Yes	agriculture	pasture	10982	8796.16	9.37	0.86	216.93	2085.84	$0	$563	$8,220,000
Streamside Forest Buffers	20	Yes	agriculture	hay without nutrients	1094.86	340	21.26	1.15	529.04	754.86	$7,000	$260	$6,660,000
Streamside Grass Buffers	80	Yes	agriculture	degraded riparian pasture	1370	1238.02	126.50	11.80	3237.64	131.98	$240	$390	$390,000
Barnyard Runoff Control	57	Yes	agriculture	animal feeding operations	168	19.65	80.30	11.08	731.00	148.35	$36,333	$727	$6,140,000
Irrigation Water Capture Reuse	48	Yes	agriculture	nursery	127	0	346.42	94.44	0.00	127	$8,570	$385	$1,430,000
Non Urban Stream Restoration**		Yes	agriculture	degraded riparian pasture	7000	0	0.20	0.07	310.00	7000	$250	$1	$1,780,000
Off Stream Watering w/o Fencing	4	Yes	agriculture	pasture	1453.76	8.99	0.38	0.06	14.80	1444.77	$1,100	$33	$1,920,000
Stream Access Control w/ Fencing	41	Yes	agriculture	degraded riparian pasture	1179	364.38	105.86	11.18	2546.90	834.62	$9,960	$1,187	$15,250,000
Tree Planting	0.58	Yes	agriculture	pasture	1231	1129.94	7.62	0.92	299.00	100	$7,000	$520	$1,060,000
Wetland Restoration	0.13	Yes	agriculture	Agricultual - all	134	0	10.67	1.09	327.37	134	$60,000	$520	$8,530,000
Erosion and Sediment Control	100	n/a	urban	regulated construction	2039.85	2039.85	14.06	3.91	3214.00	0	$0	$0	$0
Street Sweeping acres	2.2	Yes	urban	regulated impervious develop	290	23.14	0.63	0.06	79.10	266.86	$0	$1,045	$1,950,000
Urban Nutrient Management (Nr)	63	Yes	urban	nonregulated pervious develo	18161	2042.64	2.63	0.12	0.00	16118.36	$20	$0	$320,000
Urban Nutrient Management (reg)	72	Yes	urban	regulated pervious developed	15417	1708.19	2.63	0.12	0.00	13708.81	$20	$0	$270,000
Impervious Surface Reduction (no replacement)	0.5	No	urban	regulated impervious develop	33	0	8.40	1.59	748.00	40	$90,000	$0	$3,600,000
Urban Stream Restoration**		Yes	urban	nonregulated pervious develo	3600	0	0.20	0.07	310.00	3600	$500	$5	$1,930,000
Urban Tree Planting (free land)	0.75	Yes	urban	Pervious urban-all	370	0	8.63	0.55	248.79	370	$0	$400	$1,040,000
Urban Tree Planting (easement)	0.25	Yes	urban	Pervious urban-all	70.1	0	8.63	0.55	248.79	70.1	$40,000	$400	$3,000,000
Dry Detention Ponds and Hydro Str (NR)	4	n/a	urban	nonregulated developed	1328.89	1334.22	0.82	0.10	45.30	0	$16,800	$120	$0
Dry Detention Ponds and Hydro Str (reg)	5	n/a	urban	regulated developed	1584.61	7206.35	0.82	0.10	45.30	0	$16,800	$120	$0
Dry Extended Detention Ponds (Retrofit)	9	n/a	urban	nonregulated developed	3365.7	3428.27	3.28	0.21	271.78	0	$8,400	$120	$0
Dry Extended Detention Ponds (Retrofit)	26	Yes	urban	regulated developed	7875	3940.52	3.28	0.21	271.78	3934.48	$8,400	$120	$36,350,000
Urban Filtering Practices (Cartridge Filters)	0.1	No	urban	regulated developed	343	165.84	6.55	0.62	362.37	194.16	$19,500	$800	$4,870,000
Urban Filtering Practices (Sand Filters)	0.01	n/a	urban	nonregulated developed	3.64	171.81	6.55	0.62	362.37	0	$29,000	$1,500	$0
Urban Infiltration Practices - (Nr)	0.00	n/a	urban	nonregulated developed	0	0	13.92	0.87	430.32	0	$0	$0	$0
Urban Infiltration Practices - (reg)	0.00	n/a	urban	regulated developed	0	0	13.92	0.87	430.32	0	$0	$0	$0
Urban Infiltration Practices-AB soils	0.0	n/a	urban	nonregulated developed	0	0	13.92	0.87	430.32	0	$0	$6,115	$0
Wet Ponds and Wetlands (Nr)	26	n/a	urban	nonregulated developed	9451.49	9493.07	3.28	0.46	271.78	0	$13,556	$44	$0
Wet Ponds and Wetlands (reg)	68	n/a	urban	regulated developed	18875.82	18941.33	3.28	0.46	271.78	0	$13,556	$44	$0
Septic Connection***	0.27	No	septic	systems	46	0	9.19	0.00	0.00	46	$48,000	$414	$2,340,000
Septic Denitrification***	0.36	No	septic	systems	59	0	4.59	0.00	0.00	59	$13,500	$200	$880,000
Septic Pumping***	18	No	septic	systems	2753	0	0.46	0.00	0.00	2753	$0	$60	$1,160,000
Abandoned Mine Reclamation	99	n/a	urban	regulated extractive	1434	0.77	2.80	0.60	480.40	1433.23	$0	$0	$0
Forest Harvesting Practices	28	n/a	forest	harvested forest	418.31	418.31	23.42	0.67	525.13	0	$0	$0	$0
													$180,270,000

