WICOMICO COUNTY
PHASE II WATERSHED IMPLEMENTATION PLAN

September 2012

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Wicomico County
Phase II WIP Technical Addendum

Introduction

A primary goal in the development of the Phase II Watershed Implementation Plan (WIP) is to identify viable recommendations to develop and implement programmatic actions. These actions are designed to improve water quality as a result of reducing the amount of nutrients and sediments from entering our waterways. This Phase II WIP contains discussions about the current pace of implementation, limitations of achieving the interim and final targets, technical addendum (loading decks and projected costs to achieve targets), as well as on-going and future endeavors of the Core Planning Team (hereby referred to as the Team).

In response to a request by the Maryland Department of the Environment (MDE), a planning team was assembled to lead this local planning effort. Membership consists of representatives from each of the municipal jurisdictions, Wicomico County Department of Public Works, Salisbury – Wicomico County Department of Planning, Zoning, & Community Development, Wicomico County Health Department, Wicomico County Agricultural Work Group, Wicomico County Board of Education, State Highway Administration, Non-Governmental Organization (Wicomico Environmental Trust), and the developer community. Since the initial State-sponsored kick-off meeting at Salisbury University on February 7, 2011, 10 Team meetings occurred, which included public meetings on July 21, 2011 and August 30, 2011. The efforts / progress of the Team are documented on their website. To learn more information about the activities of the Team, visit http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/WicomicoTeam.aspx.

To obtain an in-depth understanding about this planning effort, representatives of the Core Planning Team participated in numerous webinars, conferences, and training opportunities such as MDE webinars including: April 13, 2011; May 16, 2011; June 13, 2011; July 14, 2011; July 19, 2011; and October 13, 2011, as well as attended the Maryland Assessment Scenario Tool (MAST) training conducted by MDE on August 2, 2011. Given the magnitude of this planning effort related to the amount of background data (process and model based), it was imperative the team coordinated with the State, as well as surrounding counties, to obtain a clear and concise understanding of the anticipated deliverables associated with this task.

Purpose

As requested by MDE, each of the twenty-three counties and Baltimore City were instructed to prepare a Phase II Watershed Implementation Plan that details / demonstrates how each jurisdiction will do their part in improving the water quality of the Chesapeake Bay and its tributaries across Maryland. In doing so, MDE provided each County with existing nutrient loads (2010 progress), 2017 nutrient targets, and 2025 final targets for the following sectors:

- Individual septic systems;
- Urban run-off (Non-Regulated and Regulated);
- Waste water treatment plants;
- Agriculture; and
- Forest.

It is important to note for the purpose of this planning effort, the use of the term "County" within this document refers to a scale of geography utilized for this application and is **not intended to imply or suggest County regulatory or approval authority of this document or any content herein**. **This document was submitted to MDE by the Core Planning Team.**

The expectations of the State related to the preparation of local Phase II WIPs include the development of Two-Year milestones for 2012 and 2013, input decks generated in the Maryland Assessment Scenario Tool (MAST), and supporting narrative. The Team developed the Two-Year milestones in accordance with the guidance provided by MDE. These Two-Year milestones were submitted to the State liaison on September 12, 2011, for the purpose of receiving comments from MDE on the preliminary draft. The proposed Two-Year milestones are discussed throughout this document; however, the complete listing is located in *Appendix I*.

The milestones represent a variety of programmatic actions to be considered by the locally elected officials to assist in meeting the targeted allocations for septic, urban runoff, and waste water sectors. Moreover, the milestones emphasize the need for significant federal and State funding, as well as programmatic actions necessary to accomplish the nutrient reductions to meet the 2025 target. For example, State consideration to increase our annual funding levels for septic system upgrades as part of the Bay Restoration Fee (BRF) would increase the potential to meet the 2025 target for the septic sector. If implemented, this recommendation would provide the necessary funding to upgrade approximately 70 – 100 onsite individual septic systems per year to Nutrient Removal Technology / Best Available Technology (BAT). It is unlikely this goal could be achieved without an increased allocation to the existing program.

In a letter dated October 5, 2011, the Environmental Protection Agency (EPA) identified a substantive change in expectations of the local jurisdictions Phase II WIP submissions with regard to loading decks being incorporated within the Phase II WIP. Specifically, the local jurisdictions were informed to proceed with the preparation of a Phase II WIP that "does not expect the jurisdictions to express "local area targets" in terms of Phase 5.3.2 Watershed Model inputs or outputs, such as pounds of pollutant reductions by county." Furthermore, the letter stated "Instead, Phase II WIPs could identify "targets" or actions that local and federal partners would take to fulfill their contribution toward meeting the Chesapeake Bay TMDL allocations." Therefore, based on the most recent direction provided by the EPA, this Phase II WIP is consistent with the expectations of the federal and State government. This Plan contains dialogue regarding the opportunities and weaknesses associated with meeting the 2017 and 2025 targets for nutrient reductions.

A major undertaking in the development of this Phase II WIP is to identify viable recommendations that have a reasonable level of assurance of being implemented. Also, this Phase II WIP includes information related to the current pace of implementation, limitations of achieving the interim and final targets, loading decks designed to achieve the 2017 and 2025 targets, cost estimates based on the 2017 and 2025 loading decks meeting the nutrient targets, as well as on-going and future endeavors of the Core Planning Team.

I. Urban Sector

Background

This report serves as the County's Phase II WIP and includes the urban BMP strategies and cost estimates for Wicomico County and the City of Salisbury to achieve the 2017 and 2025 nutrient load reductions required by the Chesapeake Bay TMDL. The urban BMP strategies were developed as urban runoff loading decks using the Maryland Assessment and Scenario Tool (MAST). These strategies represent planning level efforts as opposed to an engineering grade report and have not been endorsed or adopted by any member jurisdiction. **Therefore, the loading decks were submitted by the County Core Planning Team for the purpose of identifying potential Best Management Practices (BMPs) for future consideration.**

The strategies reflected in the loading decks are based on discussions with the County Core Planning Team and limited spatial data analysis using Geographic Information Systems (ArcGIS 10). Additional analyses provided by watershed management plans and water restoration action reports are critical for identifying suitable locations for the proposed BMPs and to further refine the strategies. As a major component of the Two-Year milestones, the preparation of Watershed Management Plans for the Nanticoke, Wicomico, and Pocomoke Rivers has been recommended. At the time of this publication, the City of Salisbury was recently awarded a National Fish and Wildlife Foundation Grant to prepare a Watershed Management Plan for the Wicomico River watershed. Moreover, the Nanticoke Watershed Alliance is in the final stages of completing the Nanticoke River Watershed Management Plan. Funding opportunities need to be pursued to finance the Pocomoke River Watershed Management Plan. Upon completion, these plans will provide recommendations related to the preferred type and placement of BMPs designed to reduce Nitrogen contributions from stormwater runoff, which the proposed BMPs should be consistent with the loading decks for the urban runoff sector.

Upon the completion of detailed engineering grade studies, it is anticipated the loading decks contained in this Plan will be revised based on field and feasibility assessments instead of the broad planning level approach used by MAST to numerically reach the 2017 and 2025 urban sector nutrient targets. The cost estimates will also be further refined to represent the actual costs of implementation within Wicomico County rather the generic approach provided by King and Hagan Report (2011). In addition, the urban BMP strategies are based on the BMPs that are currently approved by the Maryland Department of the Environment (MDE) and the Chesapeake Bay Program (CBP).

Alternative strategies and revisions to the nutrient reduction efficiencies are continuously updated through the Urban Stormwater Work Group, which could substantially affect the final strategies and cost effectiveness.

Given the limitation of available funding necessary to meet the expectations, it is unlikely that any of the local jurisdictions within Maryland are capable of achieving the 2025 targets. At a minimum, the recommendations contained within this Plan need to be considered to minimize future contributions from this Sector.

Nutrient Targets & Implementation

The tables and bar charts in this section present the 2017 Interim and 2025 Final Nutrient Reduction Targets for the State's Phase II WIP and Bay TMDL goals. The required load reduction for the County was obtained from Maryland's WIP Phase II Target Load Summaries based on the Phase 5.3.2 Watershed Model. The 2025 target load for the County corresponds to the 2020 target load in the target load summaries document prepared by MDE. The summaries document uses the 2010 progress load as a starting point for determining the reductions required to meet the 2017 and 2025 nutrient reductions. Specifically, to determine the load reduction between 2010 and 2025, the 2025 target load was subtracted from the 2010 progress load for the non-regulated land use categories (Non-Regulated Impervious Developed, Non-Regulated Pervious Developed, and Non-Regulated Extractive) for the County and the Municipal Phase II MS 4 land use categories (impervious and pervious) for the City of Salisbury. The 2017 target load was calculated as 60% of the 2025 target load reduction.

Figure 1 provides the nutrient reduction targets in tabular format. The bar charts in **Figure 2** depict the strategy reduction information in a graphic format that presents the comparative progress from 2010 loads to the 2017 interim and 2025 final targets, as well as the strategies proposed for Wicomico County and the City of Salisbury. **Figure 3** provides a table comparing the interim and final strategy results for TN and TP for the City of Salisbury and Wicomico County. Finally, **Figures 4** and **5** provide the extent of BMPs included in the 2017 and 2025 implementation strategies in terms of the acres or units treated.

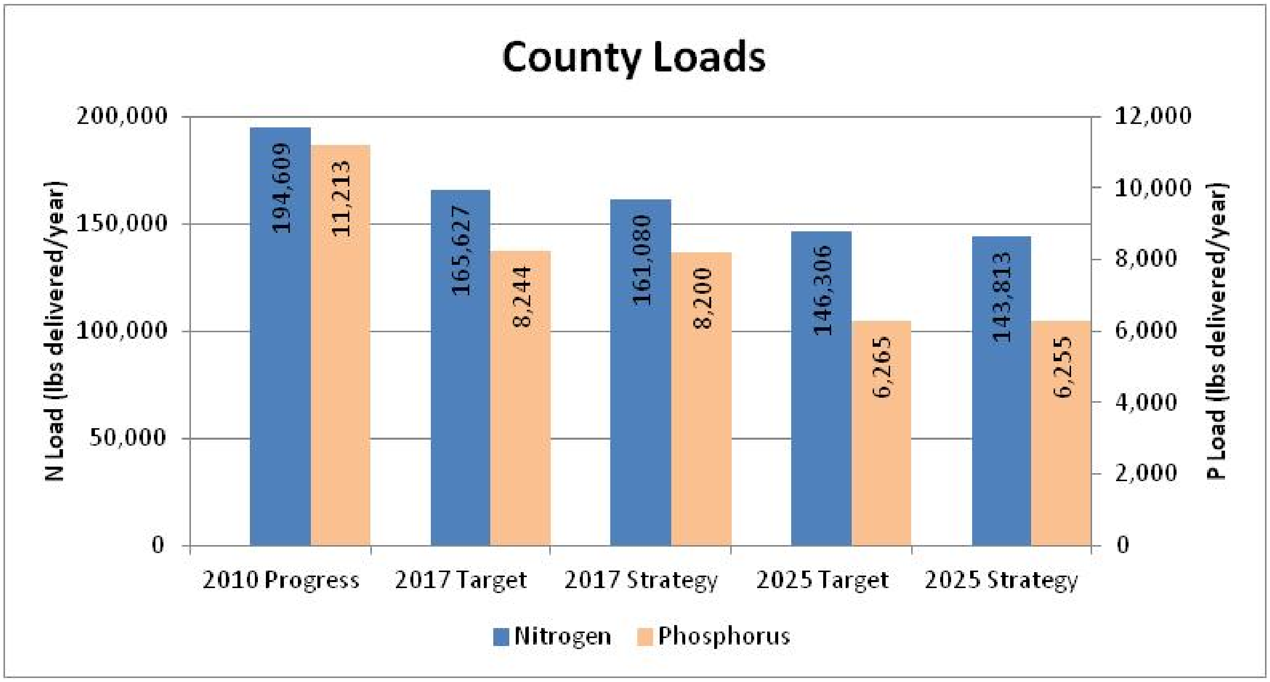
Figure 1. MDE Defined Nutrient Reduction Targets for Wicomico County and Salisbury