Sector	Total Cost of Implementation	
agriculture	$122,560,000	
urban	$53,330,000	
septic	$4,380,000	
	$180,270,000	**Total**

N Excess (lbs)	P Excess (lbs)	S Excess (lbs)
6	47,504	7,755,100

Total Costs Due to WIP	Total Costs w/o WIP
$166,130,000	$14,140,000

$180,270,000

* A negative number indicates that the number of acres treated currently exceeds the level of effort required.

***Model input in number of systems

**Model input in Linear Feet

Total Cost Estimation for BMP Implementation: Loudoun Scenario with SAC Input (03/04/2013) :

		Costs Due to WIP				***Costs Without WIP***			
BMP Name	Additional cost for implementation	Cost Share portion	Loss of Production portion	Local Govt. Funding portion	Unknown Portion	Cost Share Portion	Local Govt. Funding Portion	Unknown Portion	Comments
Enhanced Nutrient Management Eff.	$700,000	$510,000	$0	$190,000	$0	$0	$0	$0	All costs are assumed to be borne by local government for the equivalent of 2 full time employees
Nutrient Management Eff.	$1,290,000	$469,000	$0	$821,000	$0	$0	$0	$0	required to write plans (estimated by County Extension). Some costs will be offset by
Soil Cons. and Water Quality Plans	$2,500,000	$1,545,140	$0	$954,860	$0	$0	$0	$0	cost share available through SWCD.
Commodity Cover Crop Small Grain	$0	$0	$0	$0	$0	$0	$0	$0	Commodity Cover Crops have no net costs.
Conservation Tillage	$4,530,000	$1,590,000	$0	$0	$2,940,000	$0	$0	$0	All Conservation Tillage Due to WIP, with some cost share, burden of other costs unknown.
Cover Crop Early Small Grain	$430,000	$0	$0	$0	$0	$100,000	$0	$330,000	All Cover Crops considered Not Due to WIP, as WIP effort level already exists. Some cost share, burden of other costs unknown.
Cover Crop Other Small Grain	$580,000	$0	$0	$0	$0	$130,000	$0	$450,000	All Cover Crops considered Not Due to WIP, as WIP effort level already exists. Some cost share, burden of other costs unknown.
Cover Crop Standard Small Grain	$280,000	$0	$0	$0	$0	$60,000	$0	$220,000	All Cover Crops considered Not Due to WIP, as WIP effort level already exists. Some cost share, burden of other costs unknown.
Decision Agriculture Efficiency	$0	$0	$0	$0	$0	$0	$0	$0	Decision Agriculture considered Due to WIP. No cost share available, burden of other costs unknown.
Horse Pasture Management	$3,490,000	$0	$0	$0	$3,490,000	$0	$0	$0	These practices would be due to the WIP process, burden of the costs unknown.
Prescribed Grazing	$3,290,000	$0	$0	$0	$3,290,000	$0	$0	$0	
Forest Buffers	$3,910,000	$0	$1,600,000	$0	$2,310,000	$0	$0	$0	Burden of capital costs are unkown. Annual costs are loss of production costs.
Grass Buffers; Veg. Open Channel	$50,180,000	$2,100,000	$48,080,000		$0	$0	$0	$0	All costs are due to loss of production, with some costs offset by cost share program.
Land Retirement to hay w/o nutr.	$8,220,000	$0	$8,220,000	$0	$0	$0	$0	$0	All costs are due to loss of production, with no cost share available.
Streamside Forest Buffers	$6,660,000	$150,000	$1,370,000	$0	$5,140,000	$0	$0	$0	Burden of capital costs is unkown. Annual costs are loss of production costs. Some costs are offset by cost share.
Streamside Grass Buffers	$390,000	$20,000	$360,000	$0	$10,000	$0	$0	$0	Burden of capital costs is unkown. Annual costs are loss of production costs. Some costs are offset by cost share.
Barnyard Runoff Control	$6,140,000	$0	$0	$0	$6,140,000	$0	$0	$0	Burden of all costs is unknown.
Irrigation Water Capture Reuse	$1,430,000	$0	$0	$0	$1,430,000	$0	$0	$0	Burden costs is unknown.
Non Urban Stream Restoration	$1,780,000	$0	$30,000	$0	$1,750,000	$0	$0	$0	Burden of capital costs is unknown. Annual costs are loss of production costs.
Off Stream Watering w/o Fencing	$1,920,000	$140,000	$0	$0	$1,780,000	$0	$0	$0	Burden of all costs is unknown. Some costs offset by cost share.