	2010 Progress	2017 Target	2025 Target	Reduction between 2010 and 2017 (lbs, %)	Reduction between 2010 and 2025 (lbs, %)
County N	194,609	165,627	146,306	28,982 lbs, 14.9%	48,303 lbs, 24.8%
County P	11,213	8,244	6,265	2,969 lbs, 26.5%	4,948 lbs, 44.1%
Salisbury N	52,096	44,599	39,600	7,497 lbs, 14.4%	12,496 lbs, 24.0%
Salisbury P	3,648	2,780	2,201	868 lbs, 23.8%	1,447 lbs, 39.7%

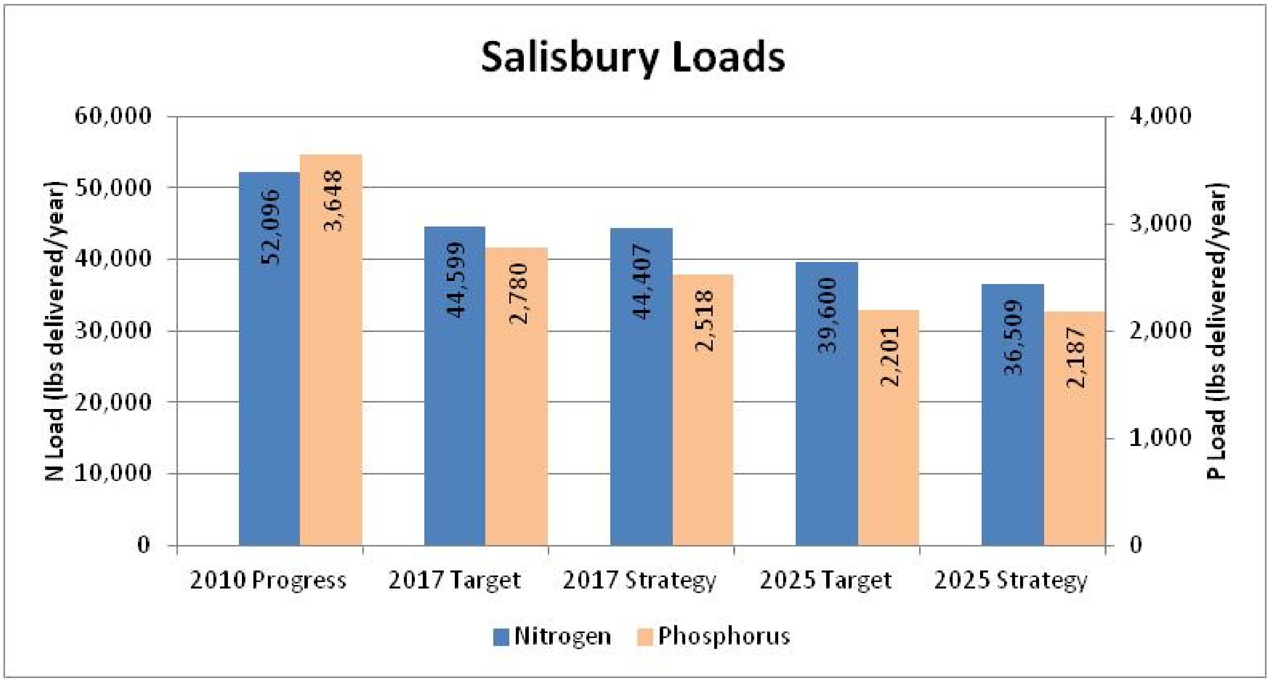
Source: MDE Nutrient Allocation Files (CBP Model 5.3.2.) and MDE prepared 2010 Progress MAST loading decks

**County includes the following land uses: non-regulated extractive, non-regulated impervious developed and non-regulated pervious developed. Salisbury includes the following land uses: municipal phase II MS4 impervious and municipal phase II MS4 pervious.*

Figure 2. Urban Sector Bar Graphs Representing TN and TP Loads for 2010 Progress, 2017 Interim Strategy and Target, and 2025 Final Strategy and Target.



Source: MDE Nutrient Allocation Files (CBP Model 5.3.2.), MDE prepared 2010 Progress MAST loading decks, and the Core Planning Team Loading Decks



Source: MDE Nutrient Allocation Files (CBP Model 5.3.2.), MDE prepared 2010 Progress MAST loading decks, and the Core Planning Team Loading Decks

Figure 3. MAST Loading Decks - Comparison of Interim and Final Strategy Results for TN and TP (pounds, delivered)

Scenario	Landuse	2010 Progress	2017 Interim Strategy	2025 Final Strategy	2025 Final Target
County N	Non-Regulated Extractive	1,243.2	1,243.2	1,243.2	
	Non-Regulated Impervious Developed	61,891.6	49,367.1	43,219.5	
	Non-Regulated Pervious developed	131,474.6	110,469.2	99,350.2	
	Subtotal	***194,609.4***	***161,079.5***	***143,812.9***	***146,306***
City N	Municipal Phase II MS4 Impervious	31,020.1	28,694.0	26,000.2	
	Municipal Phase II MS4 Pervious	21,076.2	15,713.4	10,509.0	
	Subtotal	***52,096.3***	***44,407.4***	***36,509.2***	***39,600***
County P	Non-Regulated Extractive	191.8	191.8	191.8	
	Non-Regulated Impervious Developed	5494.1	4,293.1	3,706.4	
	Non-Regulated Pervious developed	5526.9	3,714.6	2,356.5	
	Subtotal	***11,212.8***	***8,199.5***	***6,254.7***	***6,265***
City P	Municipal Phase II MS4 Impervious	2,759.3	2,488.6	2,187.0	
	Municipal Phase II MS4 Pervious	888.9	29.2	0	
	Subtotal	***3,648.2***	***2,517.8***	***2,187.0***	***2,201***

Figure 4a. Wicomico County 2017 Interim Strategy Developed Lands BMPs[1]

Developed Land BMPs		2010 Progress	2017 Interim Strategy*	Total Implementation (2010 & 2017)
BMP Name	**Unit**			
Bioretention/raingardens	Acres	-	700	700
Bioswale	Acres	-	236	236
Dry Detention Ponds and Hydrodynamic Structures	Acres	684	-	684
Dry Extended Detention Ponds	Acres	28	-	28
Forest Conservation	Acres/Year	706	-	706
MS4 Permit - Stormwater Retrofit	Acres	118	-	118
Permeable Pavement – with sandveg with underdrain with AB soils	Acres	-	300	300
Stormwater Management by Era 1985 to 2002 MD	Acres	1,789	590	2,379
Stormwater Management by Era 2002 to 2010 MD	Acres	5,974	-	5,974
Street Sweeping 25 times a year – acres (formerly mechanical monthly)	Acres/Year	-	595	595
Urban Filtering Practices	Acres	81	-	81
Urban Forest Buffers	Acres	-	85	85
Urban Infiltration Practices – no sand/veg no underdrain	Acres	192	-	192
Urban Infiltration Practices – with sandveg no underdrain	Acres	-	700	700
Urban Nutrient Management	Acres/Year	5,807	3,365	9,172
Urban Stream Restoration (Interim)	Linear Feet	-	13,200	13,200
Urban Stream Restoration; Shoreline Erosion Control; Regenerative Stormwater Conveyance	Linear Feet	-	79,200	79,200
Urban Tree Planting; Urban Tree Canopy	Acres	-	1,700	1,700
Vegetated Open Channel - Urban	Acres	-	630	630
Wet Ponds and Wetlands	Acres	3,003	-	3,003

**BMPs in this column exclude 2010 progress.*

[1]The extent of BMPs included in this table represents the total amount of implementation in place. The BMP values are the amount credited in the Bay watershed model. It is the amount of BMP submitted minus the amount not given credit for (e.g., due to overlapping with other BMPs). This table does not reflect the decrease in area for some BMPs in MAST that occurs when less effective BMPs are reduced incrementally and replaced by the implementation of more effective BMPs. This occurs because there is a finite area of land to apply BMPs and they cannot be applied to more than 100% of the available urban land.

Figure 4b. Salisbury 2017 Interim Strategy Developed Lands BMPs[2]

Developed Land BMPs		2010 Progress	2017 Interim Strategy*	Total Implementation (2010 & 2017)
BMP Name	**Unit**			
Bioretention/raingardens	Acres	-	150	150
Bioswale	Acres	-	-	-
Dry Detention Ponds and Hydrodynamic Structures	Acres	151	-	151
Dry Extended Detention Ponds	Acres	6	-	6
Forest Conservation	Acres/Year	111	-	111
MS4 Permit - Stormwater Retrofit	Acres	27	-	27
Permeable Pavement – with sandveg with underdrain with AB soils	Acres	-	-	-
Stormwater Management by Era 1985 to 2002 MD	Acres	404	734	1,138
Stormwater Management by Era 2002 to 2010 MD	Acres	1,351	-	1,351
Street Sweeping 25 times a year – acres (formerly mechanical monthly)	Acres/Year	-	85	85
Urban Filtering Practices	Acres	18	-	18
Urban Forest Buffers	Acres	-	50	50
Urban Infiltration Practices – no sand/veg no underdrain	Acres	43	-	43
Urban Infiltration Practices – with sandveg no underdrain	Acres	-	200	200
Urban Nutrient Management	Acres/Year	915	69	984
Urban Stream Restoration (Interim)	Linear Feet	-	10,560	10,560
Urban Stream Restoration; Shoreline Erosion Control; Regenerative Stormwater Conveyance	Linear Feet	-	7,920	7,920
Urban Tree Planting; Urban Tree Canopy	Acres	-	300	300
Vegetated Open Channel - Urban	Acres	-	-	-
Wet Ponds and Wetlands	Acres	679	-	679

**BMPs in this column exclude 2010 progress.*

[2] See footnote #1.

Figure 5a. Wicomico County 2025 Final Strategy Developed Lands BMPs[3]

Developed Land BMPs		2010 Progress	2017 Interim Strategy*	2025 Final Strategy**	Total Implementation (2010 to 2025)
BMP Name	**Unit**				
Bioretention/raingardens	Acres	-	700	220	920
Bioswale	Acres	-	236	79	315
Dry Detention Ponds and Hydrodynamic Structures	Acres	684	-	-	684
Dry Extended Detention Ponds	Acres	28	-	-	28
Forest Conservation	Acres/Year	706	-	-	706
MS4 Permit - Stormwater Retrofit	Acres	118	-		118
Permeable Pavement – with sandveg with underdrain with AB soils	Acres	-	300	50	350
Stormwater Management by Era 1985 to 2002 MD	Acres	1,789	590	192	2,570
Stormwater Management by Era 2002 to 2010 MD	Acres	5,974	-	-	5,974
Street Sweeping 25 times a year – acres (formerly mechanical monthly)	Acres/Year	-	595	-	595
Urban Filtering Practices	Acres	81	-	-	81
Urban Forest Buffers	Acres	-	85	-	85
Urban Infiltration Practices – no sand/veg no underdrain	Acres	192	-	-	192
Urban Infiltration Practices – with sandveg no underdrain	Acres	-	700	250	950
Urban Nutrient Management	Acres/Year	5,807	3,365	1,678	10,850
Urban Stream Restoration (Interim)	Linear Feet	-	13,200	13,200	26,400
Urban Stream Restoration; Shoreline Erosion Control; Regenerative Stormwater Conveyance	Linear Feet	-	79,200	79,200	158,400
Urban Tree Planting; Urban Tree Canopy	Acres	-	1,700	800	2,500
Vegetated Open Channel - Urban	Acres	-	630	630	1,260
Wet Ponds and Wetlands	Acres	3,003	-	-	3,003

**BMPs in this column exclude 2010 progress.*

***BMPs in this column exclude 2010 progress and 2017 interim strategy.*

[3] See footnote #1.

Figure 5b. Salisbury 2025 Final Strategy Developed Lands BMPs[4]

Developed Land BMPs		2010 Progress	2017 Interim Strategy*	2025 Final Strategy**	Total Implementation (2010 to 2025)
BMP Name	**Unit**				
Bioretention/raingardens	Acres	-	150	250	400
Bioswale	Acres	-	-	-	-
Dry Detention Ponds and Hydrodynamic Structures	Acres	151	-	-	151
Dry Extended Detention Ponds	Acres	6	-	-	6
Forest Conservation	Acres/Year	111	-	-	111
MS4 Permit - Stormwater Retrofit	Acres	27	-	-	27
Permeable Pavement – with sandveg with underdrain with AB soils	Acres	-	-	-	-
Stormwater Management by Era 1985 to 2002 MD	Acres	404	734	702	1,840
Stormwater Management by Era 2002 to 2010 MD	Acres	1,351	-	-	1,351
Street Sweeping 25 times a year – acres (formerly mechanical monthly)	Acres/Year	-	85	-	85
Urban Filtering Practices	Acres	18	-	-	18
Urban Forest Buffers	Acres	-	50	-	50
Urban Infiltration Practices – no sand/veg no underdrain	Acres	43	-	-	43
Urban Infiltration Practices – with sandveg no underdrain	Acres	-	200	200	400
Urban Nutrient Management	Acres/Year	915	69	718	1,702
Urban Stream Restoration (Interim)	Linear Feet	-	10,560	10,560	21,120
Urban Stream Restoration; Shoreline Erosion Control; Regenerative Stormwater Conveyance	Linear Feet	-	7,920	7,920	15,840
Urban Tree Planting; Urban Tree Canopy	Acres	-	300	200	500
Vegetated Open Channel - Urban	Acres	-	-	-	-
Wet Ponds and Wetlands	Acres	679	-	-	679

**BMPs in this column exclude 2010 progress.*

***BMPs in this column exclude 2010 progress and 2017 interim strategy.*

[4] See footnote #1.

Cost – Current Pace of Implementation

The cost of implementing any BMPs should be inclusive of land acquisition, pre-construction, construction, and post-construction costs. In an effort to minimize costs, the key Phase II WIP strategies recommended for this sector are Urban Nutrient Management and Rural Residential Tree Planting. Because of the inexpensive nature and the relative ease of implementation, both of these BMPs have been included as part of the Two-Year milestones.

It is envisioned that participation in a program designed to establish and put into practice Urban Nutrient Management Plans for existing and future residential subdivisions would be voluntary, instead of regulatory. The primary goal of this BMP is to reduce the amount of fertilizer applied to grass lawns. A major component required for the success of this program will involve public education and awareness.

Establishing a voluntary tree planting program is another example of an inexpensive and effective method to reduce nutrients. At this time, there are minimal limitations to implementing this type of program. Therefore, opportunities to establish partnership(s) with local non-profit organizations to develop this program and determine the technical resources and volunteer base available to assist in the successful implementation of this program should be considered.

Other than establishing voluntary based Urban Nutrient Management Plans, Urban Tree Canopy Program, and a Rural Residential Tree Program, the County and local jurisdictions do not have the funding or staff resources necessary to implement any BMPs beyond that required by State Ordinances such as Storm Water Management, Forest Conservation Act, and the Chesapeake Bay Critical Area Program.

Cost – Achieving 2017 & 2025 Nutrient Targets

Estimates of the cost of implementation were derived from King and Hagan (2011), which provides planning level cost estimates for implementing BMPs in Maryland counties. They are planning level in the sense that they are intended to be generally accurate when averaged across the state of Maryland and across Maryland counties. The overall Wicomico County stormwater BMP cost adjustment index of 0.970 was applied to the total cost and the average annual cost as recommended by King and Hagan (2011). This adjustment was not applied to the total initial cost or the maintenance cost. This cost adjustment accounts only for differences in project input costs among Maryland counties and does not reflect many other geo-physical, regulatory, and other differences among counties that could affect BMP costs. In addition, cost estimates assume that each jurisdiction will need to acquire 100 percent of the land necessary for implementation at a generic state-wide $100,000/acre land value. This may lead to an overestimation of cost for instances where BMPs are implemented on public land and land costs therefore do not apply.

All cost estimates were determined from King and Hagan (2011), with the exception of Stormwater Management by Era 1985-2002. This practice involves the retrofits of existing ponds. King and Hagan (2011) did not provide cost data for retrofits and therefore cost estimates were based on data collected by the Center for Watershed Protection.

The King and Hagan cost data is expressed for all BMPs as the cost per impervious acre. For many of the BMPs suggested for the City/County, the area treated is split between impervious and pervious. Therefore, pervious area was converted to an equivalent impervious area by dividing the lbs of N removal from pervious land by the lbs of TN removed per impervious acre. The equivalent impervious area and the impervious area were then added together and multiplied by the King and Hagan (2011) cost estimates per impervious acre. This methodology for equivalent impervious area was used for the following BMPs: bioretentions/rain gardens, bioswale, permeable pavement, stormwater management by era, and urban infiltration practices.

The cost estimate for other BMPs is based solely on the pervious area or linear foot treated. These BMPs include: urban forest buffers, urban nutrient management, stream restoration, shoreline erosion control, and urban tree planting. King and Hagan provide cost estimates for these BMPs based on the impervious acre treated. The costs for these practices were converted into the cost per pervious acre or linear foot treated. For example, King and Hagan used an adjustment factor of 2.94 for the amount of impervious acres treated by urban forest buffers. In other words, the unit cost per impervious acre treated is roughly 3 times the cost estimated to plant one acre. To account for this, the costs provided by King and Hagan (2011) were divided by 2.94, which converts the cost per impervious acre back to the cost per pervious acre.

Figure 6a. Wicomico County Cost to Implement Developed Lands BMPs (2010 – 2025)[5] derived from King and Hagan (2011)

BMP Name	Unit	Pre-Construction Costs	Construction Costs	Land Costs	Total Initial Costs	Total Post-Construction Costs	Total Costs over 12 Years	Average Annual Costs over 12 years
Bioretention/raingardens	Acres	$6,920,211	$27,680,843	$2,214,467	$36,815,521	$13,561,487	$48,865,698	$4,072,141
Bioswale	Acres	$3,780,000	$9,450,000	$630,000	$13,860,000	$3,519,218	$16,857,841	$1,404,820
Permeable Pavement – with sandveg with underdrain with AB soils	Acres	$8,095,549	$80,955,492	-	$89,051,041	$9,747,602	$95,834,684	$7,986,224
Stormwater Management by Era 1985 to 2002 MD	Acres	$8,208,196	$16,416,391	-	$26,624,587	$12,131,054	$35,652,972	$2,971,081
Street Sweeping 25 times a year – acres (formerly mechanical monthly)	Acres/Year	-	$3,599,155	-	$3,599,155	$3,223,639	$6,618,110	$551,509
Urban Forest Buffers	Acres	$86,734	$867,340	-	$954,074	$426,870	$1,339,516	$111,626
Urban Infiltration Practices – with sandveg no underdrain	Acres	$12,610,679	$31,526,697	$3,603,051	$47,740,427	$7,834,561	$53,907,738	$4,492,312
Urban Nutrient Management	Acres/Year	-	$27,723,893	-	$27,723,893	$1,876,601	$28,712,479	$2,392,707
Urban Stream Restoration (Interim)	Linear Feet	$5,676,000	$11,352,000	-	$17,028,000	$12,548,448	$28,689,155	$2,390,763
Urban Stream Restoration; Shoreline Erosion Control; Regenerative Stormwater Conveyance	Linear Feet	$34,056,000	$68,112,000	-	$102,168,000	$75,290,688	$172,134,927	$14,344,577
Urban Tree Planting; Urban Tree Canopy	Acres	$2,851,750	$28,517,500	$125,000,000	$156,369,250	$13,998,600	$165,256,815	$13,771,401
Vegetated Open Channel - Urban	Acres	$5,040,000	$25,200,000	$2,520,000	$32,760,000	$9,228,341	$40,728,691	$3,394,058
Total		**$87,325,119**	**$331,401,311**	**$133,967,518**	**$554,693,948**	**$163,387,109**	**$694,598,624**	**$57,883,219**

[5] Total costs and average annual costs in the table are calculated over 12 years, assuming the BMPs will be implemented between 2013 and 2025.

Figure 6b. Salisbury Cost to Implement Developed Lands BMPs (2010 – 2025)[6] derived from King and Hagan (2011)

BMP Name	Unit	Pre-Construction Costs	Construction Costs	Land Costs	Total Initial Costs	Total Post-Construction Costs	Total Costs over 12 Years	Average Annual Costs over 12 years
Bioretention/raingardens	Acres	$16,419,395	$41,048,489	$938,251	$58,406,135	$5,745,888	$62,227,462	$5,185,622
Stormwater Management by Era 1985 to 2002 MD	Acres	$ 14,446,472	$28,892,943	-	$43,339,415	$21,350,725	$62,749,436	$5,229,120
Street Sweeping 25 times a year – acres (formerly mechanical monthly)	Acres/Year	-	$514,165	-	$514,165	$460,520	$945,444	$78,787
Urban Forest Buffers	Acres	$51,020	$510,200	-	$561,220	$251,100	$787,950	$65,663
Urban Infiltration Practices – with sandveg no underdrain	Acres	$5,341,460	$13,353,648	$1,526,131	$20,221,239	$3,318,456	$22,833,505	$1,902,792
Urban Nutrient Management	Acres/Year	-	$4,326,533	-	$4,326,533	$292,858	$4,480,809	$373,401
Urban Stream Restoration (Interim)	Linear Feet	$4,540,800	$9,081,600	-	$13,622,400	$10,038,758	$22,951,324	$1,912,610
Urban Stream Restoration; Shoreline Erosion Control; Regenerative Stormwater Conveyance	Linear Feet	$3,405,600	$6,811,200	-	$10,216,800	$7,529,069	$17,213,493	$1,434,458
Urban Tree Planting; Urban Tree Canopy	Acres	$570,350	$5,703,500	$25,000,000	$31,273,850	$2,799,720	$33,051,363	$2,754,280
Total		**$44,775,097**	**$110,242,278**	**$27,464,382**	**$182,481,757**	**$51,787,094**	**$227,240,786**	**$18,936,732**

[6] See footnote #5.

Conclusion

The 2017 and 2025 loading decks submitted for the City of Salisbury and Wicomico County are for planning purposes only and have not been formally adopted by any member jurisdiction. The information contained within this technical addendum is not representative of future commitments to meet the mandated 2017 and 2025 nutrient targets as expressed by the Maryland Department of the Environment.

In order to meet the nutrient target allocations by 2025, the County would need to reduce TN load delivered by 48,303 lbs and TP load delivered by 4,948 lbs from the 2010 Progress Load. The strategy proposed by the County includes a combination of practices that include new BMPs, retrofits of existing ponds, street sweeping, urban nutrient management, and stream restoration. The total cost of these practices over 12 years is estimated as $694,598,626

In comparison, to meet the nutrient target allocations by 2025, the City would need to reduce TN load delivered by 12,496 lbs and TP load delivered by 1,447 lbs from the 2010 Progress Load. The strategy proposed by the City includes a combination of practices that include new BMPs, retrofits of existing ponds, street sweeping, urban nutrient management, vegetative open channels, and stream restoration. The total cost of these practices over 12 years is estimated as $227,240,786.

It is important to keep in mind that the 2017 and 2025 strategies developed by the City and County represent planning level efforts as opposed to an engineering grade report. The next critical step in this process is to identify the location of the proposed BMPs and further refine the strategies based on the feasibility of implementation and identification of high-priority restoration projects. The cost estimates will also be refined to represent the costs of implementation within Wicomico County, rather the generic approach provided by King and Hagan (2011). In addition, the urban BMP strategies are based on the BMPs that are currently approved by the Maryland Department of the Environment and the Chesapeake Bay Program. Alternative strategies and revisions to the nutrient reduction efficiencies are continuously updated through the Urban Stormwater Work Group, which could substantially affect the final strategies and cost effectiveness.