Stream Access Control w/ Fencing	$15,250,000	$7,632,500	$3,807,500	$0	$3,810,000	$0	$0	$0	Burden of capital costs is unknown. Annual costs are loss of production costs. Some costs are offset by cost share.
Tree Planting	$1,060,000	$25,000	$0	$0	$1,035,000	$0	$0	$0	Burden of all costs is unknown. Some costs offset by cost share.
Wetland Restoration	$8,530,000	$0	$310,000	$0	$8,220,000	$0	$0	$0	Burden of capital costs is unknown. Annual costs are loss of production costs.
Erosion and Sediment Control	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this BMP is mandated by the State and the local Zoning Ordinance.
Street Sweeping acres	$1,950,000	$0	$0	$1,950,000	$0	$0	$0	$0	All costs would be borne by local government.
Urban Nutrient Management (Nr)	$320,000	$0	$0	$0	$320,000	$0	$0	$0	Burden of all costs is unknown, but will include local government.
Urban Nutrient Management (reg)	$270,000	$0	$0	$0	$270,000	$0	$0	$0	Burden of all costs is unknown, but will include local government.
Impervious Surface Reduction (no replacement)	$3,600,000	$0	$0	$0	$0	$0	$0	$3,600,000	This BMP represents reductions that will be required for any future redevelpment projects, paid for by the project developer.
Urban Stream Restoration	$1,930,000	$0	$0	$0	$1,930,000	$0	$0	$0	All costs are Due to WIP. Costs may be paid for by local government, grants, volunteer efforts, property owners or developers.
Urban Tree Planting (free land)	$1,040,000	$0	$0	$0	$1,040,000	$0	$0	$0	All costs are Due to WIP. Costs may be paid for by local government, grants, volunteer efforts, property owners or developers.
Urban Tree Planting (easement)	$3,000,000	$0	$0	$0	$3,000,000	$0	$0	$0	All costs are Due to WIP. Costs may be paid for by local government, grants, volunteer efforts, property owners or developers.
Dry Detention Ponds and Hydro Str (NR)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Dry Detention Ponds and Hydro Str (reg)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Dry Extended Detention Ponds (Retrofit)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Dry Extended Detention Ponds (Retrofit)	$36,350,000	$0	$0	$36,350,000	$0	$0	$0	$0	These costs are borne by the County Government, and required to meet WIP reductions for the MS4 permit.
Urban Filtering Practices (Cartridge Filters)	$4,870,000	$0	$0	$0	$0	$0	$0	$4,870,000	Costs for additional reductions in anticipated redevelopment, most likely to be borne by the project developer.
Urban Filtering Practices (Sand Filters)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Urban Infiltration Practices - (Nr)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Urban Infiltration Practices - (reg)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Urban Infiltration Practices-AB soils	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Wet Ponds and Wetlands (Nr)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Wet Ponds and Wetlands (reg)	$0	$0	$0	$0	$0	$0	$0	$0	No additional costs, as this is not a BMP that will be used for future pollutant reductions in Loudoun.
Septic Connection	$2,340,000	$0	$0	$0	$0	$0	$0	$2,340,000	This BMP effort matches current trends in septic connections.
Septic Denitrification	$880,000	$0	$0	$0	$0	$0	$0	$880,000	This BMP effort matches current trends in septic denitrification systems.
Septic Pumping	$1,160,000	$0	$0	$0	$0	$0	$0	$1,160,000	Septic Pumpouts at this effort level are required by County code.
Abandoned Mine Reclamation	$0	$0	$0	$0	$0	$0	$0	$0	This BMP has no costs, as the County does not anticipate effort required to meet reduction goals.
Forest Harvesting Practices	$0	$0	$0	$0	$0	$0	$0	$0	This BMP has no costs, as the County does not anticipate effort required to meet reduction goals.
	$0	$14,181,640	$63,777,500	$40,265,860	$47,905,000	$290,000	$0	$13,850,000	
				Total:	$166,130,000		Total:	$14,140,000	
	$180,270,000						Total All:	$180,270,000	