The watershed implementation plan outlines the extent of BMPs needed to achieve water quality standards. However, there are many details that need to be resolved between the federal, State, and local governments to ensure that the 2017 and 2025 strategies presented in this Plan are achievable. These details include funding, staffing, development and adoption of innovative practices, identifying and crediting voluntary practices, developing better accounting and tracking processes, and refining the analytical tools by which progress is evaluated. **Without necessary State and federal funding for a significant portion of implementation and programmatic actions, it is unlikely that any jurisdiction will achieve the 2025 targets. In addition, credit can only be given for actions that are tracked, reported, and verifiable.**

References

King, D. and P. Hagan. 2011. Costs of Stormwater Management Practices in Maryland Counties. Technical Report Series No. TS-626-11 of the University of Maryland Center for Environmental Science.

Appendix A. Assumptions used to Develop the 2017 and 2025 Strategies for Wicomico County and the City of Salisbury

All assumptions are based on discussions with the Core Planning Team, as well as a limited GIS analysis. A more detailed analysis would need to be conducted to refine the estimates. All pollutant removal estimates were extracted from MAST. The assumptions listed below are for the extent of BMPs submitted and do not reflect the amount not credited in the Bay watershed model (e.g., due to overlapping with other BMPs).

County (2025)

Public lands are treated with bioretention/rain gardens and infiltration. Approximately 4,285 acres of public lands in the County determined from GIS. Assume almost 1/4 treated by bioretention/rain gardens, almost 1/4 treated by infiltration, and almost 1/10 treated by permeable pavement. The acreage is split evenly between pervious and impervious land for these three BMPs.

- Bioretention/Rain gardens treating pervious = 475 ac
- Bioretention/Rain gardens treating impervious = 475 ac
- Infiltration treating pervious = 475 ac
- Infiltration treating impervious = 475 ac
- Permeable pavement treating pervious = 175 ac
- Permeable pavement treating impervious = 175 ac

Road Ditches – The County has approximately 2,000 miles of ditches (determined from the County's ditch GIS layer). Assume 100 miles of the ditches could be converted to bioswales. 100 miles x 26 ft average road width = 315 ac of impervious treated. Assume 400 miles could be converted to vegetated open channels. 400 miles x 26 ft average road width = 1,260 ac

Street Sweeping – Street sweeping is accounted for in MAST as the acres of road swept annually. The County conducts 700 miles of street sweeping annually. 700 miles x 7 ft street sweeper width = 595 acres of impervious treated.

Urban Forest Buffers – Assume forest buffers could be planted along 20 stream miles. 20 miles x 35 ft buffer width = 85 acres of pervious treated.

Urban Nutrient Management – There are approximately 10,383 acres of suburban lawns in the County according to a 2006 land use layer from CBP. However, this does not include lawns within other land uses, such as commercial, industrial, and institutional. For Wicomico County, the MDE scenario includes 13,106 acres (18,912 total acres minus 5,806 acres from the 2010 Progress Loads). The state's estimate for urban nutrient management is based on EPA's E3 target levels (everything implemented by everyone everywhere). A conservative estimate of 6,500 acres (half of the MDE scenario) was used for urban nutrient management in the County's scenario as a more realistic estimate of what is achievable.

Urban Stream Restoration – Assume 5 miles of streams will be restored within the County. The interim stream restoration pollutant removal estimates are used.

Shoreline Erosion Control – According to the County's planimetric shoreline GIS data, there are approximately 500 miles of shoreline in the County. Assume 30 miles could be treated with shoreline erosion control. The length of shoreline treated by this practice could be increased. This is currently one of the less cost effective practices because it is based on the existing CBP approved efficiencies for shoreline restoration and not the interim stream restoration efficiencies. It is expected that the shoreline erosion efficiencies will be increased through revisions in future iterations of the bay model, which in turn will increase the cost effectiveness of this practice.

Urban Tree Planting/Canopy – Current forest cover in the County according to the Woodlands GIS layer is 45%. Approximately 2,500 acres are needed to increase the tree/canopy cover by 1%. The assumption for tree planting is that 100 trees are planted and survive per acre of planting credited. This would equate to 250,000 tree plantings required in the County. A tree canopy study for the City/County is currently underway, and when available, the recommendations will be used to refine the credit provided by urban tree planting/canopy.

Ponds – Retrofitting existing ponds within the County provides a cost effective means to increasing water quality treatment of these existing practices. There are 38 dry ponds in the County, with a combined drainage area of 460 acres (total of all reported DAs). There are also 306 wet ponds within the County and assuming they have an average drainage area of 20 ac, their total drainage area would be 6,120 acres. Assume that all 38 dry ponds and ¼ of the wet ponds could be retrofitted to increase their water quality treatment volume to the maximum extent practicable. This would amount to a total of 1,990 acres. These ponds currently exist and are therefore accounted for as part of the 2010 progress load. In order to account for the additional load reduction provided by ponds with retrofit potential in MAST, half of the drainage area of these ponds (995 acres) was entered as Stormwater Management by Era 1985-2002. The 995 acres treated was split between pervious and impervious. The Era 1985-2002 was chosen as a more conservative estimate over the 2002-2010 Era to account for the fact that it would not be possible to bring the water quality treatment volume for all of the ponds retrofitted up to the maximum extent practicable.

County (2017)

Reduced shoreline erosion control by half to 15 miles.

Reduced stream restoration by half to 2.5 miles.

Reduced urban nutrient management to be half of that in the 2017 MDE scenario (4,200 acres).

Reduced permeable pavement to 150 acres pervious and 150 acres impervious.

Reduced bioretention to 350 acres pervious and 350 acres impervious.

Reduced infiltration to 350 acres pervious and 350 acres impervious.

Reduced the pond retrofits entered as Stormwater Management by Era to 365 acres pervious and 365 acres impervious.

Reduced urban tree canopy to 1,700 acres.

Reduced road ditch conversions to bioswales to 75 miles of roadway treated. 75 miles x 26 ft average road width = 236 acres impervious treated.

Reduced road ditch conversions to vegetated channels by half to 630 acres impervious treated.

Salisbury (2025)

Street Sweeping – Street sweeping is accounted for in MAST as the acres of road swept annually. The City has 152 miles of roadway in the City (based on a road layer in GIS). Assume 100 miles are swept annually. 100 miles x 7 ft street sweeper width = 85 acres of impervious treated.

Urban Forest Buffers – Assume forest buffers could be planted along 12 stream miles. 12 miles x 35 ft buffer width = 50 ac. The numbers entered into the spreadsheet are estimates because MAST is down for service.

Urban Nutrient Management – There are approximately 869 acres of suburban lawns in the City according to a 2006 land use layer from CBP. However, this does not include lawns within other land uses, such as commercial, industrial, and institutional. For Salisbury, the MDE scenario includes 2,361 acres (3,276 total acres minus 915 acres from the 2010 Progress Loads). The state's estimate for urban nutrient management is based on EPA's E3 target levels (everything implemented by everyone everywhere). A conservative estimate of 1,100 acres (half of the MDE scenario) was used for urban nutrient management in the City's scenario as a more realistic estimate of what is achievable.

Urban Stream Restoration – Assume 4 miles of streams will be restored within the City. The interim stream restoration pollutant removal estimates are used.

Shoreline Erosion Control – According to the County's planimetric shoreline GIS data, there are approximately 12 miles of shoreline in the City. Assume 3 miles could be treated with shoreline erosion control.

Urban Tree Planting/Canopy – Current forest cover in the City according to the Woodlands GIS layer is 10%. Approximately 500 acres are needed to increase the tree/canopy cover to 18%. The assumption for tree planting is that 100 trees are planted and survive per acre of planting credited. This would equate to 50,000 tree plantings required in the City. This estimate is used as a placeholder. A tree canopy study for the City/County is currently underway, and when available, the recommendations will be used to refine the credit provided by urban tree planting/canopy.

Ponds – Retrofitting existing ponds within the City provides a cost effective means to increasing water quality treatment of these existing practices. There are approximately 600-700 wet ponds within the City. Assume 320 of the ponds could be retrofitted to increase their water quality treatment volume to the maximum extent practicable. Also assume that the ponds have an average drainage area of 10 ac, which amounts to a total of 3,200 acres. These ponds currently exist and are therefore accounted for as part of the 2010 progress load. In order to account for the additional load reduction provided by ponds with retrofit potential in MAST, half of the drainage area of these ponds (1,600 acres) was entered as Stormwater Management by Era 1985-2002. The 1,600 acres treated was split between pervious and impervious. The Era 1985-2002 was chosen as a more conservative estimate over the 2002-2010 Era to account for the fact that it would not be possible to bring the water quality treatment volume for all of the ponds retrofitted up to the maximum extent practicable.

Bioretention/Rain Gardens and Infiltration – These practices were added after the others listed above to bring the load reduction up to meet the target value. The acreage for these practices was split evenly between pervious and impervious as listed below:

- 400 ac bioretention / rain gardens
- 400 ac infiltration

Salisbury (2017)

Reduced the number of pond retrofits entered as Stormwater Management by Era in half to 400 acres pervious and 400 acres impervious.

Reduced bioretention to 75 acres pervious and 75 acres impervious.

Reduced infiltration to 100 acres pervious and 100 acres impervious.

Reduced stream restoration by half to 2 miles.

Reduced shoreline erosion control by half to 1.5 miles.

Reduced tree planting to 300 acres.

Reduced urban nutrient management to be half of that in the 2017 MDE scenario (725 acres).

A Note about Urban Nutrient Management

According to Maryland's Phase II WIP Strategy, urban nutrient management includes 220,000 acres/year through the existing regulation of commercial lawn care companies and is based on compliance rates garnered from annual inspection results. An additional 222,000 acres is estimated to be included from local plans, for a total of approximately 442,000 acres/year. These acres do not explicitly account for the Fertilizer Use Act of 2011 ; however, they approximate the effect of the nutrient management education and outreach that is part of the Act. The Act will take effect on 10/1/13 and prohibits professional lawn care companies and homeowners from applying fertilizer between November 15 and March 1; applying lawn fertilizer within 10 to 15 feet of a waterway; applying lawn fertilizer on impervious surfaces, when the ground is frozen or when heavy rain is predicted; and using lawn fertilizers as a deicer. The Maryland Department of Agriculture will track implementation and compliance with this program expansion beginning in 2014. Counties will not be responsible for tracking this practice (MDE technical staff via Tom Thornton, email 6/18/2012).

A Note about the Year up to which BMPs are Included in the 2010 Progress Load

The Watershed Model is calibrated between 1985 and the end of 2005. The 2010 Progress Scenario is based on the BMPs that the State has in its records. Missing BMPs from 2010 and earlier that are not accounted for can be added, along with a note that distinguishes these additional existing BMPs added from the new BMPs proposed post 2010. During revisions to the model a historical record of implementation can be used to inform the model. This historical record would need to have all of the necessary information, such as BMP type (WetPond); date (MM/DD/YYYY); Drainage area (area draining to the BMP); Locational info (Lat/Long in decimal degrees).

When 2010 Progress was uploaded into MAST, stream restoration was not included. At the time, the model only accepted the percentage of land area being treated by BMPs for each land use category. Stream restoration is measured in linear feet and was therefore unable to be incorporated. If jurisdictions have the cumulative amount of existing stream restoration, this amount can be input into MAST, along with new implementation proposed post 2010. Care should be taking when inputting stream restoration. When a length is input and multiple land uses chosen the entire length is applied to each land use. Example: if County Phase I/II impervious and County Phase I/II pervious is highlighted and 100 feet is applied. The 100 feet goes on County Phase I/II impervious and 100 feet on County Phase I/II pervious, for a total of 200 feet.

Appendix B. 2017 and 2025 Strategies developed by the Maryland Department of the Environment

The Maryland Department of the Environment developed state WIP scenarios to meet the 2017 and 2025 target loads for TN, TP, and TSS. MDE's strategy for meeting the target loads is documented in *Maryland's Phase II Watershed Implementation Plan for the Chesapeake Bay TMDL*. To meet the interim 2017 target, stormwater BMPs included: 6% of pervious land in urban stream buffers and 60% of pervious land under urban nutrient management; and stormwater retrofits of developed lands with little or no management using urban filtering practices and impervious surface removal. To meet the

2025 target, the set of BMPs included in the EPA Bay Program E3 strategy was used at a level necessary to close the load reduction gap and include filtering practices, forest buffers, impervious surface reduction, and urban nutrient management.

The 2017 and 2025 state WIP scenarios developed by MDE were included in MAST so that local jurisdictions could access them. In order to compare the state WIP scenarios to those developed by Wicomico County and the City of Salisbury, they were exported from MAST and entered into similar spreadsheets as the City/County scenarios. **Figure 7** shows the load reduction comparison between the state WIP strategies and those developed by City and County.

The State WIP scenarios include the 2010 progress loads. In order to determine the progress after 2010, the 2010 progress was exported from MAST and then subtracted from the State WIP scenario. Subtracting the 2010 progress resulted in negative acres for many of the BMPs in the 2017 and 2025 state scenarios. This is because the acreage of some BMPs in these scenarios decreases from the 2010 progress to 2017 and 2025. There is a finite area of land to apply BMPs and for developed land; BMPs cannot be applied to more than 100% of the available urban land. When it was found that there was more BMP implementation than land available, less effective BMPs were reduced incrementally (such as dry ponds or the ERA BMP) until the level of implementation for the other more effective BMPs was achieved. To account for this, negative values in the spreadsheet were changed to zero.

Related to the issue of some BMPs decreasing, forest conservation was found to increase from the 2010 progress load. This seems counterintuitive because future growth is not accounted for in the model for urban land and the forest conservation BMP is based on MD's Forest Conservation Act, where 20% of forest is conserved on a development site. The reason for the increase in forest conservation acres is due to automation in some aspects of the State strategies, such that BMP levels were computed as a percentage of available acres. The application of some BMPs convert the acres of developed land to forest land, or impervious to pervious. This reduces/increase the available acres so that, if the same percentage level of other BMPs is applied to these lands, then a decrease/increase in BMP acreage might be observed even though the implementation level was intended to remain equal.

The load reduction achieved from the 2025 State WIP scenario corresponds with the required load reduction for the City of Salisbury. However, the 2025 State WIP scenario for the County estimates a reduction of 11,026 lbs N higher than the load requirement from Maryland's WIP Phase II Target Load Summaries. Further clarification from MDE is needed on why the State WIP scenario for the County achieves a N reduction higher than the target load, but it is assumed this was done to achieve a P reduction closer to the target load.

In comparison, the 2017 State scenario for both the City and County are short of the 60% load reduction goal for 2017. According to MDE, when a County did not submit a 2017 scenario, MDE created one for them. However, it was not necessarily created to meet the 2017 load reduction goal. The load reduction from certain BMPs was entered to be 60%, but this falls short of the total 60% reduction goal for 2017.

Figure 7. Comparison among the 2017 and 2025 state WIP scenarios with the scenarios developed by Wicomico County and the City of Salisbury

Scenarios	Acres Pervious Land Treated*	Acres Impervious Land Treated*	lbs N delivered	Target N Load	lbs P delivered	Target P Load	Total Cost (over 12 years)	Average Annual Cost (over 12 years)
2017 City	813 ac + 18,480 ft stream/shoreline	660	44,407	44,599	2,518	2,780	$108,645,919	$9,053,827
2025 City	2,195+ 36,960 ft stream/shoreline	1,285	36,509	39,600	2,187	2,201	$227,240,786	$19,936,732
2017 MDE City	1,859	309	47,676	44,599	3,251	2,780	$62,864,203	$5,238,684
2025 MDE City	4,836	1,084	37,891	39,600	2,287	2,201	$251,962,410	$20,996,867
2017 County	5,645ac + 92,400 ft stream/shoreline	2,676	161,080	165,627	8,200	8,244	$457,426,146	$38,118,845
2025 County	8,200ac + 184,800 ft stream/shoreline	3,793	143,813	146,306	6,255	6,265	$694,598,624	$57,883,219
2017 MDE County	8,958	0	181,308	165,627	10,477	8,244	$60,477,775	$5,039,815
2025 MDE County	26,368	2,279	135,280	146,306	6,575	6,265	$857,937,810	$71,494,817

*The BMP values represent the amount of implementation in place minus the 2010 progress and are the amount credited in the Bay watershed model. It is the amount of BMP submitted minus the amount not given credit for (e.g., due to overlapping with other BMPs).

II. Septic System Sector

Background

The reduction of nutrient loadings from On-Site Disposal Systems (OSDS), commonly referred to as septic systems (or onsite wastewater management systems by the Chesapeake Bay Program) is a major strategy in meeting the waste load allocations of the Chesapeake Bay TMDL. A conventional OSDS involves the separation of solid and liquid domestic waste by allowing solids to settle gravimetrically into the bottom of a septic or holding tank. The septic tank provides for primary settling and partial digestion of organic matter. Baffles help to prevent wastewater from moving through the tank too quickly and forces wastewater to exit below the scum layer through a discharge pipe that allows liquid waste to discharge either into a drain field or another tank. In modern-day systems, there is an adjoining tank where additional settling occurs. This tank is fitted with an effluent pipe that allows the liquid waste to enter a drain field. The drain field is a network of perforated pipes imbedded in permeable, unsaturated natural soil or a soil gravel mixture that allows wastewater to infiltrate through the underlying soil to the ground water. As the wastewater flows through the soil, some removal of nutrients (especially phosphorus) occurs through a variety of physical, chemical, and biochemical processes and reactions. While this process is highly effective in removing certain contaminants (e.g., bacteria and phosphorus), the Maryland Department of the Environment (MDE) estimates that as much as 80 to 100 percent of the nitrogen is not removed by the system, which in certain areas can be a significant source of controllable nitrogen entering the Chesapeake Bay.

In Maryland's Phase II Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL, jurisdictions are expected to reduce nitrogen load reductions by 38.2% by 2025. The reduction to meet the 2025 target for the septic sector represents impacts from previously developed areas on individual septic systems and does not account for new growth.

The Chesapeake Bay Program recognizes three treatment alternatives for this sector of nutrients, which include:

- Pumping of Septage (solids in septic tank);
- Connection to a waste treatment system; and
- Upgrade to a denitrification system using Best Available Technology.

Nutrient reduction efficiencies for these practices only applies to total nitrogen since it is assumed that existing septic technology removes 100 percent of phosphorus loading.

In developing the State's Phase II WIP, septic system strategies provided by county teams were compared to the interim and final target loads of the Chesapeake Bay TMDL. If the local plan met the target it was incorporated within the State's Plan; however, if the plan did not meet the target or no plan was submitted, the following assumptions were made:

- Septic Upgrades: Upgrades (or denitrification systems) are first applied in the order of systems in the critical area (within 1,000 feet of tidal waters) for applicable counties, then to systems within 1,000 feet of a perennial stream and then to remaining systems;
- Septic Pumping: If septic upgrades alone do not achieve the necessary reduction for a given county, septic system pumping was added on a 5-year rotating basis (20% of the systems per year);
- Septic Systems: Upgrade or connect 60% of the septic systems in the Critical Area (1,000 ft from tidal waters); and
- Septic Systems: Use the set of BMPs included in the EPA Bay Program E3 watershed model scenario at a level necessary to close the load reduction gap for each county.

The 2025 Final Target Strategy for the Chesapeake Bay watershed assumed approximately 1.24 million pounds reduction in nitrogen through the following:

- Septic pumping of about 58,991 systems – estimated costs $88.4 Million;
- Septic system connections by 39,186 – estimated costs $1.75 Billion; and
- Septic system upgrades by 189,148 – estimated costs $2.45 Billion.

Source:

http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/DRAFT_PhaseII_WIPDocument_Main.aspx.

Description of OSDS BMPs

Pumping

Studies have shown that the removal of septage from septic tanks increases the capacity of the system to remove settleable and floatable solids; therefore, possibly extending the life-span of the system. The liquid portion of domestic waste flows out of septic tanks and into an underground soil adsorption system (field). The septic system's function is drastically limited if the septic tank is not properly maintained. If not maintained the sludge or septage in the bottom of the tank builds up to the outlet pipe that carries the liquid flow to the drain field. This may cause clogging of the drains and underlying soil allowing the liquid waste to discharge through the surface and contaminating surface and groundwater with untreated waste. The underlying soil is a primary component of the treatment process so seasonally high water table can dramatically reduce the treatment capacity.

The removal of septage through pumping is one of several measures that can be implemented to protect soil adsorption systems from clogging and failure. The Chesapeake Bay Program (CBP) estimates that routine periodic pumping can reduce nitrogen loadings by 5 percent http://www.hrpdc.org/Documents/Phys%20Planning/2011/ChesBayTMDL/AdditMaterials/CB_Model_BMP_Doc.pdf. The CBP recommends that septic tanks be pumped once every three to five years to maintain effectiveness. The ultimate disposal of septage generally falls into three basic categories - land application, treatment at a wastewater treatment plant, or treatment at a special septage treatment plant. At the time of this publication, none of the six publicly owned WWTPs accept septage; therefore, septage is transported to the nearest WWTPs, which include The Towns of Berlin, Princess Anne, and Hurlock.

Septic System Connections

This practice extends the public sewerage system from the existing wastewater treatment system to targeted homes and business. This involves the installation of a gravity sanitary sewer pipes or a force main (pipes under pressure with a pumping or "lift" station) and assumes that a wastewater treatment plant has reserve capacity to accept the additional flow. This option is particularly useful when a seasonally high water table precludes the use of septic system upgrades. The nutrient load reduction is assumed to be 100 percent; however, the loading from the treatment plants will increase as their capacity is diminished affecting the jurisdictions growth allocation. MDE will only allow credit for this option if the receiving treatment plant has been upgraded to Enhanced Nitrogen Removal (ENR) and has severe restrictions to assure funding for connection projects is supportive of Smart Growth (e.g., within Priority Funding Areas). This would apply to the major facilities (Salisbury, Fruitland, and Delmar) consisting of flows greater than 0.5 MGD and that have either been upgraded to ENR or planned for ENR upgrades.

Septic System Upgrades with BAT (denitrification)

Senate Bill 554 (SB554) enacted in 2009 requires that for property owned in the Critical Area, all OSDS serving newly constructed buildings and all replacement OSDS include the best available technology (BAT) for removing nitrogen. Senate Bill 554 also states that in those circumstances where a residence (or other building) is being altered and the Approving Authority determines that the existing OSDS is not adequate, then BAT is required. In those circumstances where a residence or other building is being altered and the Approving Authority determines that the existing OSDS is adequate to serve the proposed altered building, a BAT upgrade is not required.

BAT upgrades to septic systems typically include a two-stage treatment process involving aeration and anaerobic denitrification. Most of the treatment systems are proprietary and MDE has a certification process that screens and certifies these systems. These systems employ many of the same principles that are used in the treatment of sewage at municipal wastewater treatment systems. The basic process involves the primary settling of solids similar to a conventional septic tank. The effluent enters an oxidation chamber where organic nitrogen is oxidized through aeration forming nitrate through a process called nitrification. The effluent is then discharged to an aerobic denitrification chamber where denitrifying bacteria attach and grow on submerged media such as plastic rings and reduce nitrate to nitrogen gas. The systems are most effective during warmer months that support bacteria growth. MDE assumes that typical residential septic systems deliver 30 pounds of nitrogen per year to the groundwater, while an upgraded, nitrogen-removing septic system is estimated to reduce that nitrogen load by one-half.

Number and Location of Existing Septics Allocated to the County within MAST

MAST estimates 23,200 septic systems in Wicomico County; however, internal County records indicate 19,750 systems. In an effort to remain consistent, the number of connected systems in the 2010 Progress load prepared by MDE has been adjusted by connecting 3,450 systems to eliminate the associated load from the 2010 progress load. In addition, MAST does not show any septic systems allocated to the Critical Area, whereas internal County records estimate 1,300 systems within the Critical Area.