Loudoun County VIRGINIA
WHERE TRADITION MEETS INNOVATION

Phase II
Watershed Implementation Plan Update

April 12, 2013

The WIP

(Watershed Implementation Plan)

Each contributing state was required to submit a plan

- Phase I WIP (2010)
  - Virginia's general plan for meeting the TMDL
- Phase II WIP (2012)
  - Virginia's plan for local involvement
  - Outreach and development of local plans
- Phase III WIP (2017)
  - Update of model input parameters
  - General reset of process

Phase II WIP

- Department of Conservation and Recreation (DCR) provides localities (Counties) with:
  - Targets for pollution reduction
  - Tool (VAST) to evaluate pollution reduction measures
- Localities to provide:
  - Updated land use and pollution control efforts data
  - Action plans, known as scenarios
    - Sectors - agriculture, urban stormwater, and septic systems
  - Strategies for implementation
  - Resource (financial) requirements for implementation

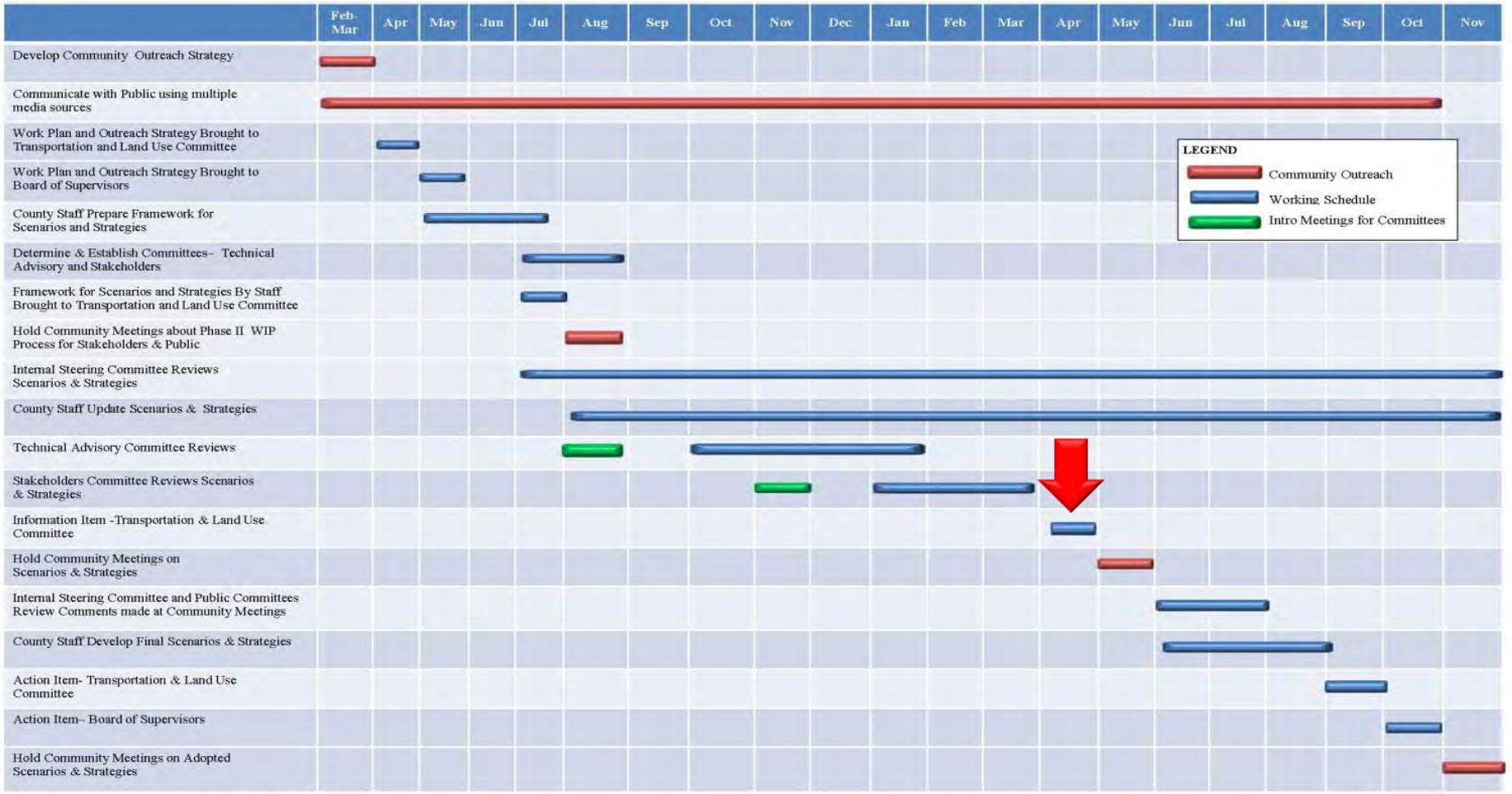
Loudoun Scenario

- Meet pollution reduction goals in the most reasonable and cost-effective manner
- Public Process
  - Technical Advisory Committee
  - Stakeholder Advisory Committee
  - Community Engagement