Baltimore County believes that the number of OSDSs in the State database developed by Tetra Tech could be overestimated. Wicomico County should also evaluate this by conducting a parcel-by-parcel analysis of the TetraTech OSDS data. The revised estimate could result in a lower number of OSDSs. Many of the assumptions made by the state and EPA were done at such a large scale and the room for error is tremendous. The County should make it a priority to develop an accurate inventory of septic systems.

Figure 8 shows the number of existing septic systems allocated to the County within MAST.

Figure 8. Number of Existing Septic Systems Allocated to the County within MAST

Septic Zone	Pre-BMP Systems
Critical Area	0
Within 1,000 ft of a perennial stream	7,054
Outside of the Critical Area, not within 1,000 ft of a perennial stream	16,146
Total	***23,200***

Cost – Current Pace of Implementation

Since 2006, the Wicomico County Health Department averages approximately 50 upgrades of existing individual on-site sewerage disposal systems to BAT systems. Each upgrade cost approximately $13,000, which funding is provided by Maryland's Bay Restoration Fee program. Over the past five years, the County has received $300,000 to $400,000 annually for septic system upgrades. These upgrades have occurred in all three (3) septic zones (CBCA, within 1,000 feet of a perennial stream, and outside of CBCA and not within 1,000 feet of a perennial stream). As a result of upgrading roughly 300 systems, contributions of Nitrogen delivered to our local receiving waters decreased. To quantify the impact of these upgrades, a conservative approach was utilized to calculate the contributions based on accepted methodology. For example, MDE estimates the Nitrogen contribution of individual systems with a Nutrient Removal Technology will reduce Nitrogen by approximately 50 percent compared to systems without this technology.

For the purpose of this rudimentary analysis, the Team allocated these upgrades of individual septic systems to those occurring within 1,000 feet of a perennial stream. Prior to the upgrade, these 300 systems accounted for 4,500 lbs of Nitrogen per year delivered to the edge of stream. In comparison, the annual contribution of these 300 systems after being upgraded to BAT resulted in an annual Nitrogen contribution of 2,250 lbs, thus a reduction of 2,250 lbs annually compared to the conventional septic system.

Cost – Achieving 2017 & 2025 Nutrient Targets

The 2017 and 2025 total nitrogen septic targets are provided in **Figure 9**. **Figures 10** and **11** provide the interim and final strategy septic system BMPs. Septic system costs reflect unit costs of $13,000/system for upgrades and $30,000/system for connections from the MD Phase II WIP.

Figure 9. MDE Defined Septic Total Nitrogen Reduction Targets for Wicomico County (Based on revised 2010 Progress Scenario)

2010 Progress	2017 Target	2025 Target	Reduction between 2010 and 2017 (lbs, %)	Reduction between 2010 and 2025 (lbs, %)
141,406.6	116,128.8	99,277	25,277.8 lbs, 17.9%	42,129.6 lbs, 29.8%

Figure 10. Wicomico County Septic System BMPs based on revised 2010 Progress and estimated cost based on pricing assumptions contained in this Technical Addendum

Septic System BMPs			2010 Progress	2017 Interim Strategy*	Estimated Cost to Implement 2017 Interim Strategy[2]
BMP Name	**Zone**	**Unit**			
Septic Connection	Critical Area	Systems	0	0	$0
	Outside of the Critical Area, not within 1,000 ft of a perennial stream	Systems	3,600[1]	0	$0
	Within 1,000 ft of a perennial stream	Systems	150	0	$0
	Septic Connection Total		***3,750***	***0***	***$0***
Septic Denitrification	Critical Area	Systems	0	0	$0
	Outside of the Critical Area, not within 1,000 ft of a perennial stream	Systems	134	4,257	$55,341,000
	Within 1,000 ft of a perennial stream	Systems	59	2,633	$34,229,000
	Septic Denitrification Total		***193***	***6,890***	***$89,570,000***

*The BMP values represent the total amount of implementation in place. The BMP values are the amount credited in the Bay watershed model. It is the amount of BMP submitted minus the amount not given credit for (e.g., due to overlapping with other BMPs).

[1] The MDE prepared 2010 Progress is representative of 344 septic connections for the "Outside of the Critical Area, not within 1,000 ft of a perennial stream" septic zone. Moreover, as a result of the exaggerated number of septics systems assigned to Wicomico County, the 2010 Progress has been modified to connect an additional 3,256 systems in an effort to be consistent with the number of septic systems determined by the County 19,750.

[2] Price estimates are not inclusive of the 2010 Progress.

Figure 11. Wicomico County Final Septic System BMPs and Estimated Cost

Septic System BMPs			2010 Progress	2017 Interim Strategy*	2025 Final Strategy *	Estimated Cost to Implement 2025 Final Strategy[2]
BMP Name	**Zone**	**Unit**				
Septic Connection	Critical Area	Systems	0	0	0	$0
	Outside of the Critical Area, not within 1,000 ft of a perennial stream	Systems	3,600[1]	0	0	$0
	Within 1,000 ft of a perennial stream	Systems	150	0	0	$0
	Septic Connection Total		***3,750***	***0***	***0***	***$0***
Septic Denitrification	Critical Area	Systems	0	0	0	$0
	Outside of the Critical Area, not within 1,000 ft of a perennial stream	Systems	134	4,257	0	$0
	Within 1,000 ft of a perennial stream	Systems	59	2,633	3,521	$45,773,000
	Septic Denitrification Total		***193***	***6,890***	***3,521***	***$45,773,000***

*The BMP values represent the total amount of implementation in place. The BMP values are the amount credited in the Bay watershed model. It is the amount of BMP submitted minus the amount not given credit for (e.g., due to overlapping with other BMPs).

[1] The MDE prepared 2010 Progress is representative of 344 septic connections for the “Outside of the Critical Area, not within 1,000 ft of a perennial stream” septic zone. Moreover, as a result of the exaggerated number of septics systems assigned to Wicomico County, the 2010 Progress has been modified to connect an additional 3,256 systems in an effort to be consistent with the number of septic systems determined by the County 19,750.

[2] Price estimates are not inclusive of the 2010 Progress or the 2017 Interim Strategy.

Limitations to Implementation

It is unlikely that any jurisdiction will be able to meet the septic BMP targets without a new source of sustainable revenue because of the extensive capital, maintenance, and operating costs. MDE has estimated these costs to be approximately $3.7 billion statewide. To put the cost of implementation into perspective, the cumulative cost for Wicomico County to provide septic upgrades and septic disconnection is roughly $135 million; whereas, the County's annual operating budget of $116 million. Without dedicated Federal and State funding to meet the WIP goals, most jurisdictions will have to consider developing a dedicated user fee system.

Pumping

To receive nutrient reduction credit for pumping out septic systems, jurisdictions will need to work with septic haulers to track and report the date, address, number of septic tanks pumped, as well as document the wastewater treatment plant that accepted the septage for treatment and disposal. This will be especially difficult for Wicomico County because they are not a centralized authority or sanitary district and the seven (7) publicly-owned WWTPs in Wicomico County do not accept septage. The CBP and MDE require pump-outs at least once every 5 years to receive a nutrient reduction credit. This will create an additional burden to the increase in administrative costs and the need for a database system. There will be an additional burden to the haulers, but more importantly to the homeowners who cannot afford to have their septic tank pumped. The jurisdictions will also have to assure that there are adequate facilities for handling and disposing of the additional waste and haulers that dispose of waste in other counties are accounted for.

Septic System Connections

Besides the costs and disruption to the community of constructing sewers and lift stations, one of the major obstacles to implementing this option is that as reserved wastewater capacity is used through connection, the municipal wastewater treatment plants growth capacity is reduced. This may preclude additional hookups for septic systems as available treatment plant capacity might be planned to service new development.

One major obstacle of implementation of this BMP is Wicomico County does not possess Regulatory Authority over the operation of water and sewer facilities owned and operated by the incorporated jurisdictions. The water and sewerage facilities are operated by the seven (7) public sewer systems located in the incorporated towns (Salisbury, Fruitland, Delmar, Hebron, Sharptown, Willards, and Pittsville). The majority of connections to public service occur as a result of annexation, or in the past by the establishment of Urban Service Districts. It is unlikely that connections of existing individual septic systems will occur since the local jurisdictions are reluctant to expand or create new Urban Service Districts. Therefore, the only means available to receive public sewerage service will occur as an annexation or on parcels of undeveloped land already located within an incorporated jurisdiction.

Septic System Upgrades with BAT (denitrification)

Upgrading or installing a new OSDS with BAT will increase capital, maintenance, and operating cost to the homeowner. BRF Grant eligibility includes the capital cost of BAT plus the cost of 5-years of operations and maintenance. The maintenance must be performed by a certified service provider at a minimum of once per year or the minimum frequency recommended by the manufacturer. Not all sites are amenable to this technology because of soils and water table issues requiring expensive pump and haul options or connection. Because of the complexity of these systems, to receive nutrient reduction "credits" from the CBP, a countywide management program will be necessary to assure the proper operation of the different proprietary OSDSs, as well as standard treatment units. This will require additional staff and training, and the development of a database management system tied to a GIS to track septic system upgrades, installation, and maintenance. The County should consider establishing standard operating procedures to assure the continued operation and performance of each denitrifying unit. This could include an alarm system with telemonitoring, which provides an email or text message to the County Health Department and service provider upon system failure or the development of mechanical problems.

Opportunities for Implementation

In 2013, the BRF is expected to generate an estimated $56.5 M in revenue. While this amount is not enough to meet the total anticipated costs, it is substantial and the County should continue to request for increased allocation of BRF monies for upgrades to septic systems. The Bay Restoration Fund legislation allows for the billing authority to use up to 5% of the fees collected for reasonable administrative expenses. The County should approach MDE about increasing this percentage to account for the disproportionately large increase in operation and administrative charges that will be necessary to implement an expanded comprehensive program that includes pumping, disconnection, and OSDS upgrades.

Counties with proactive septic strategies will be most competitive to receive increased BRF funding. The Task Force recommends that BRF funds should be awarded to local governments through a competitive process in which awards are determined primarily based on the goal of maximizing the pounds of nitrogen, phosphorus, and sediment reduced per state dollar expended. Wicomico County should consider developing a comprehensive OSDS Management Program to be competitive for these funds. This would include the creation of an enterprise fund that would be supported by waste water service charge to owners of OSDS's. The County would be able to use the fund to issue bonds or leverage low interest loans such as the Water Quality Revolving Loan Fund and supplemental assistance grants which can be used for BAT upgrades. Other counties are likely to consider the development of an enterprise fund and it would be worthwhile to work together with these counties especially to develop a public participation program and outreach strategy to disseminate information in a timely manner.

Maryland authorizes two types of nutrient trading options. These include trading from point source to point source (Type I) and trading between non-point source to point source (Type II). The Type I Program has been in effect since April 2008 and the Type II Program since June 2010. Maryland is considering the development of a Type III system (non-point source to non-point source). To date, trading efforts have been limited with only a few Type I trades and no Type II trades occurring since these programs started. However, given the expense of implementing the WIPs strategies, trading has the potential for substantially reducing costs to meet the TMDL targets. Type I Trading allows for trading between point sources and trading involving the removal of OSDSs so it could be particularly useful to reduce the costs of BAT upgrades in areas where sewer connection to an ENR facility is viable. As this implementation effort continues, the County should consider discussing a comprehensive Trading Program with the seven (7) wastewater communities.

Pumping

Of the three (3) BMPs for the septic sector, it is difficult to determine the Nitrogen reductions resulting from pumping of individual septic systems. As a general practice, it is recommended that homeowners have their individual septic system pumped every three (3) to five (5) years to keep the system at optimal performance; however, this is not mandated / regulated.

There are numerous challenges to implementing this BMP including the associated costs, as well as the reporting and tracking functions. To make this BMP more appealing to homeowners with septic systems, the creation of a Septic System Pumping Program is recommended. It is envisioned this proposal would be a voluntary-based voucher program, not regulatory, using funds from the BRF. Every three (3) to five (5) years each homeowner would be eligible to receive a voucher to cover an undetermined portion of the pumping costs. In Wicomico County, the average cost to pump-out a system is estimated at $250.00 per household. Therefore, if one-fourth of the existing systems were pumped every four (4) years, approximately 5,800 individual systems would be pumped annually at a projected cost of $1.45 million. The Team will continue to effectively coordinate with the State and local partners to identify methods designed to increase public awareness of properly maintaining septic systems.

A key question related to this Best Management Practice is to what extent are citizens already maintaining their septic system. For instance, in Talbot County a survey of septage haulers indicated that approximately 70% of septic owners have their septic systems pumped regularly. So, receiving nutrient reduction credit might be more of an exercise of documenting what is currently occurring. While septic haulers should be willing to participate in such a program, they will have added expenses related to tracking and reporting. Therefore, it will be imperative to work closely with WWTPs accepting sewerage to coordinate this effort since the facilities for disposal of septage are not located within Wicomico County. Since septic haulers in the County dispose of waste outside of Wicomico, cooperation from adjacent counties will also be required to achieve the tracking expectations for this septic system BMP.

Septic System Connections

Of the three (3) BMPs to reduce nutrients, connecting to a public waste water treatment plant achieves the greatest benefit related to reducing nutrients contributed by this sector, but is the most expensive alternative to implement. With exception of the Town of Mardela Springs, which is served by individual septic systems, the remaining seven (7) incorporated areas have regulatory authority and operating responsibilities for their public waste water treatment facilities. It is important to note, Wicomico County does not possess regulatory authority of the public systems located within the incorporated jurisdictions.

In the past, the majority of connections to public service occurred as a result of establishing Urban Service Districts or annexation. Annexations typically occur on parcels of undeveloped land rather than areas previously developed; therefore, it is unlikely that connections of existing individual septic systems will occur as a result of annexation. The interest level of incorporated jurisdictions to create new or expand existing Urban Service Districts is limited; however, it is recommended that the County and the municipalities with public waste water treatment systems continue discussions to identify possible alternatives to connect individual septics to a public system.

Disconnection projects are eligible for funding using BRF if it can be demonstrated that the replacement of the onsite sewage disposal system with service to an existing ENR municipal wastewater facility is more cost–effective for nitrogen removal than upgrading the individual onsite sewage disposal system and the replacement with a BAT upgraded OSDS is not feasible. http://www.mde.state.md.us/programs/Water/QualityFinancing/Documents/Program%20Guidance%20FY%202012-%20Appendix%20B-Final%20June%202011.pdf

If it is the desire of the State to reduce the amount of existing individual septic systems by connecting them to public systems, several programmatic and funding actions will need to be implemented to realize this initiative. Currently, the County Health Department and MDE have two (2) detailed policies to determine if a property will require connection to a public system or issue permits to replace an existing septic system should the system fail. The first issue is the adequacy of the public system's ability to meet the anticipated demand based on the available supply of a waste water treatment plant. The second, and more important criteria, is the issue of defining availability. For the purpose of this discussion, MDE and the County Health Department have defined availability as "ready for immediate use." Therefore, it has been the determination of MDE if a property must be annexed as a condition to connect to a public sewer system, that system would not be considered available.

In addition to affording MDE and the County Health Department the leverage necessary to encourage an incorporated jurisdiction to connect systems within areas containing failing septic system without requiring annexation, funding mechanisms will need to be identified. See *Appendix II* for a map delineating the areas with failing systems. In some circumstances, funding will be necessary to offset costs associated with infrastructure improvements to expand service and capacity at publicly-owned waste water treatment plants. For example, if an incorporated jurisdiction desires to annex land adjacent to an area experiencing failing septic systems, the financial expenditure required to provide service to those areas with failing septics should be considerably or completely subsidized by using BRF monies or other federal and State funding opportunities. Therefore, the incorporated jurisdiction is not assuming the financial responsibility of serving an unincorporated area. Prior to the expansion of any Urban Service District, it is recommended the incorporated jurisdictions review their fee structure to make certain the costs associated with the provision of service are at an acceptable level to ensure the ongoing operations meet present and future demand. As part of the Two-Year milestones, it is recommended that continued discussions occur between the County and the seven (7) municipalities for the purpose of identifying opportunities designed to increase the level of interest to expand or create new Urban Service Districts. In addition, it has also been recommended that a study to identify the impacts of establishing a water and sewer authority be prepared, contingent on available funding.

The County Comprehensive Water and Sewerage Plan states that there has been some consideration of creating a county-wide authority, such as a Sanitary Commission, to plan for and manage the water and sewer needs of the entire county in a comprehensive manner. The development of a commission would benefit the County in overcoming obstacles related to sewer extension and consideration should be made to discuss this idea with the towns and owners of the private facilities.

The County Charter has designated an Urban Services Commission to manage service development and expansion. While this is typically done for planned growth areas, the same process should be investigated for existing areas that need sewer extensions. The County should consider meeting with the incorporated jurisdictions to discuss this as an alternative to annexation.

Septic System Upgrades with BAT (denitrification)

Working with organizations, such as Maryland Onsite Wastewater Professionals Association http://www.mowpa.org/MOWPA/, in addition to MAMWA, will assist the County to stay on top of issues specifically related to OSDS. This will be particularly helpful in addressing future legislation affecting OSDS. For instance, MDE has proposed new regulations to require BAT units for all new construction and on-going maintenance and operation for all BATs in perpetuity http://www.mowpa.org/MOWPA/wp-content/uploads/2011/04/Proposed-Reg-Changes-for-26-04-02-May-2012.pdf. While these regulations will be onerous to the County and citizens, they provide the incentive for the consideration of establishing a centralized authority or sanitary district, as well as consideration for a possible enterprise fund.

Once ENR goals have been met (estimated 2016) conceivably more BRF should be available for OSDSs, although cover crops and stormwater retrofits will also be in competition for monies available through the BRF. The Bay Restoration (Septic) Fund statute (Annotated Code of Maryland under 9-1605.2) requires that funding priority for BAT installations are given according to the following conditions:

- Failing OSDS or holding tanks in the Critical Areas;
- Failing OSDS or holding tanks not in the Critical Areas;
- Non-failing OSDS in the Critical Areas including new BAT installation; and
- Non-failing OSDS outside the Critical Areas.

For Wicomico County to remain competitive it must have accurate information on the location and operational conditions of all OSDSs in the County. Funding for OSDS upgrades through the BRF currently provides grant recipients financial assistance determined on income-based criteria. The County should discuss with MDE the possibility of adjusting this to make sure that areas in most need (within the critical area), as well as those areas of failing septic systems as identified in the 2010 Wicomico County Comprehensive Water and Sewerage Plan, receive the greatest amount of assistance regardless of income level.

III. Waste Water Treatment Plants

Background

There are seven (7) public sewer systems located in the incorporated jurisdictions of Wicomico County (Salisbury, Fruitland, Delmar, Hebron, Sharptown, Willards, and Pittsville) currently serving over 17,500 housing units. For the purpose of this discussion, treatment plants will be classified as a major or minor facility. Waste water treatment plants with a capacity greater than 0.5 million gallons daily (MGD) are major plants; whereas, facilities with a capacity less than 0.5 (MGD) are referred to as minor plants. Of the seven (7) waste water treatments plants (WWTP), three (3) are considered major plants with a capacity greater than 0.5 million gallons daily (MGD) and the remaining four plants are minor systems with a capacity less than 0.5 MGD. See **Figure 12**.

Figure 12. Municipal Waste Water Treatment Systems in Wicomico County

Jurisdiction	*Existing / Permitted Treatment Capacity (million of gallons per day)*	*Treatment Technology*
Salisbury	8.5	Biological Nutrient Removal (BNR) & Enhanced Nutrient Removal (ENR)
Delmar	0.85	Activated sludge
Fruitland	0.80	Advanced secondary BNR
Hebron	0.101	Facultative lagoon
Pittsville	0.115	Oxidation ditch; activated sludge
Sharptown	0.15	Activated sludge
Willards	0.20	Activated sludge

Source: 2010 Wicomico County Comprehensive Water and Sewerage Plan

The baseline / 2009 progress amount of Nitrogen delivered annually from municipal-owned waste water treatment plants (major and minor plants) and minor industrial plants located within Wicomico County is 276,778 lbs. To accomplish the 2017 target load of 117,072 lbs of Nitrogen, a reduction of 159,706 lbs by 2017 will need to be achieved. Between 2017 and 2025, this sector will experience a surplus above the 2017 target of 22,963 to accommodate future growth and development. The State Phase I WIP recommends considerations to achieve the necessary nutrient reductions that include the following:

- Major WWTPs – Upgrade existing plants to ENR;
- Minor WWTPs – Upgrade the five largest plants; and
- Minor Industrial – MDE has a conceptual strategy for Minor Discharges that will become better defined in the coming years.

Major Waste Water Treatment Plants

The City of Fruitland and the Town of Delmar are in the process of upgrading their facilities to achieve ENR treatment levels of nutrient removal. These extensive Capital Improvement Projects have been funded in whole or in part by the State as part of the BRF expenditures to the Wastewater Treatment Fund. The City of Salisbury recently completed upgrades to their waste water treatment facility, which included increasing hydraulic capacity from 6.8 MGD to 8.5 MGD, as well as improving the treatment technology to ENR. At the time of this publication, the plant is unable to achieve the anticipated treatment levels. However, the City intends to upgrade the level of treatment at their facility to meet ENR discharge levels. The exact timing is difficult to project based on issues including the identification of available funding and on-going negotiations between the City and MDE.

Upon completion of the upgrades to the major WWTPs, it is projected the 2017 target allocations for this sector will be achieved; however, these upgrades may not be completed prior to that target date.

Minor Waste Water Treatment Plants

The baseline (2009 progress) amount of Nitrogen delivered annually as a result of contributions from the four (4) existing minor waste water treatment plants is 14,439 lbs. This component of the waste water sector is currently operating within the 2025 target loads (15,452 lbs of Nitrogen). Therefore, a reserve of 1,013 lbs of Nitrogen exists, which may be capable of supporting limited growth.

Maryland adopted a point source strategy to address nutrient loadings from publicly-owned and operated waste water treatment plants. The strategy for minor treatment plants is to base annual nutrient loads on design capacity or projected 2025 flow, whichever is less. Therefore, when a minor facility expands, its projected nutrient loads become point source caps. If the projected nutrient loads are less than 6,100 lbs / year of Nitrogen and 457 lbs / year of Phosphorus, the point source cap must remain at the projected nutrient load. In contrast, if the projected nutrient loads exceed the aforementioned limits, the minor plant will need to reduce contributions of Nitrogen to no more than 6,100 lbs / year and Phosphorus to 457 lbs / year.

At the time of this publication, there are no immediate plans to expand the design capacity or to upgrade any of the minor facilities to BNR or ENR standards. It is recommended that jurisdictions with minor plants, at or near capacity, begin to consider identifying potential solutions including nutrient trading, changes in future land use, or the use of spray irrigation as a means of disposing the treated effluent.

IV. Agriculture

Background

The baseline / 2009 progress amount of Nitrogen delivered annually from this sector is 963,866 lbs. To meet the 2017 target load of 934,088 lbs of Nitrogen, a reduction of 29,778 lbs of Nitrogen will need to be achieved. In an effort to meet the 2025 target load an additional reduction of 12,762 lbs of Nitrogen is required. Based on the current and projected rate of implementation it is plausible this sector may meet their target loads.

For more information about the efforts of the Agricultural work group for the Phase II Watershed Implementation Plan, contact the Wicomico County Soil Conservation District at (410) 546-4777.

V. Public Involvement

Non-Governmental Organizations (NGO)

Wicomico County's Watershed Implementation Plan (WIP) can improve the health of area waterways, but the Plan will require support from local residents, businesses and institutions to be successful. Representing many people who live and work in Wicomico, non-profit organizations active on the Shore can provide assistance to the County and municipalities in meeting nutrient reduction targets under the Bay TMDL.

Local non-profits have historically engaged citizens, businesses, and institutions who prioritize clean water in a variety of public and private initiatives including shoreline restoration, water quality monitoring, technical assistance and participation on policy committees, and support for grant funding, among other opportunities.