Loudoun County VIRGINIA
WHERE TRADITION MEETS INNOVATION

Loudoun Work Plan (Attachment 1)

PHASE II WIP COMMUNITY OUTREACH WORK PLAN FOR 2012– 2013*



* Work Plan updated based on process progress as of 1/3/2013.

Draft V

Best Management Practices

Combination of 37 BMP's on numerous land uses in 3 Sectors

- **Urban** – 11 BMP's
- **Agricultural** – 23 BMP's
- **Septic** – 3 BMP's

	Cost per Pound of Reduction			*Implementation Potential*	*Reduction Potential*		
Best Management Practice	**Nitrogen**	**Phosphorus**	**Sediment**		**Nitrogen**	**Phosphorus**	**Sediment**
AGRICULTURAL SECTOR							
Barnyard Runoff Control	Medium	Medium	Medium	Fair	Low	Low	Fair
Commodity Cover Crop Small Grain	Low	**NA**	**NA**	Good	Low	Low	**NA**
Conservation Tillage	Medium	**NA**	Low	Good	Fair	Fair	Good
URBAN SECTOR	**Nitrogen**	**Phosphorus**	**Sediment**		**Nitrogen**	**Phosphorus**	**Sediment**
Urban Nutrient Management	Low	Low	**NA**	Good	Good	Fair	**NA**
Abandoned Mine Reclamation	Low	Low	Low	Low	Fair	Fair	Good
Urban Filtering Practices (sand)	High	Medium	Medium	Fair	Good	Fair	Fair
SEPTIC SECTOR	**Nitrogen**	**Phosphorus**	**Sediment**		**Nitrogen**	**Phosphorus**	**Sediment**
Septic Connection	High	**NA**	**NA**	Fair	Fair	**NA**	**NA**
Septic Denitrification	Medium	**NA**	**NA**	Low	Low	**NA**	**NA**
Septic Pumpout	Medium	**NA**	**NA**	Good	Good	**NA**	**NA**

Examples from BMP Summary Matrix

The Loudoun Scenario:

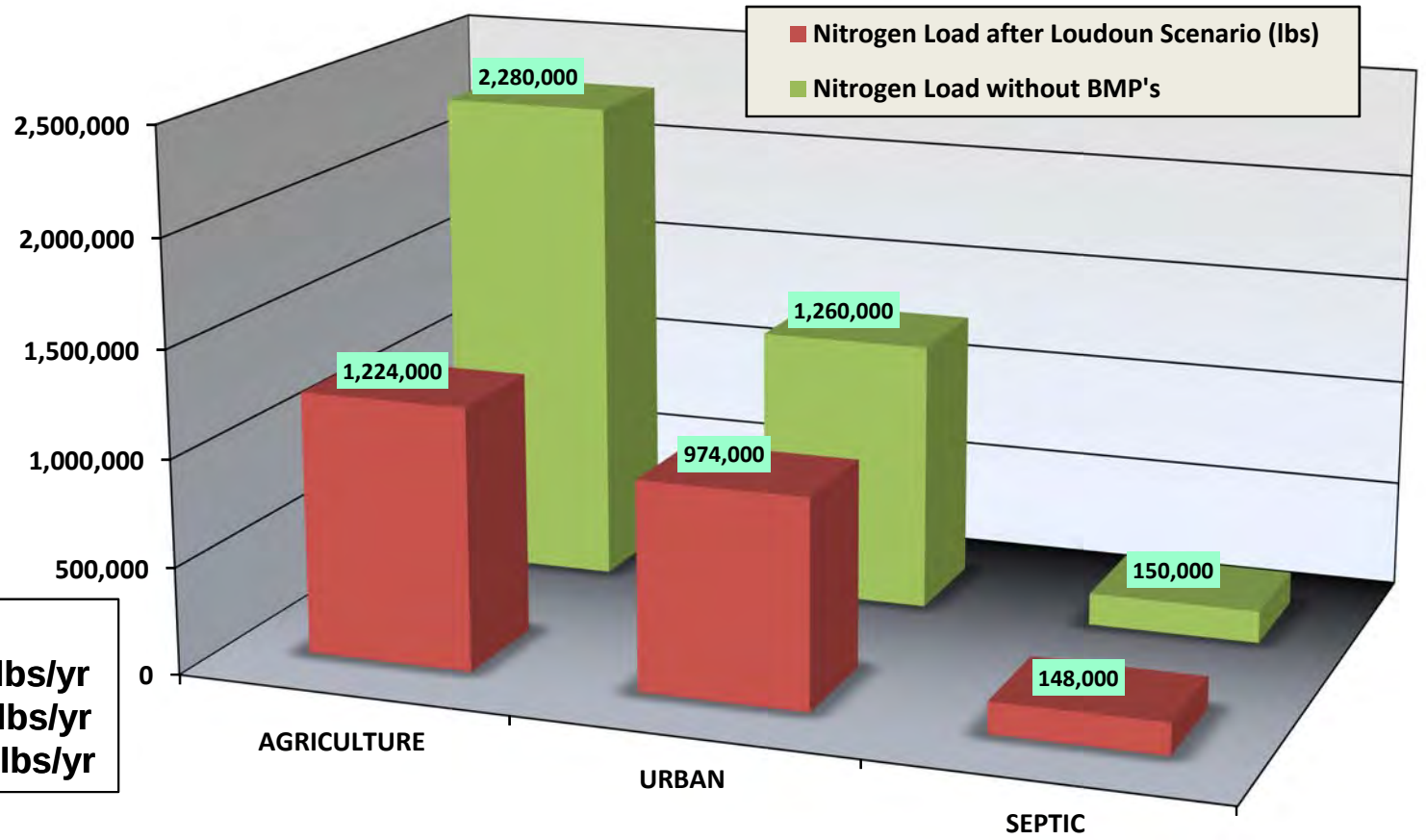
- Compilation of BMP's from three Sectors
- BMP Effort derived from criteria
  - Cost Per Pound Reduction
  - Implementation Potential
  - Reduction Potential
- Loaded into VAST
- Adjusted until Reduction Goals Achieved
- Costs calculated

EXAMPLE – Next Slide

BMP Name	% Effort	Sector	Model Input (acres)	2009 Progress Input (acres)	BMP Goal (acres)*	Capital Costs per acre	Annual Costs per acre	Additional cost for implementation
Barnyard Runoff Control	**57**	agriculture	168	20	150	$36,333	$727	$6,140,000
Commodity Cover Crop Small Grain	**22**	agriculture	1445	293	1152	$0	$0	$0
Prescribed Grazing	**53**	agriculture	19,600	6,900	12,800	$167	$13	$3,290,000
Enhanced Nutrient Management Eff.	**50**	agriculture	19,900	0	19,900	$0	$5	$700,000
Forest Buffers	**0.44**	agriculture	470	101	370	$7,000	$520	$3,910,000
Grass Buffers; Veg. Open Channel	**14**	agriculture	12,400	400	12,000	$240	$563	$50,180,000

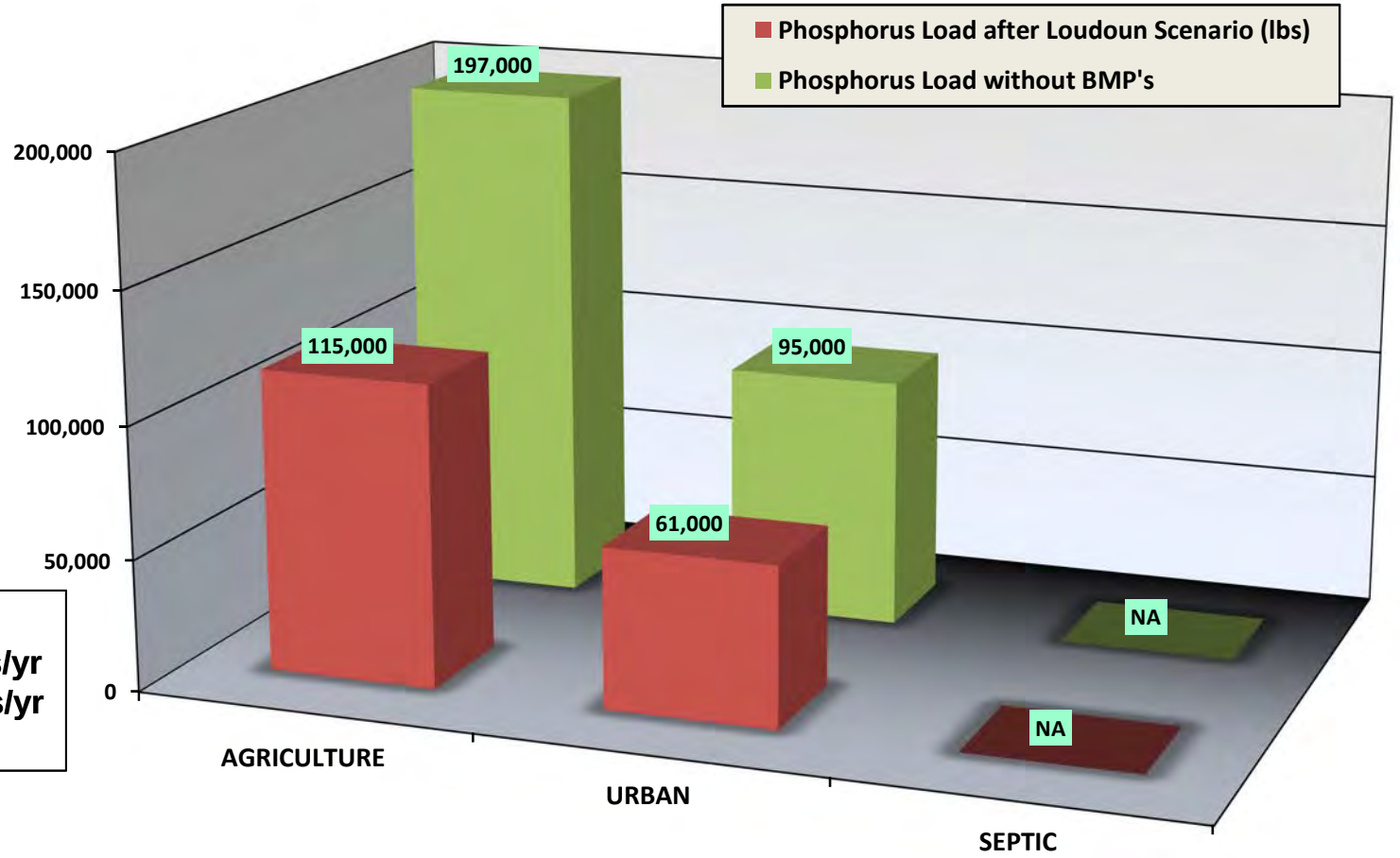
Enhanced Nutrient Management: Applied to land receiving nutrients.
Total Acres Available = 39,800 x 50% = 19,900 acres treated.

Nitrogen Loads – Loudoun Scenario:



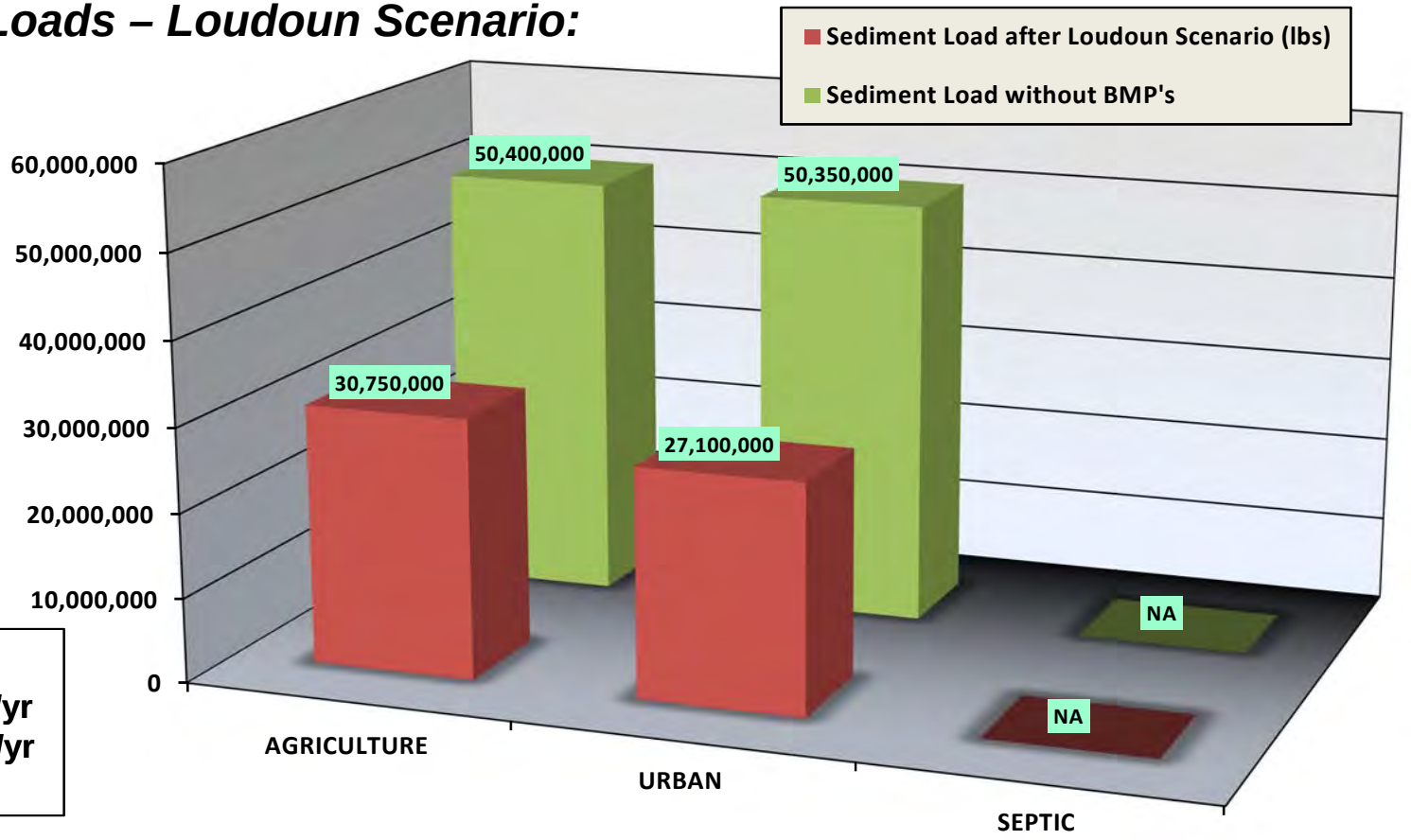
Reductions:
Agri. = 1,055,000 lbs/yr
Urban = 286,000 lbs/yr
Septic = 2,000 lbs/yr