As Wicomico County develops and implements its WIP, the non-profit community can assist in the following ways:

- Deliver a volunteer base to assist with streamside restoration projects, tree plantings, and river cleanups;
- Assist with surveys/inventories of potential project sites and review available funding incentives for restoration and BMP implementation;
- Administer water quality monitoring programs, such as the Wicomico Creekwatchers program operated jointly by Salisbury University, the Wicomico Environmental Trust, and the Creekwatchers volunteer leadership team;
- Provide professional technical support for policy analysis and implementation;
- Co-sponsor grant applications and help secure additional financial resources, including further grant funds for Wicomico River watershed assessment, management, remediation, and stakeholder outreach; and
- Educate and engage citizens in support recommendations and considerations contained within this Draft WIP.

Appendix I

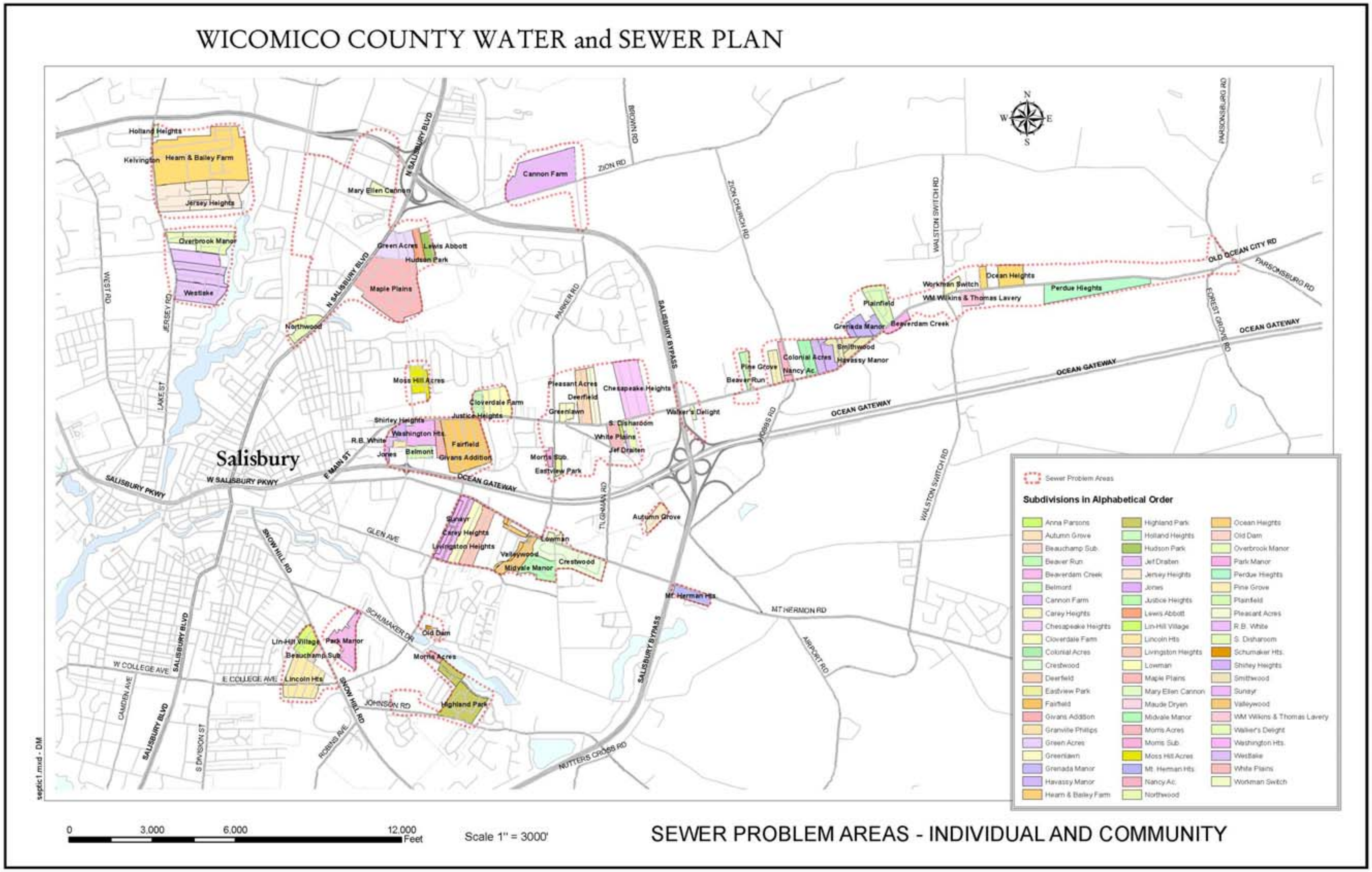
Two-Year Milestones

1. Scale – Planning level
2. Recommendations – Countywide
    a. Work closely with the agricultural community to reduce nutrients from entering our local waterbodies;
    b. Establish a voluntary tree planting program;
    c. Create tracking and reporting systems consistent with the needs of rural and urban areas for septic, stormwater, and WWTP;
    d. Identify State and Federal funding opportunities for the purpose of obtaining professional consulting services to prepare watershed management plans for the Wicomico and Pocomoke Rivers;
    e. Seek increased funding levels of the Bay Restoration Fund to facilitate a septic pumping program that is voucher based. Additionally, utilize additional funding to increase the number of septics upgraded annually;
    f. Upgrade approximately 70 – 100 septic systems to best available technology;
    g. Continue discussions with municipalities to accept sewage from individual on-site septic systems;
    h. Quality control of data used within Bay model and MAST
        i. Overestimated the number of septic systems in the County. MAST is calibrated to 23,200 systems; whereas, approximately 19,750 systems exist. This discrepancy results in a potential reduction of 20,000 lbs of nitrogen;
        ii. Continue to identify eligible BMPs implemented since 12/31/2005
    i. Partner with non-profit organizations to identify funding sources to implement stormwater BMPs;
        i. Rain gardens;
        ii. Working with Home Owners Associations to prepare voluntarily compliance nutrient management plans; and
        iii. Streamside plantings;
    j. Consideration of municipalities to expand urban service districts in areas identified as experiencing failing septic systems;
    k. Continue the upgrades of Fruitland and Delmar WWTP to ENR;
    l. Consideration of preparing a Stormwater Financing Feasibility Study
    m. Consideration of establishing an urban tree canopy program;

n. Continue street sweeping program; and
o. Consider preparing a study identifying the impacts of establishing a water and sewer authority.

Appendix II

Areas With Failing Septic Systems



Appendix III

MAST BMP Analysis

Chesapeake Bay Model - Land Uses Reduction Pounds of Nitrogen Per Acre Per SW BMP

	CSS Construction	CSS Impervious Developed	CSS Pervious Developed	Muni Phase II MS 4 Impervious	Muni Phase II MS 4 Pervious	Nonregulated Extractive	Nonregulated Impervious Developed	Nonregulated Pervious Developed	Regulated Constructive	Regulated Extractive	Regulated Industrial Facility Impervious	Regulated Industrial Facility Pervious
Bioretention / Raingarden	N/A	0.00	0.00	7.28	3.95	N/A	7.13	3.89	N/A	N/A	7.28	3.94
Bioswale	N/A	0.00	0.00	7.28	3.95	N/A	7.13	3.89	N/A	N/A	7.28	3.94
Dry Detention Ponds and Hydrodynamic Structures	N/A	0.00	0.00	0.48	0.26	N/A	0.47	0.26	N/A	N/A	0.47	0
Dry Extended Detention Ponds	N/A	0.00	0.00	1.94	1.05	N/A	1.90	0.26	N/A	N/A	0.47	0.25
Erosion and Sediment Control	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.64	N/A	N/A	N/A
Forest Conservation	N/A	N/A	0.00	N/A	0.00	N/A	N/A	0.00	N/A	N/A	N/A	0.00
Impervious Urban Surface Reduction	N/A	0.00	N/A	9.71	N/A	N/A	9.51	N/A	N/A	N/A	9.7	N/A
MS4 Permit - Required SW Retrofit	N/A	0.00	0.00	2.43	1.32	N/A	2.38	1.30	N/A	N/A	2.43	1.30
Permeable Pavement no Sand Veg w/Underdrain A&B Soils	N/A	0.00	0.00	4.85	2.64	N/A	4.75	2.59	N/A	N/A	4.85	2.64
Permeable Pavement with Sand Veg w/Underdrain A&B Soils	N/A	0.00	0.00	4.85	2.64	N/A	4.75	2.59	N/A	N/A	4.85	2.64
Recent Stormwater Management	N/A	0.00	0.00	1.94	1.96	N/A	1.90	1.04	N/A	N/A	1.95	1.05
Stormwater Management by ERA 1985 to 2002 MD	N/A	0.00	0.00	1.65	0.90	N/A	1.62	0.88	N/A	N/A	1.66	0.88
Stormwater Management by ERA 2002 to 2010 MD	N/A	0.00	0.00	2.91	1.58	N/A	2.85	1.56	N/A	N/A	2.9	1.55
Stormwater to Maximum Extent Practicable (SW to MEP)	N/A	0.00	0.00	4.85	2.64	N/A	4.75	2.59	N/A	N/A	4.85	2.64
Street Sweeping Mechanical Monthly	N/A	0.00	N/A	0.29	N/A	N/A	0.28	N/A	N/A	N/A	0.3	N/A
Urban Filtering Practices	N/A	0.00	0.00	3.88	2.11	N/A	3.80	2.08	N/A	N/A	3.91	2.10
Urban Forest Buffers	N/A	N/A	0.00	N/A	6.56	N/A	N/A	6.48	N/A	N/A	N/A	6.58
Urban Grass Buffers	N/A	N/A	0.00	N/A	0.00	N/A	N/A	0.00	N/A	N/A	N/A	0.00
Urban Growth Reduction	N/A	0.00	0.00	9.71	5.27	N/A	9.51	5.19	N/A	N/A	9.7	5.24
Urban Infiltration Practices - No Sand / Veg. No Underdrain	N/A	0.00	0.00	7.77	4.22	N/A	7.61	4.15	N/A	N/A	7.75	4.19
Urban Infiltration Practices - with Sand / Veg, No Underdrain	N/A	0.00	0.00	8.25	4.48	N/A	8.08	4.41	N/A	N/A	7.75	4.48
Urban Nurtient Management	N/A	N/A	0.00	N/A	0.90	N/A	N/A	0.88	N/A	N/A	N/A	0.88
Urban Tree Planting: Urban Tree Canopy	N/A	N/A	0.00	N/A	5.27	N/A	N/A	5.19	N/A	N/A	N/A	5.24
Vegetated Open Channel - Urban	N/A	0.00	0.00	4.37	2.37	N/A	4.28	2.33	N/A	N/A	4.38	2.35
Wet Ponds and Wetlands	N/A	0.00	0.00	1.94	1.05	N/A	1.90	1.04	N/A	N/A	1.95	1.05

Chesapeake Bay Model - Land Uses Reduction Pounds of Nitrogen Per 1,000 Feet Per SW BMP

	CSS Construction	CSS Impervious Developed	CSS Pervious Developed	Muni Phase II MS 4 Impervious	Muni Phase II MS 4 Pervious	Nonregulated Extractive	Nonregulated Impervious Developed	Nonregulated Pervious Developed	Regulated Constructive	Regulated Extractive	Regulated Industrial Facility Impervious	Regulated Industrial Facility Pervious
Shoreline Erosion Control*	N/A	0.00	0.00	258.70	178.50	N/A	517.70	1,115.00	N/A	N/A	73.40	74.00
Street Sweeping Feet	N/A	0.00	N/A	73.40	N/A	N/A	71.60	N/A	N/A	N/A	73.40	N/A
Urban Stream Restoration or Regenerative Stormwater Conveyance	N/A	0.00	0.00	18.40	18.50	N/A	17.90	18.20	N/A	N/A	18.40	18.50

Notes:
Was listed in MAST as a SW BMP as of 9/19, not listed as BMP within MAST as of 9/20
N/A indicates the BMP in not applicable to the Land Use per MAST