Phosphorus Loads – Loudoun Scenario:



Reductions:
Agri. = 82,200 lbs/yr
Urban = 34,000 lbs/yr
Septic = N/A

Sediment Loads – Loudoun Scenario:



Reductions:
Agri. = 19.7 M lbs/yr
Urban = 23.3 M lbs/yr
Septic = N/A

Loudoun Scenario – Key Components

- Provides a vetted, reasonable and cost-effective scenario
- Includes no local mandates beyond what currently exists
- Accounts for new MS4 permit requirements
- Leverages existing programs and activities (cost share programs, volunteer and voluntary activities)
- Includes a significant level of effort in the area of agricultural resource management plans

Fiscal Impact

- $180 Million - Fiscal Impact
  - $14 Million – Regardless of the WIP
  - $166 Million –Due to the WIP
    - $14 Million – State and Federal Cost Share (Beyond Anticipated Level of Funding)
    - $40 Million – Funding by Local Governments
    - $48 Million - Undetermined Party
    - $64 Million - Potential Lost Production

Fiscal Impact Comparison

- $180 Million – Draft Loudoun Scenario
- $800 Million – Unsolicited Est. (Stormwater Only)
- $517 Million – DCR Potential Phase I WIP BMP Allocation

QUESTIONS?

From: [redacted]
To: Brewer, Alan
Subject: Support Clean Water in Loudoun
Date: Friday, May 10, 2013 11:00:00 AM

May 10, 2013
Environmental Program and Policy Administrator Alan Brewer

Dear Alan Brewer,

My family and I live on Dutchman's Creek in Lovettsville, just south of where it runs into the Potomac River. I see firsthand the way our beautiful waterways are being polluted, whether it's farm runoff that creates algae blooms, or actual films of chemicals on the surface from runoff.

I'm writing to you today to show my support for the County's plan to clean up Loudoun's streams and creeks. It's important for me and my family to live in a healthy environment. Voluntary measures by residents and businesses can make a big difference, but the County also needs to provide leadership and support to create a stewardship culture in Loudoun.

The County should implement its Phase II Watershed Improvement Plan, and incorporate the following additions:

-Provide an education and outreach program about the direct and indirect benefits of the proposed pollution reduction practices outlined in the plan.
-Install demonstration projects that show what's being proposed, how pollution will be reduced and the benefits to property owners.
-Create incentive, recognition and reward programs. Explore tax exemptions and other strategies to reward those who implement the practices.
-Facilitate conservation projects with county equipment and resources.
-Collaborate with other localities to request that State and Federal governments provide significant increases in cost-share funding.
-Pursue partnerships with private industry for grants, cost-share funding and material support.
-Encourage local businesses to take voluntary pollution reduction measures on their properties.
-The County should lead by example by implementing practical and innovative measures at county facilities -- including schools, transportation facilities, parks, and other public facilities.

These great ideas are going to take commitment and I urge the County to find creative funding and financing solutions needed to meet its objectives.

Please make this letter part of the public record.

Sincerely,

[redacted]